

NUTRITION RULES!

Guidelines from the Master Consultants
22 inspiring interviews which could change the way
you farm and alter the way you eat.



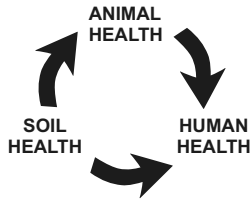
GRAEME SAIT

Founder and CEO of Nutri-Tech Solutions

FIRST EDITION

NUTRITION RULES!

**GUIDELINES FROM THE MASTER
CONSULTANTS**



**22 Inspiring Interviews which
could change the way you farm -
and alter the way you eat!**

Graeme Sait

Published By

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Root Causes...

“The more fragmented, the more specialised we become in terms of problem solving, the more problems we create and the less we solve. I have a need to address my life-threatening illness with alternative techniques, but the caveat there is that the treatment of symptoms can pre-empt the search for the ultimate cause of this illness. If we see ourselves as manifestations of this organism that’s called Earth, and we, as a manifestation, are developing absolutely outrageous levels of this illness called cancer, the only thing this can mean is that the organism called Earth has cancer. If we don’t address this from humanity’s perspective, we can never escape from the abyss of this horrid disease. It’s not just bad luck, bad lifestyle or genetics. It’s a fact that the whole planet is sick on multiple levels, including the environment, including our disregard for the sacredness of food, including the fact that we are so disconnected from nature.”

Jerry Brunetti, 2002

Acknowledgements

I would like to express my heartfelt thanks to my wife Rosa, without whom this book would not have been possible.

I would also like to thank my long-suffering children - Adam, Laura, Rachael, Tania and Daniel, for accepting our absence during the numerous international forays required to complete this book.

Thank you, Bryan Sait, my brother and business partner, for holding the fort so many times in our absence and for your capacity to propose and realise creative solutions.

I'd like to express my gratitude to my Mum and Dad, Colin and Eunice Sait, for implanting in me the passion and purpose needed to push for change.

I am indebted to Charles and Fred Walters for bringing together the leading movers and shakers in sustainable soil and health management for their annual Acres USA Conference. Many of the subjects have been speakers at these memorable events.

I recognise the efforts of the passionate and dedicated NTS team, who have so ably handled the pressures of rapid growth during the past eight years. Thank you for your initiative, which has allowed me the freedom to work on my books.

Finally, I would like to thank the talented and committed interview subjects who have so willingly donated their wisdom and expertise for the enlightenment of us all.

Introduction

I have always loved a good interview - not the ten-minute tabloid specials where a handful of cues turn talking head celebrities onto autopilot. I like the real thing - in-depth and inquiring, where you're almost there with the interviewer, working the coalface. My decision, in 1998, to begin conducting and collating my own interview series, was based on several key factors.

First and foremost, I wanted to indulge my own passion - to gather up some more pieces of the puzzle and satisfy my thirst. I was also intent, from the outset, in sharing my quest with Australian farmers seeking a new way to farm. In this context, I contacted Lindsay Bock from Acres Australia, the newspaper of sustainable agriculture, and Lindsay agreed to run with the interview series in his publication.

The ultimate goal of the exercise had always been to source, condense and contrast the varying philosophies and techniques which are changing the way we produce and utilise our food. I was always aware that, when I had arrived at a point where the pieces were coming together, a book could be produced, which might, in some way, help to shape the new paradigm in agriculture.

This paradigm essentially involves working with nature rather than working against her. Charles Walters calls it Eco-Farming, Gary Zimmer refers to Biological Farming and Hugh Lovel tags his approach Energy Farming or Quantum Agriculture. All of them are concerned with providing viable frameworks to offer the right answer to the big question - a semi-cosmic query that Malcolm Beck has identified as "DOES NATURE APPROVE?"

In our work with thousands of Australian farmers, it has become increasingly obvious that nature does not approve of a prevailing system where we poison our soils, pollute our air, degrade our food and water and then have the arrogance to tamper with the blueprint because the original plan can't deliver like it used to.

It has also become obvious that 'we are what we eat' and the current epidemic of chronic and degenerative diseases is testimony to what we become when we ignore the critical link between soil health and human health.

We need to redefine our relationship with nature - to end the war of attrition and to realise that at the core of everything good lies nutrition - NUTRITION RULES!

Peak nutrition should be the ultimate goal for the soil, microbes, plants, animals and humans. It could be argued that soil nutrition is currently addressed with fertilisers and that animal / human nutrition is taken care of with supplements, but there is a problem here.

The ability of a 'fertiliser' to build soil fertility can be reliably measured with two criteria - microbe counts in the soil and relative plant health. Professor Elaine Ingham has confirmed that commercial salt 'fertilisers' are killing off the key players in the soil foodweb. Fungi, beneficial nematodes and protozoa are all struggling under the load. Beneficial microbes thrive in a fertile soil, but these so-called 'fertilisers' can rarely deliver fertility.

In the absence of key players, the inherent protective and self-regulating capacity of the soil foodweb is compromised and the pathogens make their presence felt. Out come the chemicals, and the collateral damage includes at least as many good guys as bad. Working against nature is a proven failure and yet the war continues.

Plant health is the second determinant of fertiliser efficacy. Healthy, minerally balanced plants do not attract insects or disease. Professor Phil Callahan has identified an infrared emission from plants to which insects 'tune in'. Healthy, mineralised plants produce a completely different emission to sick, unbalanced plants. The insects target the sick - these garbage disposers serve to remove unhealthy plants from the genetic pool as a service to us all. The problem, of course, is that most of what we grow now falls into the garbage category.

Dr Arden Andersen and Dr Phil Wheeler have widely promoted the use of the refractometer to monitor plant health. The brix levels measured by this instrument are a measure of how well the plant is photosynthesising in response to mineral and biological stimulation. In essence, a healthy plant will have a high brix level, which in turn relates to a specific infrared emission that does not attract insects. Bruce Tainio has discovered that the pH of plant sap is another indicator of plant health and associated pest and disease pressure. An ideal sap pH of 6.4 reflects the optimum vibratory frequency for that plant. If plant sap is acidic, then the vibratory profile of that plant attracts disease. Conversely, if plant sap is alkaline, insects are attracted. There is a beautiful synergy in Bruce's concept, in that the measurable number (the vibration that represents the state of balance, also reflected as a

sap pH of 6.4) comprises the sum of the vibrations of all of the elements that determine the sap pH. That is, each element vibrates in a unique manner, and these vibrations can now be categorised numerically. If there is a deficiency in a cation - calcium, potassium and magnesium being the key players - then there will be more hydrogen in the plant sap, the sap will be acidic and the plant will attract disease. At the other end of the pH-spectrum, the anions are shaping the scenario. If the acidic anions - nitrates, phosphates and sulfates - are deficient, then the balance is blown. The sap pH becomes alkaline and it's 'tucker time' for the sap-suckers. There is no incongruity here. Callahan's infrared emissions, Reams' Refractive Index and Tainio's sap pH concept are all monitoring the same thing - the plant's response to the mineral, biological and atmospheric environment into which it has germinated. High sap pH often correlates to low brix levels, because phosphate, the 'sugar slave', is lacking. When sugar production is compromised due to the phosphate shortage, then the daily delivery of sugars from the roots to the beneficial microbes living in the root zone, is similarly affected. Mineral availability and uptake doesn't happen efficiently when microbes are under-fed or lacking energy.

The point is that balance is everything, and unbalanced fertilisers create health problems for plants. The level of chemical intervention in the soil and on the leaf surface is a direct measure of the failure of a fertiliser program. The total amount of chemicals applied to cropland continues to grow each year and yet there has never ever been a recorded reduction in pest problems. Chemicals are not solving the problems because we are treating symptoms. The root cause of these problems is poor nutrition and balance. It is the same root cause which has filled the pharmacy shelves with vitamin and mineral supplements. Plants were intended as the vehicles for the delivery of minerals from the soil to animals and humans. Why else would plant-derived minerals be 98% bioavailable? Our nutrition should come from our food, not from a bottle. We desperately need access to chemical-free, nutrient-dense food, which contains all of the vitamins, minerals, enzymes, antioxidants, amino acids, fatty acids and the numerous plant compounds now attributed to optimum health management.

The committed pioneers who have donated their wisdom for the purposes of this book have the keys to the production of this precious nutrient-dense food. I trust that you will enjoy their revelations and become empowered with your new knowledge.

Graeme Sait

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SOIL HEALTH - MINERAL MANAGEMENT



CHARLES WALTERS

Interview recorded December 1999



*Sometimes, in the summation of a life's work, it becomes blindingly apparent that a 'rare gem' has been unearthed. Here we move beyond the simple fulfillment of a dream and the pursuit of excellence to a realm where we are dazzled by the sheer magnitude of the achievements. Twentieth Century agriculture has produced such a luminary in the form of author / editor / publisher **Charles Walters Jr**, the founder of **Acres USA** - the journal for eco-agriculture. Over a thirty-year period, Acres USA has spawned the brains-trust largely responsible for the current surge toward more sustainable food production. A master wordsmith, above all, Charles Walters has demonstrated the potency of the written word in initiating meaningful change. Author or co-author of a dozen books, including the classic 'Eco-Farm' and Neal Kinsey's 'Hands-on Agronomy', Charles Walters has been a torch bearer - a voice in the wilderness, demanding a rational appraisal of an agriculture drowning in a sea of toxins. He was personally responsible for the compilation and resurrection of **Dr William Albrecht's** life work. This priceless research has since formed the basis for a redefined, balance-orientated agronomy, which is now favoured by the majority of successful eco-consultants. Charles Walters Jr has published the works and nurtured the careers of the leading educators in the field, including **Professor Philip Callahan, Dr Arden Andersen, Dr Phil Wheeler, Neal Kinsey, Dan Skow** and several others. On the back sleeve of his powerful autobiography, 'A Life in the Day of an Editor', Walters expresses his disillusionment about the fickle nature of public opinion and the journalists who so readily sacrifice honesty in the manipulation of that opinion. He writes: 'Most people would rather swallow lies than truth; especially if the liar has authority and the misinformation is soothing - like a fine liqueur. Moreover, the wordsmith's trade is full of crafty liars, workmen who think of truth as something relative and malleable. The supply of lies, much like ignorance, is infinite.' In his thousands of articles and interviews over several decades, Charles Walters has helped stem the flow of lies. He has consistently dished up the hard truth, and the bitter after-taste is finally beginning to mellow. A trickle of truth-seekers is becoming a raging stream, and a great man can now enjoy the fruits of his labour. I interviewed **Charles Walters** at the Acres USA Conference in Minneapolis last December. At seventy-five, he has lost none of his fast wit and compelling insight, and he remains an inspiration to us all.*

Graeme: You have had an enormous impact in the field of sustainable agriculture. In fact, it is a chilling thought to contemplate where we all would be without you. Did you envisage this kind of international impact when you founded Acres USA almost thirty years ago?

Charles: Well, actually, there are people who have gone before who should not be forgotten. Some of the work that we are relying on goes back to the beginning of the present century in Russia, Europe and England. It was transported to the United States and picked up by some of our great professors, ending with people like Dr Albrecht, Chris Hopkins, and some of the people who worked with ‘The Friends of the Land’ under Louis Bromfield at Malabar Farm. Acres USA actually came along in the wake of Rachel Carson’s great work ‘Silent Spring’. I think she was the one who kicked open the door more than Acres kicked it open - we merely picked up on it and realised that these important concepts were not being fitted into where they really belonged - which is mainline agriculture. That’s a big task to set out for yourself - to try to recast mainline agriculture. I don’t really know what we really envisaged, except that somebody had to get started.

Graeme: The point is that if you hadn’t started, it’s conceivable that no one would have.- You mentioned Albrecht, for example - no one would have ever known of his work without you.

Charles: That was one of the tragedies of the time, that Albrecht should die unknown and Norman Borlaug should get the Nobel Prize. Borlaug’s work has been a disaster in every third world country it’s been tried, and Albrecht’s has been a success in every country its been tried.

Graeme: I’m not familiar with Norman Borlaug - who was he?

Charles: He was the NPK man. He was going to fertilise them into heaven across the board.

Graeme: In ‘Unforgiven’, one of your early works, you highlight government policies which have featured in the demise of the family farm. You demonstrate the link between this rural crisis and the social and economic unrest in our cities. Several decades later, at the dawn of a new millennium, this urban unrest has certainly not diminished. In retrospect, how much has rural upheaval contributed to our current problems?

Charles: Well, it’s contributed a great deal. At the end of World War II, in 1946, it took about 15 families to run 500 acres of cotton in Mississippi, but the chemical companies were knocking at Jamie Whitten’s door. Jamie Whitten was the chairman of the Appropriations Committee for Agriculture. By 1948 he was responsible for instigating a complete change in the entire direction of the Land Grant University system from biological agriculture to the so-called ‘conventional’ agriculture. Jamie Whitten’s district was 75% black and 25% white. By the time he got through shipping them out it was 75% white and 25% black. Those people went to Detroit, to Newark, to Chicago, to Watts - to every trouble spot in America. That’s just one small sample of it. We’ve closed down thousands of small towns and villages in the US, and those people have crowded their way into metro-centres - not necessarily to become the unemployed, but often to displace other people because they were often workers. The legacy from that upheaval remains a problem.

Graeme: Over thirty years ago, Italian scientist Dr Americo Mosca demonstrated that many man-made farm chemicals, particularly fungicides, can produce genetic damage and toxic responses almost identical to those caused by nuclear radiation. Dr Mosca suggested that up to 15% of newborn babies were mentally retarded, largely as a result of toxic chemicals. At the end of this century we face a cancer plague that strikes one in every two of us. In your opinion, what role have toxic chemicals played in this current cancer crisis?

Charles: Well, according to the pediatric journals, it's been devastating - but it's not just children - it's the degenerative metabolic diseases which have affected the entire population. Diabetes, for example, is running rampant. One of the causes of diabetes is fluoridation. Excessive fluoride in the thyroid gland affects the production of thyroxin. Without the proper level of thyroxin you can't metabolise sugar. This is not even a toxic genetic chemical we are talking about; it's just a mined chemical we willy-nilly throw into our water supply. Now add to that another 44,000 preparations that have been set loose into the environment. We can no longer tell who shot the gun, all we know is that it is devastating.

Graeme: Last week, in San Diego, I interviewed Joel Wallach of 'Dead Doctors Don't Lie'. Joel would argue that mineral nutrition is the big link in the etiology of disease. Remineralising is certainly a central focus in our approach. Are you familiar with Joel's arguments regarding the mineral link to disease, violence, drug addiction and food cravings?

“One of the causes of diabetes is fluoridation. Excessive fluoride in the thyroid gland affects the production of thyroxin. Without the proper level of thyroxin you can't metabolise sugar. This is not even a toxic genetic chemical we are talking about; it's just a mined chemical we willy-nilly throw into our water supply. Now add to that another 44,000 preparations that have been set loose into the environment. We can no longer tell who shot the gun, all we know is that it is devastating.”

Charles: Yes, I agree with Joel to some extent, but I suspect that mineral deficiency is more pronounced in a very old continent like Australia. A large percentage of our problems are more related to 'lock-ups' and complexing through the amateurish application of NPK fertilisation. We've had the glaciers over much of our country, and mineralisation was very high. In general, people who have not embraced the NPK system are not suffering from mineral deprivation.

Graeme: Do you think Joel may have overstated the case in the US example?

Charles: Not necessarily. In many areas we are repeating the mistakes made by the Egyptians in the Nile Valley. My God, we don't know how many square miles of incredibly fertile farmland were irrigated into oblivion in that area. In California and other areas we continue to desertify with the same reckless abandon.

Graeme: William Albrecht was certainly aware of the importance of mineral nutrition in animal health. It is fair to say that, in all likelihood, Albrecht's work would have

faded into obscurity if not for your efforts. At the time, when you were taping the autobiography of the aging professor, did you fully sense the legacy with which you had been entrusted?

Charles: I don't think I had any particular sense of 'saving the world' in those times. We just felt - well, it was often just a pragmatic thing - this kind of information couldn't be ignored. You just did what had to be done.

Graeme: Is there any part of Albrecht's legacy that you consider more important than another? For example, were his revelations regarding the primacy of calcium as a nutrient more significant than his findings regarding cation balancing, or are they inseparable?

Charles: Calcium was the linchpin of his work of course, but then he took some of that silt loam clay out of Missouri and put it in a centrifuge and spun it out at thousands of revolutions per minute until he had a fine, naked jelly. Then he added nutrients to that colloidal material, one after another, under very controlled conditions, to find out what these various minerals were doing. Now, a growing army of Albrecht people is proving his findings correct in the field in all corners of the globe. A good Albrecht man can go into the tropics or into Canada and get good results in either place. Calcium, magnesium, potassium and sodium have to maintain a certain equilibrium, and then you take care of the minor nutrients.

Graeme: Well, we have proven the viability of this approach beyond doubt in Australia. We have thousands of clients who return year after year.

Charles: That's good to hear. Yes, we have been responsible for some of the developments that have swept around the planet a little bit. For example, we were the first to publish brix information for refractometers.

Graeme: Yes, I intend to ask you shortly about the circumstances surrounding that, but I'll continue with my planned question format. I enjoyed the chapter in 'A Day in the Life of an Editor', which covered Gene Poirot. He was a real visionary. I loved his quote regarding the futility in building industrial greatness without building a soil potential to provide nutrition for the people it represents. I also liked the concept that farming with nature should nurture the soul of man. This would be good advice for some of our Australian cotton farmers who believe that the only good plant besides cotton is a dead one. What, for you, was the highlight of Gene Poirot's work?

Charles: Gene Poirot went out on a farm in southern Missouri with such bad soil he didn't get a crop the first year. When he started to build it up, he kept a small plot of the original soil for comparison. Forty years later, it was a magnificent achievement. The streams ran crystal clear, the crops were abundant and always beautiful with a lot of nutrients attached to them. He used some of the salts, but he used them very judiciously. This is one of the mistakes some of our organic people make. The fact is, if you don't have the humus to make organic production possible, then you're just whistling Dixie. They will have to use the needle a little bit.

Graeme: I agree. Similarly, if you have no zinc, for example, all of the animal manure in the world won't correct that deficit.

Charles: Exactly. Gene Poirot experimented with everything, and he found a lot of answers, particularly with compost. Of course he worked a lot with Dr Albrecht at the University of Missouri. They worked hand-in-hand.

Graeme: CJ Fenzau was another of your colleagues who left his mark in no uncertain terms. He was a realist who was aware that the ongoing amateurism of organics could not compete with a well-developed, well-funded chemical system. He seemed to be suggesting that high-production, biological agriculture could best be achieved using a combination of the best of both worlds. This is, in fact, now the main thrust of contemporary agriculture. Would it be correct to suggest that CJ Fenzau - I wonder why no one called him Clarence - was a pioneer in the unifying of chemical and organic approaches to improve the biological system?

Charles: Well, he never liked the name Clarence. He was indeed a pioneer in combining the best of both worlds, but there was always one exclusion - rescue chemistry didn't have a part of it. Yes, he would use the nutrients, but he didn't use the poisons. This has been part of the confusion here. People tend to think of fertilisers and rescue chemistry all in the same breath. Several of these fertilisers actually work well with microorganisms. There are of course others that don't. If you want to turn your farm into an airplane runway, then anhydrous [ammonia] will do the trick. CJ used soil tests. If he needed copper then he put it on. It was a scientific approach.

Graeme: Your autobiography reads like the who's who of Twentieth Century agriculture - well, of what I call 'real' agriculture, anyway. It is fascinating to see the natural progressions and to appreciate the difficulties faced by visionaries presenting sound ideas that conflicted with 'academics'. It is also satisfying to see large-scale change beginning to happen as a result of these pioneers. In the field of remineralisation, for example, the work of Albert Carter Savage and John Hamaker can now be dove-tailed with Phil Callahan's work to magnify the appeal and viability of rock dust fertilising. In Australia, there is a huge surge of interest in these sorts of approaches. Do you see the same change happening in the US?

Charles: Yes, its happening, but a little slower. Golf courses are beginning to use these materials, as people object to high toxicity levels on the playing field. In row crop agriculture, they are also starting to use them on a larger scale. A lot of places require them more than others. The American south, which has been mined to death with tobacco and cotton over many years, will really benefit. Part of the growing interest is related to the fact that we have simple measuring instruments to determine the fertiliser value of rock dusts. Phil Callahan has developed a good instrument for this. Malcolm Beck from Austin, Texas, has a couple of hundred different materials, some of them with astonishing numbers.

Graeme: Still talking changes - do you feel that we are any closer to the economic changes which you have fought so hard for?

Charles: No, I can't see any positive changes here, and it's my biggest disappointment. I'll tell you how bad it gets. There is a professor named Steven Blank out of the University of California Davis. He just put out a book, 'The End of Agriculture in the American Portfolio'. His whole theory is that the economy of scale and the cost of labour is ultimately going to consolidate the land in the US into a few strong hands - a few huge factory farms. Then they will, in turn, lose out to world producers who have

even cheaper labour, and by fifty years time we will be importing most of our food. Now, this professor doesn't see this as a bad thing at all. He thinks that this is part of the New World order and it will work. The problem is that he has missed the point. You can't have a world order that has four billion out of six billion who literally don't have anything to eat and no promise of anything to eat. Are you going to govern people that way? I'm afraid not. If they don't have automatic weapons to revolt with, then they'll use stones and hatchets. This is the reason we have only had a few months of peace since World War II. There has always been a war going on - the whole thing is geared to ensure this.

Graeme: You have been very vocal in 'Acres USA' over the years, about the human health risks associated with the absurd array of chemicals added to our foods to prolong shelf-life. Do you feel an equivalent outrage about the arrival of genetically modified food?

Charles: Well, I think the best thing I can say is that genetically modified food may be alright, but we don't know. Now, the Japanese did use a genetically modified organism to create L-Tryptophan, because they could do it cheaper and faster. The only problem was that the genetically modified organism excreted a poison that buried over one hundred people, and several thousand others had their health wrecked for life, so the FDA eventually banned it. The word I get back from cattle and hog growers is that, if they feed them genetically modified corn - BT corn, it has a red mould associated with it. Now, those animals will eat it if they are hungry enough, but it is slowly poisoning them. The losses have been staggering. It's often a race to get them to the slaughter house on time.

Graeme: At least the preservatives are listed on the labels, but, unlike the rest of the world, the American public seems to have accepted the lack of labelling of genetically modified food almost without question. Why is this?

Charles: I don't know that they have accepted it. I like to think it is that they haven't found a way of expressing their disgust. Maybe the first inkling of this came in Seattle recently, when they did step out and make themselves heard. The objection has been going on in England, in Ireland, in Europe, in India. You know what the biggest selling bumper sticker in India is? - 'CREMATE MONSANTO'. People are beginning to ask questions here now.

Graeme: I have one other question about current trends in food production. In your books, you have commented several times about the inherent bankruptcy of the hydroponic concept, as it does not involve microorganisms. Hydroponics continue to be a huge growth industry, and adherents claim dramatic improvements in taste and quality as nutrient formulas have improved. Can hydroponics ever produce high-nutrition food?

Charles: Well, it's possible to do better. Most of the cucumbers and tomatoes we get are no better than cardboard. However, I've heard about growers introducing seaweed and humic acid to their formulas and getting huge improvements in taste and quality.

Graeme: In the field of fertility tools, what is your opinion of radionics? I have interviewed many of your regular contributors in the last couple of years, and there are certainly conflicting opinions about the value of scanners in modern agriculture. On one hand, we have respected consultants like Dan Skow, personally advising me to com-

pletely steer clear of this technology and on the other hand, author/consultants like Dr Phil Wheeler, suggesting that his clients embrace the concept. Scanners have been around now for many decades. Do you consider that they are valid technology with mass-market potential?

Charles: I don't use them myself. I think there is such a thing as a good operator, and I think the health of the operator also plays a big part. I think it's valid. Once I cornered one of my friends up in Pennsylvania, and I had a few soil samples. I had the lab read-outs, using their \$100,000 soil testing equipment, and he took them out to the barn and came back half an hour later with his own readout. He was right on the money. He really had it down pat.

Graeme: I am always concerned about the alienating effect of fringe technology, particularly when, in Australia at least, we are on the brink of meaningful change, and I don't want anything to jeopardise it. Am I being too conservative?

Charles: It's definitely a bit of a heavy bullet to bite in virgin territory. It's unsalable to newcomers - incomprehensible. Once you've got them on board and they have seen all the benefits of biological agriculture, then more radical concepts could be slowly introduced.

Graeme: I attended Dan Skow's seminar yesterday, and he was recollecting the time you were collaborating on his book. He recalled the original development of the famous Carey Reams Refractive Index. How did that come about?

Charles: Carey and Dan Skow worked that out in his basement, and I was up at one of Carey Reams' seminars. He came up to me and said, "Why don't you print this for a change". Well, I said, "Why don't you explain it to me," and he did and I ran it on a front page of Acres. Since then everyone around the world has copied it - some of them even claiming that it was their work. The refractometer is now a commonly used instrument in agriculture to monitor crop health.

Graeme: You have interviewed the full spectrum of consultants, writers, scientists and agronomists during your career. How did Carey Reams rate? Did his message seem any more or less profound when dealing face-to-face with the man?

Charles: Well, he was a hard man to interview, probably because you needed to have a better understanding of the grammar of his subject than I did at the time. I would be able to do a much better job today than when I first encountered him twenty years ago. When you're interviewing, some people present good coherent answers, and with others it's a bit like pulling teeth. Carey wasn't quite a dental patient, but he didn't like to elaborate too much.

Graeme: But did you have a sense that he was onto something pretty important?

Charles: Oh yes, definitely. See, Reams worked with Earp-Thomas, who was a physician in Florida, and many of the early health food findings in the US were made by the Earp-Thomas Laboratory. They pioneered some pretty impressive fertility work down in the sandy soils of Florida. In fact, they called themselves 'crop engineers' rather than agronomists. They had some great results down there with citrus and other crops. Carey Reams had a healing experience where he attended a church service in a seriously ill condition and was told to throw away his crutches. He did so successfully and, from then on, his seminars were always preceded by a ten-minute lecture on

Christian morality. Dan Skow has also been influenced by this approach. You can't change these guys - their strength is their faith.

Graeme: I sense that you have a soft spot for the maverick, perhaps because you have lived your own life favouring common sense over convention. Do you have any particular favourites among the countless independent souls who have graced the pages of Acres USA for the past three decades?

Charles: Well, I think that Albrecht and Callahan are probably my two favourites. Callahan identified what happens when insects come to take a plant. We knew that there was something about one plant that would attract pests rather than another, but the precise mechanism was unknown. CJ Fenzau and I did some trials in small plots. The difference between pests and no pests was the balance between calcium, magnesium, sodium and potassium, soil pH and some foliar fertilising. Callahan taught us that plants put out a signal in the infrared part of the spectrum. If a plant is sick or deficient in nutrients, it puts out a different signal, and insects will home in on it. This is part of the great design with insects as the garbage collectors. Of course we are smart - we poison the insects so we can eat the sick stuff. Albrecht gave me about eight hundred pieces of literature that he had written in his lifetime and I've used a lot of it, reprinted a lot of it, with some of it in book form. There are others, but these two stand out. I've interviewed over a thousand people over the last thirty years.

Graeme: There have been hundreds of examples of hard-hitting, honest journalism in Acres USA. Exposés over the years have ranged from the DDT debacle to your illuminating article, called 'Of Fats and Oils', where you revealed the real reason behind the promotion of the 'animal fat causes cholesterol' myths. Are there any of these stories you consider more rewarding than others?

“CJ Fenzau and I did some trials in small plots. The difference between pests and no pests was the balance between calcium, magnesium, sodium and potassium, soil pH and some foliar fertilising. Callahan taught us that plants put out a signal in the infrared part of the spectrum. If a plant is sick or deficient in nutrients, it puts out a different signal, and insects will home in on it. This is part of the great design with insects as the garbage collectors. Of course we are smart - we poison the insects so we can eat the sick stuff.”

Charles: That's a hard question, there are thousands of pages involved. There are some things that should be followed up more, including Kervran's work on biological transmutation. I also think that Alex Podolinsky from Australia has a lot to offer, but I think that the biodynamic people need to be a little bit less sequestered and allow additional ideas on top. Overall, my most satisfying experience has been just putting out the paper [Acres USA]. I was sorry to give it up, but there comes a time.

Graeme: Are you still actively involved?

Charles: I still write four columns a month. My son manages the paper now, and he's doing a very good job and I don't interfere with him.

Graeme: You must be proud of him. There were obviously also many disappointments along the way. Which would rank as the most profound?

Charles: Well, of course it's a little disappointing that the farmers would jump in so readily to buy Roundup-ready soybeans and BT corn. That is a real disappointment. You would think that more of them would have discovered what their craft was all about. The second disappointment is that so few farmers will stretch their imaginations and their mental acuity far enough to comprehend the real need for parity in terms of wages and capital cost. They just don't seem to comprehend the concept of parity.

Graeme: Well, it's the sort of concept based on economics theory that the average person has no understanding of. I'm not sure that I understand it myself. Could you summarise the concept of parity to me?

Charles: Well, basically the Roosevelt administration began putting together national statistics under a thing called the economic indicators. What they did was, they broke the national income down into six component parts. These included agriculture, small businesses, rentals per persons and corporations on one side of the equation, and on the other side we have the major cost factors which include wages and capital costs. Now to achieve real economic stability and to be able to balance the national budget you need to have 30% of the national income roll through the first four that I gave you and 66.66% of the income needs to roll through the wages and capital costs side. The one third vs. two thirds parity relationships is the norm upon which stability is based. We started to deviate from this norm around 1949 to 1950, when we started to reduce the percentage of national income that flows through the income side of the equation, and we stretched the amount that went through the costs side of the equation. Agriculture has fared the worst in this imbalance. We used to get 12 to 13% of the national income. We are down to less than 1%. Corporations have fared best, and they now get the lion's share of the reduced income on that side of the equation. This lack of equilibrium, which is a consequence of a failure in public policy, is what puts agriculture in this tremendous bind and causes this terrible upheaval that we have around the world. It's been the biggest disappointment to me that we have not been able to get this idea across.

Graeme: I can imagine your frustration. There must have been hundreds of good ideas that crossed your desk over the years, some of which have been widely accepted, and others which have fallen by the wayside. Would you like to comment on any of these?

Charles: It takes time for some ideas. Thirty years ago, foliar fertilisation was a big Ho! Ho! Ho! and considered foo-foo dust. Now it is accepted across the board. The same has happened with the refractometer. At first it was viewed as kind of a joke, but now more refractometers are sold into agriculture than anything else. Some things are swept aside, and it may not necessarily be a fault of the product. It could reflect upon poor marketing or the financial strength of the company. The main thing, I believe, is that we need to keep the information flow happening, and we can't let it perish, because it's printed and then wraps fish. That's the importance of putting that information into warehouse form in books. When we first started with Acres, I couldn't find more than a couple of titles to put on display. Now you see a stand out there that runs half the length of the hallway. We have several new titles this year, including Gary Zimmer's new book 'The Biological Farmer'. We have shown the way here, and it's so

important, because otherwise that stuff will just perish from the minds and memory of everybody.

Graeme: You have done a fine job and without your passion, the agricultural world would be a different place. In my opinion, you have been the conscience and creative force in Twentieth Century agriculture, and it's been a privilege to interview you. Thank you for your time.

Charles: Thank you. I've enjoyed myself.

NEAL KINSEY

Interview recorded July 1998.



*In mid July, the Central South East Soil Association in South Australia hosted a four-day seminar by visiting American fertility expert, **Neal Kinsey**. 250 farmers and consultants attended the seminar, held at Adelaide's Roseworthy Agricultural College. Four days of inspirational soil science, anecdotes and a sense of a common vision, interspersed with shared living quarters and canteen dining produced a rare camaraderie amongst seminar*

*patrons. There was a focused intensity about the buzz of conversation flowing from the foyers, canteen and tavern. Consultants and agronomists networked at every opportunity, and two hundred farmers had the unique opportunity to secure a dozen expert opinions on their soil test data. The 'Soil-Fest' atmosphere was bolstered by the warmth, sincerity and engaging charm of **Neal Kinsey** himself. There was no hint of a celebrity ego - just an undeniably genuine educator sharing his considerable knowledge and experience. Neal Kinsey is the pre-eminent torchbearer of the Albrecht approach to soil fertility. Kinsey trained under **Dr William Albrecht** and has since forged a remarkable career, spanning twenty-two years in thirty-eight countries. His innumerable successes have contributed to continuing stewardship over the fertility of hundreds of thousands of hectares. Kinsey's book '**Hands-on Agronomy**', is destined to become a classic of the eco-agriculture genre.*

Graeme: In Australia, at present, there appears to be a groundswell of interest in Albrecht's approach and sustainable agriculture in general. Do you think this is just a local phenomenon, or is it part of a larger trend?

Neal: I don't know that most people would identify this growing trend with the Albrecht approach. The move toward sustainable agriculture is certainly becoming more popular, but I still have people come and tell me, "*I didn't realise those ideas came from him.*" However, I do feel that his basic principles are becoming more and more recognised.

Graeme: How do you view Albrecht's role in the context of soil science in general? How much impact did he have during his career in comparison to this renewed interest?

Neal: In terms of his standing in the academic world and the farming community itself - and, remember, he travelled and addressed congresses throughout the world - I believe the impact at that time was probably still greater than now. The reason I say that was because there were quite a number of influential people that were ready to back that program in the 1940s, 50s and 60s. It has been said that, had Thomas Dewey won the election instead of Harry Truman, the fellow that would have been Secretary of Agriculture, was a journalist called Louis Bromfield. This guy actually used the Albrecht system and wanted to see it promoted. If Louis Bromfield had become Secre-

tary of Agriculture, he intended to introduce Albrecht's system as the agricultural fertiliser program for all of the United States. If that had happened, we would have had a much different outcome today. Now it feels like we are just beginning a groundswell of renewed interest, and I have no idea how far it will go. You would be amazed at the number of people who have read the 'The Albrecht Papers', which are published by Acres USA.

Graeme: There are a number of conspiracy theories related to the deposition of Albrecht as head of the Department of Soil Science in Missouri. Can you throw any more light on the subject?

Neal: I'm afraid I can't comment on these theories, but I do know that jealousy and competition within the University may have also played a part. I once sat down and talked with one of Dr Albrecht's closest associates at the University, and he told me that he will always remember a meeting addressed by Dr Albrecht and attended by the Dean of the School of Veterinary Medicine. At that meeting, Dr Albrecht suggested that *"if we could correct our soils, we would correct many of the problems we are having with animal health."* This colleague believed that the Dean became convinced that, if the soils program became really successful, then this would reduce the need or importance of veterinary science. From that day on the Dean was strongly opposed to the soils department, and the veterinary school always had far more money. Charles Walters, who was a very close friend of Albrecht's, tells that, when they actually asked the doctor to step down from the soils department, he was told that *"we need someone who is less of a research scientist and more of a fundraiser."*

Graeme: Last night we all got to watch a rare Albrecht film called 'The Other Side of the Fence', and it was hard to miss the serious, no-nonsense demeanour of the man. How would you characterise his personality?

Neal: He was a very serious man, but very friendly and helpful, especially when it came to helping farmers. He used to say that, when he was young, he had a job cleaning out the offices for a medical doctor of whom he thought a tremendous amount. It was because of that man that he went to college to study medicine. In his pre-med years he took some plant physiology and soil courses, and his interest began to grow. He said that he became disillusioned with medicine when he realised that they were more interested in making money than helping people. He also said *"I realised I could help more people through soil science because of the link to health than I could from becoming a medical doctor."*

Graeme: At present, in this new push for eco-agriculture, there appear to be two predominant schools of thought - those motivated by Dr Carey Reams, like Arden Andersen and Dan Skow - and the supporters of the more conservative Albrecht approach. Do you see any conflicts here?

Neal: I've been asked that question several times lately. I never studied under Dr Reams, but from all that I can deduce, the basic info is the same, but we are using different tools to achieve a similar goal.

Graeme: I guess I'm really interested in your opinion of the validity of some of the Reams concepts, for example his concept of a phosphate to potassium ratio, where phosphate levels should ideally be twice that of potassium.

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Neal: Well, first of all, I think it should be made clear that, when Dr Reams talked about phosphate to potassium ratios, he used a completely different kind of measurement than we talk about, and they can't really be compared. We are using a lot of different expressions and semantics, and we should really sit down together and clarify our common ground.

Graeme: I agree, but the essence of the Reams approach is that good calcium and phosphate levels increase plant sugar or brix levels in plants, and high brix levels in turn increase pest and disease resistance. Do you see any evidence to support this contention?

Neal: Increased pest resistance? Well, let me say it this way - I have many clients who will tell me that *"we just don't have the problems we used to have"*, but I always hesitate to make specific rules in this regard, where we say if you do this, this will happen - there are far too many variables.

Graeme: But you have noticed a trend?

Neal: Yes, definitely.

Graeme: I guess it's a basic tenet of organics, that healthy plants are more resistant?

Neal: Yes, but it's not just limited to organics. Many conventional growers of all types notice a similar response, when they balance their soils on our programs. We hear these reports time after time after time.

Graeme: I read somewhere in the past that you have been involved on a consulting basis with companies marketing biological and microbial products. What is your opinion of these types of products, and how do you see their role in agriculture?

Neal: I think that there is a tremendous place for these types of products, but let me say this - like any product, there will always be some people who try to give it a mystical status, claiming it will do everything for everybody. They suggest that this is all you need and that you don't need anything else. If, on the other hand, we work with these things like Dr Albrecht worked with other nutrients and say, *"Where can we use it and how does it fit?"* - then we can see real benefits. I have seen clients use biologicals to tremendous advantage and, if agriculture would do more to determine why they work and how they work, I think we would be far better off.

Graeme: There is an American microbial product being marketed in Australia at present - a nitrogen-fixing blend, and the marketers claim that application of a specified amount of this product will result in the fixation of a predetermined amount of nitrogen per hectare. Do you consider this to be a realistic possibility?

Neal: I certainly think that in any program, what works in one place won't necessarily work in another place at all. You have to know what you are working with and go from there. There is one thing I can say without question - if you have good organic matter and good calcium and phosphate levels, you will always stand a much better chance. If you don't have these prerequisites, then it gets much harder to see any kind of response from these products. I don't really believe that I've ever seen anything that you could say *"this is what you use everywhere and it's always going to work"*. I don't believe it's possible to guarantee exact amounts of nitrogen fixation in every situation.

Graeme: The relationship between paramagnetism and fertility is an exciting area of new research. What is your opinion of Phil Callahan’s work, and what are your feelings about the value of rock minerals in contemporary agriculture?

Neal: I must confess that I have not read Phil Callahan’s book on paramagnetism - I have carried it in my case for months, but I think that rock minerals and humate products have a valuable role to play. I have had clients who have had phenomenal results with humates. Like I say in ‘Hands-on Agronomy’, *“When you’ve taken care of everything you know how to take care of, then how do you take care of the unknown factors?”* You try to get something that has small amounts of everything in it, whether it be rock minerals or humates. I’ve seen fantastic results with these products, but the best results are always achieved when the soil has been balanced and conditions are right for these materials to do their thing.

Graeme: We focus heavily upon organic carbon in our fertility programs. Your lectures have covered the carbon killers - what about the humus builders?

Neal: Well, I covered the importance of factoring in the carbon to nitrogen ratio when breaking down crop residues. This ratio has to be anywhere between 10 to 1 and 20 to 1 in order to increase the humus content of that soil. Above or below that figure will result in a poor organic carbon conversion rate. The idea of adding nitrogen to improve stubble breakdown is not always understood.

“Like I say in ‘Hands-on Agronomy’, “When you’ve taken care of everything you know how to take care of, then how do you take care of the unknown factors?” You try to get something that has small amounts of everything in it, whether it be rock minerals or humates. I’ve seen fantastic results with these products, but the best results are always achieved when the soil has been balanced and conditions are right for these materials to do their thing.”

Graeme: Yes, the organic carbon conversion rate is critical when using inputs of organic matter to build humus. One of our clients, prior to working with us, put thousands of tonnes of feedlot manure on a 200-acre citrus planting in light sandy soil. His following year’s soil test revealed that his organic carbon had increased from 0.6% to just 0.7%, an increase of only 0.1%! His starting point of 0.6% organic carbon had not provided him with sufficient microbial action to benefit from all that organic matter. Just like money makes money, carbon makes carbon. If we had introduced one of our microbe inoculates, it could have been a different picture.

Neal: I agree he could have done better with a little help. Earlier today I mentioned a fellow who raised his humus content from 2.5% to 4% using a biological stimulant - all he was growing was continuous soybeans. There is no way that you can justify that he has created enough organic matter to achieve this gain. The only possible explanation is that the microbial population was stimulated to the point that one population lived on another that lived on another. There are two schools of thought for humus formation - one is that it is formed from organic matter, the other is that organic matter is the food

source to get the microbes going. The better you get the microbes going, the more humus formation you achieve.

Graeme: And what was that particular microbial stimulant?

Neal: That particular stimulant is one that is no longer in production. It was called Agralife, but those fellows got some really bad breaks. It was no fault of the product, and it's a long story, but they got stabbed in the back about four different ways at once.

Graeme: A common problem in Australian agriculture relates to overuse of potassium. The Albrecht model provides precise guidelines for achieving a balanced level of potassium by looking at the base saturation percentage. We often find it difficult to convince growers that they have enough potash and that they are throwing away their money and creating more problems when they continue to apply more. Have you had similar experiences?

Neal: Yes its very common - three weeks ago, in California, I was with a client who grows prunes. They put tremendous amounts of potassium on these crops, because they believe they need it. When you start looking at the difference in the leaves, potassium is the problem. Before I started working with them, some of these fellows were putting on one tonne of per hectare in a band, right along beside the tree to try to get potassium into the tree. The trees looked salted out and were really suffering. It's a waste and it's destructive.

Graeme: Yes, we see a lot of potassium induced magnesium deficiency in our lighter soils.

Neal: Normally if you get excessive amounts of potassium in a soil you're going to get a deficiency of magnesium into the plant. The lighter the soil the truer that becomes. I always recommend my clients use leaf analysis to avoid guessing. If you're short of something, start putting it on. In this case the foliar application is the easiest way and the fastest way to take care of these problems, but they can be avoided in the first place if you understand the figures.

Graeme: I see that as part of the appeal of the Albrecht approach. There are no assumptions or vague theorising, the rules are there, the figures are there, you just put in what's missing and correct the excesses, and it works every time.

Neal: Yes, Albrecht was a man of science, but he was also a student of nature, and part of the appeal of eco-agriculture relates to the fact that both bases are covered. However, I must add that, although the approach does always work, success is very much related to the grower's understanding of what he is trying to achieve.

Graeme: Actually, I was intending to ask you about your failures - I assume you have had your share?

Neal: Well, you learn by your mistakes, but I feel that most of my failures come from not educating well enough or not explaining enough what someone should do. My worst failures have come when I have told a fellow what he needed to do and he remembered he needed to do it - but he forgot at the time. For example, I was working with a client who grew corn. His recommendation from the test included a tonne of limestone per acre. He came in and put everything else on, but forgot the limestone. His program included the maximum amount of boron you can put on corn at 4lbs per

acre of actual boron. Boron is toxic in low calcium situations and without the limestone he killed the corn. Not everything, but a big part of the stand. It got all over the country that I was the guy that killed corn with boron, for years I was known for that. In fact there are probably still guys who remember that “*Oh that’s what Neal Kinsey does, he kills corn with boron.*” That same year I also had another boron problem.

Graeme: It sounds like a bad year.

Neal: It was - my cousin called me and asked my opinion of boron on corn. I told him it was a good thing in the right conditions, so he went right out, without testing and checking the calcium levels, and put on 4lbs of boron per acre. He killed 160 acres stone dead. He had extremely deficient calcium - around 43% base saturation. He should never have used this amount of boron without building calcium levels, but I honestly can’t think of any costly mistake where people have lost money by following instructions.

Graeme: We manufacture personal prescription blends, which include exact requirements based on the Albrecht system. This tends to reduce the possibility of mistakes.

Neal: Yes, I guess that’s a good way to make sure its done right.

Graeme: I think that one of the biggest problems relating to program performance, is the incapacity of growers to follow ‘ideal’ programs, because they can simply not afford to. This is particularly relevant in broadacre. A \$50 per hectare fertiliser budget, in 12-inch rainfall country, doesn’t allow for many luxuries.

Neal: You are right, but we usually find that any move in the right direction, using what I call our ‘bare bones’ program, will still be worthwhile. These sort of situations require a longer term perspective. If you gradually chip away at your imbalances you will be better off than ignoring them.

Graeme: I’d like to ask you a couple of calcium questions for my own benefit: The Albrecht approach offers a much-needed explanation to account for the inconsistency of results achieved with foliar fertilisers in different situations. It’s suggested that 60% calcium base saturation is a prerequisite for maximum foliar response. How important is this? I mean how much less effective are foliar fertilisers in low calcium soils?

Neal: They are quite considerably less effective. If you build your calcium levels, you will have a much better response to foliar fertilisers.

Graeme: What about high pH, calcareous soils, is it worth boosting micronutrients in the soil when they will probably only be tied up by calcium anyway?

Neal: Yes it is still worth the effort. It may take up to three times more of a given micronutrient to make it available. There is also a variation between soils. One soil may take three times more than another, in identical pH conditions, to make trace elements available.

Graeme: Wouldn’t it be more cost effective to foliar spray trace elements each season?

Neal: Well, I tell you this - once you finally get it done right in the soil, you're finished. But when you keep on with foliar you will go on spending forever. Despite this there will always be some situations where foliar is the best option.

Graeme: An interesting, perhaps controversial aspect of the Albrecht approach relates to the proposition that a soil suitably balanced to achieve an 'ideal' pH of 6.3 will grow any crop more effectively - even renowned acid-lovers.

Neal: Yes, that has been my experience. Rhododendrons, azaleas, even blueberries will perform better at 6.3. I feel there is a confusion between acid-tolerant and acid-loving.

Graeme: It would be hard to convince our Queensland macadamia growers that they should lift their soils to 6.3 pH. Macadamias are an Australian native accustomed to low calcium, acidic soils.

Neal: Get them to trial a block! Coffee is supposed to be an acid-lover. I've scared clients to death suggesting this idea, but the fellows that have gone ahead and done it are finding that all of a sudden they have tremendous increases in flowering and production and so forth. Again, I've never seen any crop that has a reputation for needing an extremely low-pH soil that has not responded well to soil balancing. As long as we have had everything else there, when we've corrected the calcium, we have never had a problem. One low-risk way to convince growers is to prepare a balanced potting mix with a 6.3 pH and let them see for themselves, using seedlings or whatever, that the plants will do well.

"I feel there is a confusion between acid-tolerant and acid-loving. I've never seen any crop that has a reputation for needing an extremely low-pH soil that has not responded well to soil balancing. As long as we have had everything else there, when we've corrected the calcium, we have never had a problem."

Graeme: I'd like to talk phosphate for a minute. I was delighted in the course today, when you discussed the benefits and attributes of colloidal soft rock phosphate, because we market the only Australian source of soft rock.

Neal: I didn't realise I was giving you a free advert!

Graeme: Thanks for that. I'd like to ask about your experiences with soft rock. I know it is virtually considered the ultimate plant food amongst the Reams-influenced consultants, because it doesn't lock up like other sources. Carey Reams believed it was the only effective way to build stable phosphate in the soil.

Neal: It is certainly a unique material. It's totally different to hard rock or reactive rock phosphate. Hard rock usually takes up to two years to release, but soft rock is available almost immediately. However, I don't feel that it is the one and only way to build phosphate levels. I've seen clients with very high phosphate levels that have been built using manures. We also find that, when everything else is right, we can still build levels with DAP.

Graeme: If, for arguments sake, you were to use a combination of soft rock and ammonium sulfate vs. a combination of DAP and Super - both with an equivalent analysis of nitrogen, phosphate and sulfur - would you achieve equivalent results with each blend?

Neal: Well, I believe that you could achieve the same major nutrient gains with either blend, but remember that soft rock has more trace elements, and it's true that it doesn't have the lock-up problems. I also believe that, in terms of soft rock phosphate, you also pick up several things that we don't know how to measure.

Graeme: Another issue I'd like to discuss relates to the broadcasting vs. banding debate for fertiliser placement. The majority of Australian growers prefer to band to maximise response.

Neal: To me, when you broadcast you are feeding the soil, and when you band you are feeding the plant. It's two different systems altogether, and the only time we advocate feeding the plant instead of the soil is when it's absolutely impossible to take care of the soil side of things.

Graeme: So your programs involve no root placement of fertilisers. You are always broadcasting?

Neal: As a matter of fact, we do have clients who continue this practice for NPK after they start with us, but eventually they try just broadcasting, and if their soils are in good shape, where everything is working the way it should, they find there is no gain to banding.

Graeme: We find, in side-by-side trials, using our balanced blends vs. banded NPK or starter fertilisers, that we often get off to a slower start but usually win out in the end. I often wonder if a root-zone NPK kick-start would have further increased our advantage at harvest.

Neal: I've had clients who use liquid starters, and when monitoring the crop, the treated areas always look like they have got a jump-start, even during the crop cycle they look better. It's an old maxim that a good start will increase the yield. In several trials, where we used a weigh wagon, there turned out to be no advantage at all in the end yield.

Graeme: Your approach differs from some of the other leading sustainable consultants in that you appear to have a distrust or dislike of foliar fertilisers.

Neal: When I talk down foliars, I'm not talking about hormonal or enzyme-based foliars. I'm talking solely about trace element supplementation. We monitor foliar response with leaf analysis, and the number of sprays required to correct a deficit can vary considerably. It is a lot more reliable and eventually less expensive to correct trace element deficits in the soil.

Graeme: Just a couple more questions - You are familiar with the concept of weeds as signposts for nutritional deficiency. It strikes me that you are in a prime position to verify or negate this theory. Does balancing a soil reduce weed problems?

Neal: We've had numerous situations where clients will tell us that they don't have the weed problems that they used to. One striking example I recall involved a pasture plot, where the lower third of the block had always been infested with oxalis. After

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three years of the program, the client reported that the oxalis had completely disappeared. I don't know if you are familiar with oxalis, but it is usually very difficult to eradicate.

Graeme: One last question: I found that the most controversial area you discussed in the course related to the question of potassium sulfate vs. potassium chloride. I share the opinion of most sustainable consultants that muriate of potash is destructive to soil life and should be avoided. However, you have condoned its use in some situations, based on cost-effectiveness.

Neal: I am of the belief that, if you need potassium but can't afford sulfate, then muriate is better than nothing. If there's a need, you better meet that need however you can.

Graeme: But surely you have noticed negative effects. I know you can't monitor microbes with the naked eye, but we have found that earthworms disappear when a grower uses muriate for any period, and this should be obvious proof of chlorine damage.

Neal: Well actually, now that you mention it, I have a group of clients who grow lucerne. They are actually dairymen, and they had always used potassium chloride. I suggested that they would benefit from the extra sulfur, and they switched over to potassium sulfate. I pulled the samples on that place myself, and the earthworms were few and far between. Exactly one year after switching to sulfate, when I returned to pull the soil samples, there was an earthworm in almost every probe of soil. The switch to potassium sulfate was the only change they made. This response wasn't confined to just one area, and some of the growers didn't make the switch. They were in the same area, with the same type of soils, but the fellows still using muriate didn't have earthworms. I didn't think about saying that in the course, but I really think I should say something about it tomorrow.

Graeme: Finally, I'd like to make a comment about the Albrecht approach, since you are the leading proponent and hands-on practitioner using those concepts. In all of the eco-ag literature and during all of my discussions with consultants and farmers I have never encountered anyone who could actually disagree with the basic Albrecht philosophy. They may choose to disregard it, but no one can say "*Well, he was wrong that time.*" Farmers involved with the system always see results, and consultants working with Brookside tests can make confident and accurate assessments. I would go as far as to defy anyone to read 'The Albrecht Papers' and find anything that can be proven inaccurate.

Neal: I must say I feel privileged to have learnt from this man, and I can only say that after twenty years of field-testing his various premises, they remain as valid now as they were when Albrecht formulated them.

Graeme: Thanks for your time, Neal. We look forward to seeing you back in Australia later this year.

Neal: Thank you, Graeme. I'm looking forward to it.

KLAAS & MARY-HOWELL MARTENS

Interview recorded December 2001



Klaas and Mary-Howell Martens are large-scale organic growers, farming 900 acres in the Finger Lakes region of Western New York. They are an intelligent, engaging couple who have become regular speakers at the Acres USA Conference in Minneapolis each year. Their presentations are a little bit like watching a tag wrestling team. The energy and purpose continues unabated, regardless of the interchange, as seminar patrons are treated to a rare combination of eloquence and pragmatism. The Martens' were at one stage the largest chemical users in their county, so their highly successful conversion to organics becomes an intriguing turnaround. They have since developed a role model enterprise, highlighting the economic logic of a biological approach. They have also become sought after consultants, and **Mary Howell-Martens** is a regular contributor to the Acres USA publication.



*The energy and purpose continues unabated, regardless of the interchange, as seminar patrons are treated to a rare combination of eloquence and pragmatism. The Martens' were at one stage the largest chemical users in their county, so their highly successful conversion to organics becomes an intriguing turnaround. They have since developed a role model enterprise, highlighting the economic logic of a biological approach. They have also become sought after consultants, and **Mary Howell-Martens** is a regular contributor to the Acres USA publication.*

Graeme: Your move to organics appeared to be pragmatic rather than philosophical. Was it difficult, initially, to override your chemical paradigms?

Mary: We were both pretty much into chemical agriculture. Klaas was the neighbourhood expert on chemical and herbicide combinations, and I was working for a branch of Cornell University, helping to plan spray programs. Neither of us really enjoyed what we were doing, though. We were aware that it wasn't healthy for us or our family, so, when we started looking for a niche marketing opportunity in agriculture, the idea of giving up chemicals was quite logical. We had to learn how to do it, but it wasn't like giving up something to which we had a particular attachment.

Klaas: Like most farmers who start out in organic farming, we started out with the idea that this is input substitution. We started looking out for an organically approved input for every chemical input that we were no longer going to use. The first big breakthrough in the transition came when we began to read and study and came to realise that this is a totally different thought process and that the input substitution model is doomed to failure. I don't think we could have been successful unless we had changed our thought process and changed our whole way of managing our farm and looking at our problems.

Graeme: So, the essence of the paradigm shift was developing an awareness of the integrated, holistic nature of this approach?

Mary: Most farmers come into organics asking too many questions, and that is: "What equipment do I need to buy to manage my weeds?" and "What materials do I need to buy to manage my soil fertility?" What we have learned is that those are probably the worst questions to start out with. You need to ask how you can plan your crop

rotations and how you can manage your long-term soil fertility and not necessarily buy products for that but to have it be a whole-farm, holistic kind of approach.

Klaas: I think an interesting thing for us, which could help farmers learn to make the transition, is to understand why we have the problems that we do. We also need to understand which conventional management practices have caused our problems. Once we understand how we've caused our own problems, it's a lot easier to shift our thought patterns to figure out how to solve the problem.

Mary: You really need to learn how to look upstream to the causes and then plan approaches which address the problem rather than the symptoms. You need to be proactive rather than reactive.

Klaas: There's a typical trap, and it's really heartbreaking when a farmer falls into this and then comes to us and asks what went wrong. The trap is that the farmer thinks now that he is not using chemical fertilisers, he needs to come up with a huge amount of manure or some other natural fertiliser. Often they will go off and buy a huge amount of poorly produced compost and an enormous amount of factory farm manure. This is the point where the farm is most susceptible to weed pressure, because we still have all the problems caused by the chemicals, but we have taken away the herbicides. Now we begin to use an input that is actually creating an even bigger weed problem. This is the biggest single cause of frustration and failure for farmers trying to make the change. They don't realise that they have actually bought their problem with this approach.

Graeme: In your seminar yesterday, you acknowledged that, prior to your own switch to organics, you had begun to see negative changes happening on your own property. What were those changes?

Klaas: One of the things that really bothered me was that we were operating under a management system where the results were not predicted by the theory. We were experts in this approach, but we would apply principles and the results wouldn't match. There is something wrong with your assumptions when this happens. Also, we were noticing that every year the soil was getting harder. We started seeing shifts in weed populations. We started seeing perceptible changes in pest pressure. We found it increasingly harder to maintain fertility. It was like a drug addiction. It took more and more inputs every year to get the same response. It doesn't make any sense to keep abusing your soil while it keeps getting weaker, but that's exactly what we were doing.

“Also, we were noticing that every year the soil was getting harder. We started seeing shifts in weed populations. We started seeing perceptible changes in pest pressure. We found it increasingly harder to maintain fertility. It was like a drug addiction. It took more and more inputs every year to get the same response.”

Mary: One of the hallmarks of modern agriculture is that it's really an arms race. Weeds and pests are remarkably adaptive at overcoming all the strategies that we throw at them to kill them. When we worked with chemicals, we could literally watch the weeds develop resistance. That's how it is when you are using such a narrow strat-

egy. The difference with organic strategies is that it is much wider and more broadly based. It's much harder for a weed to develop resistance to iron than it is to a chemical spray. We can control them pretty well with a machine.

Klaas: Beans were a good indicator crop for us. We started to see, as the soil got harder, that soybeans were more easily injured by herbicides. We would dig up soybeans and find lesions right where the stem was in contact with the soil. The soybeans would yellow and stand still.

Graeme: We always argue that photosynthesis is the key process in production. You are, above all, a chlorophyll manager. If you've knocked out a good part of your chlorophyll with a herbicide, then you're doing a pretty poor job.

Klaas: That's exactly right - we lost considerable yield due to these setbacks.

Graeme: How would you rate the agronomist skills of biological farmers compared to good conventional farmers. Have we moved beyond the 'organic by neglect' tag if you look at your industry as a whole?

Mary: Within any group of farmers, there will be good, moderate and very ordinary. Amongst conventional farmers, there are numerous very good growers. What we are seeing now is that the new farmers coming into organics are generally the good conventional farmers who already have the management and observation skills that will serve them very well when they make the change. We don't feel that organic farming is a fringe activity any more. Modern organic farming is not going back to the 30s. It's not a case of using nothing. Modern organic farming is a synthesis of traditional methods with cutting-edge science. We understand why we are doing what we are doing and how it impacts soil biology - how it impacts soil fertility.

Klaas: Organic farmers are a lot more likely to share information. They are constantly trying to raise the bar.

“Modern organic farming is not going back to the 30s. It's not a case of using nothing. Modern organic farming is a synthesis of traditional methods with cutting-edge science. We understand why we are doing what we are doing and how it impacts soil biology - how it impacts soil fertility.”

Graeme: You mentioned that the overriding mentality in a struggling rural sector is 'to get bigger or get out'. You suggested that community relations suffer in a 'dog-eat-dog' environment where all of your neighbours become potential takeover prospects. How do organics differ in this respect?

Mary: In the group of farmers we work with, there is a very strong level of support. There is a strong feeling that if 'one does better, we all do better'. The pie is big enough for everybody and we don't have to be fighting each other for market share. There's plenty to go around, so we work together.

Klaas: We discovered a new law - the more you give away, the more you have. This cooperation really does bring us all further ahead. Back to the agronomics - When farmers start learning that they can do better, it raises expectations. What may have

been good enough a few years ago, suddenly people are seeing that we can do better. Biological farmers have a different personality. When we have a meeting, especially when we bring in a good outside speaker, those speakers are amazed. Everyone's paying attention, everyone's asking questions. They don't see this in conventional meetings.

Graeme: Your emphasis on the importance of diversity goes beyond the concept of not having your eggs in one basket. You suggest, in fact, that it's the essence of farm health. Can you elaborate on that concept?

Mary: The organic standards that we operate under require that we have a diverse crop rotation. We can't follow a crop by itself. We can't grow soybeans in a field where they were grown last year. That forces us to have a wider repertoire of crops that we grow. As a result of this, we have become much more aware of the fact that each crop that we grow adds something to the soil. It also helps ensure the economic stability of our farm. We need diversity in crops. We also need diversity in the soil. We need a balance of many different species for better soil fertility, and they will, in turn, offer protection against a wide variety of diseases.

Klaas: We're beginning to look at pests in a different way. We don't see them as a cause of our problems but rather as a result of our problems. It's a lot more likely that our problem pest is an opportunist that is filling a void which we've created. There are so many species in the soil, and we are only just coming to understand their many functions. Every aid that we use - pesticides, herbicides, fungicides - they all kill something. Often we don't know exactly what they are killing and how that affects the balance under the ground.

Graeme: How does the US subsidy system affect organically certified growers? Do you still qualify for the subsidies?

Klaas: We do qualify. Many people don't think it's fair that we get such good prices for our crops and yet can still be subsidised. Organic is actually marketing. We're still in the same economic climate that the other farmers are, we are just producing a specialty crop for a market that's willing to pay for it. It's no different to a conventional farmer who does a better job of marketing than his neighbour to net a bigger price. I see a bigger problem in exchange rates. I don't think that subsidies are the problem. Our problems are related to a US dollar which is sky high. The third world agricultural suppliers have a huge advantage.

Graeme: Australia pretty much qualifies in that respect. It's definitely worked in our benefit. I'd like to ask you about weed management now. This is an area that terrifies many conventional growers when considering the organic option. You suggest that the mechanical option should be the last line of defence and that the most important thing is proactive preparation and management. Can you describe your approach for us?

Mary: We see weed control as two distinctive parts. One is cultural weed control and one is mechanical weed control, and it's true that the mechanical option is the last ditch stand to clean up anything that slips through. Our primary weed control is cultural. This involves looking at our soil fertility, balancing our calcium to magnesium ratios, balancing our trace elements. Crop rotation is very important. When you grow corn on corn, for example, you are creating the exact same conditions and you are actually selecting for certain weed species. We call this 'cultural weed enhancement', because if

you don't rotate a crop, you favour certain weeds and they have good opportunities to produce seed. If you alternate different crops and plantings at different times of the year, you avoid this problem. Alternating row crops with solid seeded crops and alternating legumes with non-legumes creates different environments, and it breaks weed cycles while also helping to balance soil fertility. The cultural practices reduce the weed populations significantly, and so the mechanical control works better.

Klaas: There are several cultural practices that are not intuitive, but they are very important. We've got a lot of our approach from a paper written in 1939, by a German researcher called Bernhard Rademacher. One of his ideas, which is quite obvious but we hadn't really thought about, relates to the shading effect of crops like heavy alfalfa or heavy clover. There seems to be some effect from the deep shading and darkness in relation to how many weeds sprout the next year. It seems to induce a dormancy in the weed seeds. When we used to farm chemically, we always used a certain herbicide after we ploughed down these crops. We thought that was the world's greatest herbicide because we always had such a clean field. When we used that herbicide for the third or fourth year in other crops, it no longer worked and we couldn't figure out why it worked so well in this particular situation. The answer was that the herbicide never worked better, it was the deep shading effect inducing the weed reduction! Allelopathy is another thing we can work with. There are a large number of crops that limit other specific plants around them. Another common-sense technique involves growing a crop that will have a certain weed spectrum, which is planted very early. There will be a different weed spectrum for a crop that's planted late or a crop that's planted in the fall. A row crop will have a different weed spectrum than a solid-seeded crop, so by constantly keeping the weeds out of balance, we can make our mechanical weed control much more effective. Simply, we are trying to create an environment that favours our crop over the weeds. We're trying to build an environment that's going to make the crop we're trying to grow, best adapted to that spot. In this context, the biggest cultural weed control is the vigour of the crop. When we use chemicals, we hope that the chemical is going to hurt the crop less than the target weeds. In contrast, when we are practising cultural weed control, we are actually enhancing the strength and vigour of the crop, at the same time that we're putting the weeds at a disadvantage.

Graeme: You mentioned the link between mineral balance and weed pressure. What is the most important mineral ratio in this context?

Klaas: The biggest problem in the US, and probably in Australia, is that when magnesium levels are too high, you tend to get summer annuals and, after a while, herbicides are very ineffective on summer annuals. We've seen almost miraculous results when balancing calcium and magnesium and getting rid of that whole class of weeds. We have a neighbour, for example, who farms a piece of land which has been overrun by summer annuals, no matter what herbicides he used. He started copying what we were doing. He is organic now. Last year he ran out of gypsum on one spot of the field and it looked like a sprayer skip. He's growing weed-free crops for the first time in his life and it's only been since he changed to organic farming. His farm was actually easy, because the summer annuals were the dominant weed class, there were virtually no other weeds of any kind there. By correcting the one problem, the job was done.

Graeme: I'm sure that this concept possibly would be appealing to many of our farmers. Often in Australia, a single farmer will manage two thousand hectares but he

spends a great deal of his time on the tractor, spraying herbicides. It's regarded as the only way it is possible to farm large areas single-handedly. The romance in farming is long gone when you spend your summers in a herbicide haze.

Klaas: That's right, believe me, I know that feeling. Another important piece of the mineral balance link is that, when you improve the calcium to magnesium ratio, you improve soil structure. The equipment we use for mechanical control is so much more effective in a soil that has good tilth.

Graeme: One of your statements in your seminar was that *"you can achieve 100% weed control using the right tools at the right time."* Were you referring to mechanical techniques or a combination of cultural and mechanical?

Mary: Yes, the combination is the key. The cultural controls, particularly the crop rotations and mineral balancing, are essential to produce good, healthy crops, but they are also essential for good weed control. We don't see that the two can be separated from each other.

Klaas: Under the right conditions, we can even achieve that 100% control without having everything right on the cultural front, but only with luck. Only if the weather cooperates.

Graeme: Is it more costly or time-consuming?

"Our cost of production has gone down since we've been farming organically"..... "We figure that, even if the organic premiums weren't there, we would continue to farm organically, because it's a better way and a cheaper way to farm, and we get better quality crops."

Mary: It's definitely not more costly. Our cost of production has gone down since we've been farming organically, and that is being very honest with our cost of production, that is, we factor in labour costs. Part of the key is that herbicides are so expensive. We figure that, even if the organic premiums weren't there, we would continue to farm organically, because it's a better way and a cheaper way to farm, and we get better quality crops.

Graeme: Can you tell me about some of the rotations that have worked well for you?

Klaas: We've probably got considerably different conditions compared to Australia, but the same concepts will apply. If we're planting corn, we'll start with a heavy cover crop of medium red clover in the spring. We'll plough that down and follow with the corn. The corn crop will be followed with a crop of soybeans. The soybean crop would be covered that fall, after harvest, with a crop of either winter wheat, winter barley or spelt. The spelt would be cross-seeded mid-winter to another medium red clover crop. The interesting thing about this piece of the rotation is that it answers one of the criticisms that the chemical and bio-tech industries always throw at organic farming. They say, *"you need a year or two to build fertility before you can achieve a good yield"*. The fact is that we're not doing that. We're taking off with a crop of small grains, and

the cover crop is then building the nitrogen requirement for the next heavy nitrogen user in the balance of the season, over the winter and the beginning of the next season.

Mary: One of the fallacies many people believe about organic farming is that we have to use vast amounts of animal manure. We use very little animal manure. We don't keep livestock. Our main source of nitrogen fertility comes from medium red clover.

Klaas: Right. Now, after the second red clover cover crop, we don't just go right back to the same crop. This is where we start getting diversity. We'll now go to a vegetable crop. We may plant dark red kidney beans, we may plant snap beans. We may go to sweet corn or cabbage at this point, often depending on the field itself.

Graeme: So you're interplanting the red clover with the cereals?

Klaas: That's right. We always put red clover in our cereal grains.

Mary: We don't harvest the straw from the small grains. That always goes back into the field. We figure that it's a more valuable resource if we don't take it off the field, because it adds organic matter. It adds carbon to improve the carbon to nitrogen ratio. It's simply valuable fertility. It doesn't make sense to remove fertility from our farm if we don't need to.

Klaas: The vegetable crop gives us the opportunity to put in another cover crop, which is usually a cereal grain. This spreads out our work because, when the vegetable crop comes off earlier, there is enough time to put our cereal grain in at our leisure.

Graeme: What sort of rainfall do you guys have? It's the first time I've heard of growing vegetable crops without irrigation.

Klaas: We have about thirty inches, but we're fortunate in that we are in a high-humidity area. There are many years that we would have benefited from irrigation, but it isn't essential. We are also fortunate that we are in a calcareous soil.

Graeme: Do you have problems with the normal negatives associated with excessive calcium?

Klaas: Oh yes! Our phosphorus levels are low and our high magnesium is always depressing our potash levels. We are finding, though, with phosphorus, that biological activity can help to overcome the calcium-related tie-ups. We find that fields with low phosphorus in winter are reading good to high by spring and early summer.

Mary: That makes sense, because phosphorus is always dependent on microbial activity. During the winter, if there is waterlogging or any conditions where the soil microbiology might be depressed, there will be phosphorus problems. This also highlights a problem with testing times. A farmer taking soil tests in February may not get a true picture of phosphate availability in May, when he is actually planting.

Klaas: These fluctuations are possibly more pronounced for organic farmers who are more dependent on biology. We can learn something here from the rainforest soil. You will find that it is virtually devoid of nutrients and yet you have phenomenal growth. The minerals are forever cycling. We are trying to rapidly recycle our minerals on an organic farm to mimic that natural system.

Mary: One of the big problems faced by conventional farmers is the leaching out and loss of nutrients from their soils. They apply large amounts, but a large percentage

ends up in the ground water. This is simply because the minerals are not being complexed. When we add organic matter and actively enhance microbial activity, we are stabilising and tying up much of our nutrition into the humus, where the nutrients are less likely to erode or leach.

Graeme: Do you soil-test regularly to keep tight control of your nutrition?

Mary: We feel that the most important tool to purchase regularly is a good soil test. We need to know what's going on down there, and we need to see how our programs are impacting upon soil fertility. We need a full test, because all of the minerals are important for crop health and weed management.

Klaas: Another guiding principle we use is this: We are dealing with a living system. No living organism likes terrible shocks. If a soil test tells us we have a big deficiency, we don't even try to correct it in a single year. It just tells us which direction we need to be heading. When we use foliar fertilisers like fish and kelp, we are not just applying one element. I think it is the imbalance when we apply too much of one element with foliar fertilisers, which can sometimes cause problems.

Graeme: You obviously have a good example of Albrecht's balance principles. Do you consider that he placed enough emphasis on biology?

Klaas: It's an interesting phenomenon with Albrecht. People are often attributing all sorts of things to him, when they have never actually read his work. I was impressed with his writings, where he demonstrated that, as organic matter goes up and as the CEC gets higher, the importance of his mineral ratios goes down. He showed that we can tolerate imbalance much more with high organic matter. Similarly, there is less tendency to burn with fertilisers in high organic matter soils and there are also far less deficiencies in the plants when organic matter is high.

Graeme: It's true and it's something that's not driven home enough. The microbes are the bridge between minerals and the plant. It's the basis of a new system called MEND™ (Microbially Enhanced Nutrient Delivery) that we are developing in Australia. You can use much lower levels of minerals to achieve the same effect, as long as there are enough 'delivery boys' present. We achieve this by supplying mineral requirements in a compost or compost tea base. It often is a mistake to play the numbers game when balancing minerals. I agree that large applications are often not necessary.

“Another guiding principle we use is this: We are dealing with a living system. No living organism likes terrible shocks. If a soil test tells us we have a big deficiency, we don't even try to correct it in a single year.”

Klaas: I've seen some terrible results with people trying to correct mineral imbalances at once. We have a friend who took his two best fields and applied five tonnes of lime per acre on a light soil, according to recommendations from his adviser.

Graeme: That's over twelve tonnes per hectare! They were pretty bad recommendations.

Klaas: They sure were. For two years his best fields become non-productive. He called in his adviser, and the guy said, “*Yep, you definitely have a problem - nothing’s growing here.*” [laughs].

Mary: His only option at that point was to try to work the soil deep and dilute the excess calcium.

Klaas: What happened was a dramatic pH rise, which shut down his microbial activity. If he had been using chemical fertilisers, he could have still grown crops, because the chemicals are acidic. He could have grown hydroponically, and the extension officer would have said, “*See, you need these chemical fertilisers.*” [laughs].

Graeme: Niche markets are often the key to expanding demand potential for special-ist crops. In your case, your expansion into stockfeed manufacture has been synergistic with your crop production. Was that part of the game plan or did it just evolve as these things sometimes do?

Mary: It was not part of the game plan. What we discovered six years ago was that there were crops in our rotation which were good for the rotation and were really needed as part of the rotation, but they didn’t have a very good market. Crops like corn and some small grains are important for soil health and all-important diversity, but there is not a good market for them, even if they are organic. We also had clean-outs from our soybeans - small beans and split beans that didn’t achieve human food grade. This was similar for other organic farmers in our area. At the same time there was a dramatic rise in organic dairying in New York State, and all these organic dairy farmers needed something for their stock to eat.

Klaas: We call this dumb luck! [laughs].

Mary: The dairy farmers asked us if we could supply some of their feed needs, so we began to grind animal feeds on a small scale. Small-scale rapidly turned to medium-scale, and now it’s turned to large-scale. Earlier this year, we purchased an old feed mill, which was being shut down in our town. We cleaned and repaired it, and now it is running as an organic feed mill and it’s taking off. There is a huge market out there, not just for dairy feed but also for organic poultry feeds. There are also an amazing number of backyard poultry producers who aren’t certified organic but want chemical-free produce to satisfy their needs. These backyarders provide an ideal market for transitional feed. This involves the products grown in the three years between the last chemical application and final organic certification. Usually, these transitional products don’t command any premium, as farmers are forced to sell them on the conventional market. The management during this transitional period can be somewhat tough, and there is no immediate reward. We’ve found that the backyard operators provide a real market for some of these transitional growers.

Klaas: It meets a need. The unifying thing, which ties all this together, is that we have tried to be very aware of opportunities and needs when they have been there. We’ve tried to recognise needs very quickly and respond to them. We also responded to needs without borrowing a tremendous amount of money, and that is important.

Mary: We tried to use infrastructure at hand, which was not being fully utilised. If we had bought the feed mill immediately rather than growing into it as we have, we would have been under a lot of pressure. The overhead would have killed us.

SOIL HEALTH – MINERAL MANAGEMENT

Graeme: It must have been quite a benefit to value-add to your unprofitable rotations...

Klaas: Part of the pleasure of our growth with the feed mill is that we have been able to extend this increased profitability to our neighbours. We are now able to offer them double the premium for corn and small grains.

Graeme: Your expansion into dryland vegetable production was met with derision from the local small crops industry, due to the belief that it was not possible without chemicals. How have you fared? Have you proven them wrong?

Mary: Pretty well - we started growing sweet corn about six years ago. We were really not sure if we could do it without fungicidal seed treatment in cold, wet soils and without chemicals to control insects. However, for the most part, the exercise has proven remarkably successful. This was the first year we grew cabbage for sauerkraut, and we were assured by everybody that we would never be able to grow cabbages without a tremendous amount of insect damage. We chose a high-fertility field, and consequently we were able to grow cabbages with only two BT sprays to control caterpillars.

Graeme: Do you use regular foliar sprays to maintain high brix levels for inherent insect protection?

Klaas: Yes, this is where we do use foliar sprays. Vegetables are a higher value crop, and we have found that we can deal with insect and disease pressure using foliar sprays to enhance nutrition. We are also experimenting with bio-stimulants, and we are finding that quite small applications of these materials can make tremendous changes in the plant.

Graeme: Bio-stimulants are one of our specialties in Australia. Have you played around with seed or seedling treatment at all?

Klaas: Actually, we have utilised the work of a Geneva professor who specialised in pre-imbibing seeds.

Graeme: How long does he soak the seeds for?

Klaas: It's a matter of hours.

Graeme: Does he just soak the seeds in water or does he add nutrients and/or stimulants?

Mary: He uses all nutrients and he might have the chemical farmers add a little fungicide to help them protect the seed. We pre-imbibe with a bio-stimulant, and there is a significant impact.

Klaas: The opportunity for pre-imbibing is often not there for chemical farmers, as their seed is usually pre-treated with fungicides and insecticides, and they can't risk compromising the chemicals.

Mary: There is a major problem with substandard seed that actually carries the fungus within, so it really must be treated with a fungicide to remain viable.

Graeme: I read your article in a recent issue of Acres USA, where you suggested that growers would be well advised to gain control of their own seed supply. Can you explain why this is so important?

Mary: As organic farmers, we need to use the very best seed available. We need rapid, uniform germination and high vigour because, without the option of chemical seed treatment, we need to rely upon the vigour of the seedling itself to resist pest and disease. There is no real quality guarantee with commercial seed and there is a new issue in relation to genetically modified seed. Suppliers are no longer able to guarantee GM-free seed. There is also a problem in sourcing varieties best suited for organic production. I was suggesting that groups of local growers should combine forces in seed-saving to overcome these problems. Co-operative seed cleaning and storage facilities would be required, but this is not a major hurdle.

Klaas: We have actually been lulled into believing that we cannot survive without chemical seed treatment. One of the underlying reasons for seed treatment is that the seed producers don't want to throw anything away. We will actually come out ahead by developing the discipline of using only high-quality seeds.

Graeme: We have had really good results just using a *Trichoderma* seed dressing for disease control.

Klaas: Yes, we use *Trichoderma* on all of our seeds. It gives the seed an edge when it is germinating in less than optimum conditions.

Graeme: You have suggested that earthworms are perhaps the best indicator of high-production fertility. How many earthworms per shovelful of soil do you consider ideal?

Klaas: We don't actually have an ideal, but we have counted twenty in a handful on some of our blocks.

Mary: Earthworms, like all other soil organisms, like oxygen, so the best soil structure and tilth will attract the highest earthworm numbers.

Graeme: It was fascinating, at today's seminars, to hear someone make the statement that earthworm castings have a paramagnetic reading of 1000. It is theoretically possible to lift paramagnetic levels in the soil by building earthworm numbers. Sometimes fertility breeds fertility...

Klaas: In this case, there is a real synergy with our programs. Everything we do for weed control also helps soil health and soil tilth, which in turn attracts higher earthworm numbers.

Graeme: In our approach, we have an umbrella concept related to photosynthesis and associated chlorophyll management. The common yellowing effect in soybeans, which can be a side effect of herbicide usage, equates to poor chlorophyll management. How do you think this impacts upon yield?

Mary: It's hard to put a figure on it, but I agree that any loss of chlorophyll is a potential yield-limiter.

Klaas: The limitation is magnified in times of stress. A healthy plant may outgrow the problem, but in bad conditions this setback really strikes home.

Graeme: Are you familiar with the concept of chlorophyll management as a yield-building tool? It usually involves foliar fertilisers, and it is very much related to precise decision making periods, where the plant literally makes fruit setting and fruit/seed retention decisions based on the amount of chlorophyll present in the leaf.

Klaas: Recently, we did some experiments with foliar bio-stimulants, and we found some powerful effects. We had a researcher come in who used a chlorophyll meter to determine photosynthetic potential. In one trial, he successfully predicted a 40% yield increase. In another trial, we neutralised our initial gains by applying a second bio-stimulant. The effects are powerful, but you don't always know what you are going to get.

Mary: The synergy may not always be what you expect, particularly with energy-type products.

Graeme: I agree. They can certainly be very effective, but you need to know your product combinations to avoid problems. Your approach involves a combination of the Albrecht approach, combined with sound, biological practices. In this context, how important have you found the calcium to magnesium ratio to be?

Mary: We have a problem with high magnesium in our soils, which tends to create very hard, tight conditions. We've found that paying attention to the Albrecht ratios has really helped our soil tilth and our soil fertility.

Klaas: It's easy to look at the Albrecht model simplistically and say, "*putting the gypsum on killed the foxtail.*" I don't think that's what's happening. I think that when we work with cation ratios, we are changing the biological terrain. We are changing the environment and, by changing the environment, we're changing the microbial populations. I don't believe we have even begun to understand all of these changes. All we can do is to make the observation that a change in mineral balance produces a desirable result.

Graeme: Have you found any of the other Albrecht ratios have proven productive? The sodium to potassium ratio, the magnesium to potassium ratio, for example?

Klaas: Our area has very low sodium, so we don't have much trouble there, but the magnesium to potassium ratio is hurting us, and we are slowly working toward correcting that.

"It's easy to look at the Albrecht model simplistically and say, "putting the gypsum on killed the foxtail." I don't think that's what's happening. I think that when we work with cation ratios, we are changing the biological terrain."

Graeme: What about the zinc to phosphate ratio?

Klaas: Yes, we need to lift our zinc levels as our phosphorus levels increase. We always need to use zinc in our starter fertilisers. At one time, our consultant suggested that we had a zinc deficiency, simply by driving past one of the fields. He didn't need a soil test, because the presence of milkweed was an indicator of a zinc shortage. We've actually seen the milkweed disappear as we have slowly corrected zinc.

Graeme: We've found the most cost-effective response is to use zinc as a seed treatment. Zinc also plays a pretty important role in animal and human health. I wonder sometimes at the relationship between low zinc in plants and animals and the possible link to increasing rates of prostate cancer.

Mary: As animal feed producers, we are very much aware of the link between minerals in the soil and animal health. For example, if sulfur in the soil is low, the forage and grains growing in that soil may have low sulfur and therefore the diet of the animal eating those materials will be deficient in sulfur. Sulfur is critical for the formation of certain amino acids in both animals and plants. In animals, these amino acids are critical in the formation of certain proteins, which are needed in the immune system. What we've learned is that, when an animal is exhibiting a depressed immune system to something like intestinal parasites, then we have to look deeper. We don't have the luxury of using a parasiticide in an organic system. We have to go back and say, "*What is the sulfur level in the pasture?*"

Graeme: You find that sulfur plays that much of a role in parasite management?

Mary: Yes, it plays a strong role in parasite management.

Klaas: Again, health problems need to be looked at upstream. We need to ask "*What are they telling us about our system?*" We had an interesting discussion several years ago, with a university professor who was criticising the Albrecht model and criticising some of our fertility balancing by saying, "*you can't show me a yield difference,*" and sometimes he's right. There are some cases where we can't show him a yield difference, but we can show him a difference in susceptibility to insects, a difference in susceptibility to disease and a difference in the performance of the animals that eat the crop.

Graeme: I agree with you completely. It is so common to see this happen. Some researchers simply don't consider the parameters related to quality.

Klaas: Yes, it's single-factor analysis!

"There are some cases where we can't show him a yield difference, but we can show him a difference in susceptibility to insects, a difference in susceptibility to disease and a difference in the performance of the animals that eat the crop."

Mary: One of the things food analysts seem to value in the conventional vs. organic debate is a comparison of the relative mineral content in the food produced with the two different approaches. The organic adherents are often frantically trying to prove their superiority, but we feel that they were not really asking the pertinent question. The question really should be, "*What larger, more complex organic molecules are those minerals incorporated with? What amino acids, proteins, flavour components, fatty acids, texture components and enzymes are involved?*" I think we are going to find that, when the basic mineral analysis of the food produced with each system doesn't vary, there are always major differences in the complex molecules, and this is what determines the difference in taste, texture and shelf-life.

Klaas: I agree, but I still think that, in most cases, the organic approach will also win out in terms of minerals, especially an important element like sulfur, which is often ignored in conventional farming.

Mary: There is a researcher at Ohio State who has shown that certain amino acids act as insect repellents or insect attractants. Well grown, organic crops consistently have higher levels of the amino acids that repel. The fact is that we have often seen organic crops that are less susceptible to insect damage than equivalent, non-organic crops grown in the same area.

Klaas: That brings us back to Albrecht suggesting that the function of insects was to destroy the weak, to destroy the plants that are not fit to live.

Graeme: At present, we use refractometers and sap pH-meters in the field, to monitor the levels of these more complex molecules. I'm hopeful that the food industry will eventually develop foolproof technology to provide this sort of analysis on a broad scale. If the public were to be educated about the meaning of these parameters, then the chickens would really come home to roost. Anyway, I'd better move on with my questions. Composting is an integral part of your system, and it's considered essential for weed control. What sort of amounts do you apply?

Mary: Well, we don't apply huge amounts, simply because it is not feasible on our scale. We farm too many acres. However, we do have an interesting project going. The two larger towns in our area collect their leaves in fall. Most trees in the area are deciduous, and this equates to a huge number of leaves. Until recently, these leaves had been simply overloading the local landfill. Five years ago, we asked them to bring them to our farm. We piled them all up and turned them periodically. It's not intensive composting but, by the end of two years, they turned into beautiful, black humus.

Graeme: The issue of 'which composting technique is best' is an interesting one. I interviewed Malcolm Beck yesterday, who produces around 200,000 tonnes of commercial compost each year. The central composting paradigm in Australia seems to be based on Dr Elaine Ingham's work, which suggests the necessity for intensive, windrow composting, requiring constant turning and watering. Malcolm's compost involves the 'static pile' technique with large, well-constructed piles, which are only turned two to three times during the six-month composting process. Although many of our larger growers are adopting the intensive windrow approach, equal numbers have not moved into composting, simply because it is too time-consuming.

Mary: That's right. Most of us simply don't have the time.

Graeme: Well, Malcolm's piles are four meters high. In general, they don't need watering, so there are none of the nutrient-leaching problems associated with windrows. The fungal component stays intact when it is not consistently compromised by compost turners, and there is no potential for carbon losses here. His aeration comes from the distribution of the correct particle size throughout the pile. Malcolm has produced huge amounts of this compost for decades but has never had it tested. Yesterday, the day I interviewed him, he had just received his first analysis results from Dr Elaine Ingham's Soil Foodweb lab. The results were astounding, and it suggests to me that large-scale composting need not be so labour and energy-intensive.

Klaas: Well, we only turn the compost two or three times during the process, and it appears to be a very good compost, with very little effort. An interesting thing about the history of compost comes from Albrecht’s writings. European farmers used to always have the manure pile in the middle of the barnyard. They would bring in all the leaves and straw and any organic matter they could get their hands on, to mix with the animal manure. People were immensely proud of their compost pile. The bigger that pile of compost, the richer the farmer because his fertility would be higher. These guys didn’t have compost turners. When you do things by hand, there isn’t any energy to waste, and yet they obviously produced a high-quality compost, because their fertility has been sustained for thousands of years.

Mary: We don’t use compost as our primary source of fertility. We use it more as an inoculum. It’s a very valuable source of soil-life.

Klaas: The more intensive, irrigated vegetable growers use far higher amounts per acre, but this isn’t feasible on our scale. Green manure and cover crops are a better option.

Graeme: What sort of compost rates do you apply?

Klaas: We might use a tonne an acre, but not every year.

Graeme: Do you band or broadcast?

Klaas: We broadcast. We like to broadcast directly onto our cover crop. We feel we get much better utilisation if it goes onto a green, living plant rather than bare soil.

Graeme: There is certainly a lot more microbial activity happening in the root-zone of these cover crops.

Mary: Yes, and we find we get improved breakdown of those crops, better mineral recycling, and the minerals are more stable.

Klaas: It’s not rocket science. My mother used to drive me crazy with an old saying, which, in retrospect, may have been quite smart. She used to say, “*Der dummmste Farmer hat die größten Kartoffel,*” which means “*the dumbest farmer has the biggest potatoes.*” We can do some of these things and we don’t have to understand exactly how they work.

Graeme: Yes, I guess that has some truth, but we usually find a link between greater understanding and improved profitability. Another question - you have identified some basic rules of crop rotation. Can you share them with us for the benefit of Australian farmers?

Mary: Again, it’s not rocket science. It’s fairly intuitive. If you’re relying on legumes as being your primary source of nitrogen fertility, then you need to alternate legumes with non-legumes. If you are relying on your crop rotation as a technique to break weed and disease cycles, then you need to alternate crop families, so that you are not continually growing grassy-type cereal crops. You need to alternate crops that have different planting times, to break the weed and insect cycles and alternate solid-seeded and row crops. If you have a weed problem in a particular crop, you can consider the potential of using allelopathic crops to counteract the problem. It needn’t involve something exotic, often they are crops we would plant anyway. Many small grains like oats and rye are allelopathic and have a strong tendency to suppress weed growth.

Other crops, like buckwheat and Sudan grass, are powerful weed suppressers. Sudan grass will suppress and actually kill nematodes. There is an increasing amount of new research in relation to which different plants are co-hosts to different diseases and insects. If you have a problem with certain nematodes, you need to find crops to alternate that don't act as co-hosts for these nematode species.

Klaas: It's interesting to see the shift that's happened. In the past, farmers just knew that you just plant this crop after that crop in a certain order. They couldn't explain why. Now there is the opportunity to scientifically design rotations, which will give us the maximum benefit.

Mary: We work closely with researchers at Cornell University. They have several new, young researchers who are very interested in researching organic systems. It works both ways, as they can also benefit from our practical experience.

Graeme: Just a couple of other questions. Roundup-ready crops have become very popular in the US. Have you seen any problems associated with this form of genetic modification?

Mary: It's a self-limiting technology. Already in the US, after a few years of using Roundup-ready crops, there are Roundup-resistant weeds, and every year there will be more. Evolution really does work, and there is heavy selection pressure now for Roundup-resistant weeds - whether this is actual genetic resistance or just by timing - by having the weed grow under the canopy when Roundup is applied. We are already seeing chemical dealers suggesting that farmers should spike their Roundup with other chemicals to maintain weed control.

Klaas: Within two to three years of using Roundup-ready crops, you begin to see a need for an additional application of Roundup or a need for spiking with other chemicals.

Mary: It's another example of the arms race. We don't need these things in organics, but in all farms it could be argued that glyphosate is the least damaging of these chemicals, and it's a serious thing to lose this as a weapon in the arsenal against weeds.

Graeme: I understand that Roundup-ready canola has become a noxious weed in Canada, and they are dusting off some of the heavier chemicals to try to control this new weed. It's not a good thing.

Klaas: One of the major problems with GM crops in general is that they encourage and perpetuate poor management practices. They are an inappropriate solution to a problem that inappropriate management has brought on. We always talk about looking upstream, looking for root causes to a problem. This technology is the opposite. It's the ultimate band-aid approach, and it will never solve problems. Farmers growing soybeans in the US have weed pressures they can't deal with because of poor management practices for the past ten or twenty years. Instead of having to respond 'upstream' and improve their management, they are able to keep doing the sloppy management by adopting this technology.

Mary: It's a very short-sighted, short-term approach. The problem will be a lot bigger before they are forced to address it. BT corn is widely promoted as high-tech farming. You're not up to speed if you don't use it, even if you don't have pressure from corn borer. In the end, you become part of the problem by promoting selective resistance.

Graeme: What tools have you found effective in the mechanical control of weeds?

Klaas: The goal of mechanical control of weeds is getting as much possible differential size between the crop and the weeds. I think blind cultivation is essential.

Mary: Blind cultivation is early cultivation immediately after the crop has been planted right around the time of emergence. The point of blind cultivation is to stir the soil and to introduce air to the soil, which will cause germinating weed seeds to dry out.

Graeme: Why is it called blind cultivation?

Klaas: Blind because the crop's not there yet.

Mary: Because you don't pay attention to where the rows are.

“One of the major problems with GM crops in general is that they encourage and perpetuate poor management practices. They are an inappropriate solution to a problem that inappropriate management has brought on. We always talk about looking upstream, looking for root causes to a problem. This technology is the opposite. It's the ultimate band-aid approach, and it will never solve problems.”

Klaas: The nice thing about blind cultivation is that it suits people like me who have trouble driving straight.

Mary: The point is to stir the whole surface of the field and take advantage of the difference in seed size between the weeds and the crop and also the difference of depth of emergence. We are taking out that first flush of weeds. When conditions are right, blind cultivation can be 100% effective. We use three or four different cultivating tools during the season, depending on soil conditions.

Klaas: We also go in a second time after the crop is up. This really makes a lot of conventional farmers shudder, to think that we go over this tender, little crop with an aggressive tool, but it really doesn't hurt the crop. We may use a coil tye harrow or a finger-weeder. We may lose the occasional plant, but there is a tremendous benefit in taking out that second flush of weeds. Now we have the crop well ahead of the weeds by the time the third flush comes. When we cultivate this third time, we can make good time. We can go faster and be more aggressive and it really saves us money in our row cultivation.

Graeme: How much time does this type of management take in comparison to herbiciding?

Klaas: The first two blind cultivations take less time than a herbicide application. It's actually much cheaper because you are not buying the chemicals. You are not going back to refill the spray tank, you are not waiting for the wind to stop. Row cultivation does take some additional time, but some farmers side-dress their row crops, so one of our cultivations takes the same time as side-dressing. In effect, we are only doing one row of cultivation more than the conventional. It's not a lot of expense. We have entered the 'Farm Journal Tight Wad of Weeds' contest this year, and we will win it

hands down if they don't disqualify us. People, including the seasoned journalists, are so conditioned to the need for chemicals, they are not even aware of how efficient other cultural approaches can be.

Graeme: What is the significance of the contest name?

Klaas: Tight Wad' is an American colloquium for someone who wants to spend the minimum amount of money for the maximum results. It's a contest to see who can get the most effective weed control for the least amount of expense. I think it's a great contest, because it highlights the economic downside of chemical weed control for chemical farmers.

Graeme: One last question for you, Mary. In your last Acres USA article, you highlight the danger of planting low-vigour seeds. What are these problems and how do you avoid planting low-vigour seeds?

Mary: There is a myth that guaranteed germination rates somehow guarantee that the seedling will be healthy and vigorous. A low-vigour seed may still germinate, but it will grow very slowly. The effect here is that, the longer a seed stays in the ground before the plant comes out and starts photosynthesising and growing rapidly, the more opportunity fungal pathogens have to attack that seed and rot it. You also lose yield potential with a slow start. Research done on beans back in the 30s showed a significant yield difference between small, weak seeds and large, vigorous seeds, and similar research has also demonstrated this with corn. The way we handle this is to select the best of our own seed each season. We have 100 seeds of various varieties wrapped up in damp paper towels. By germinating them on paper towels for five to ten days, we can determine percent germination. If all of these seeds germinate within a day or two, then that's a pretty good indication that there's good vigour, but if they don't start germinating at three days and there's still a few strugglers coming at ten days, then that's a good indication of low-vigour seeds. You can still use these seeds, but they should be planted with higher populations to compensate for poor vigour.

Klaas: You can develop a feel for how a good seed should look. It's not scientific, but it works better.

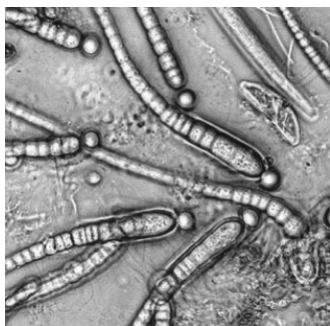
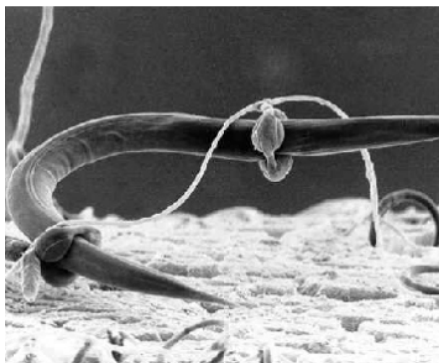
Mary: We also make use of the New York State seed testing lab for seed lots, which we are selling in large quantities to other farmers. There is an interesting example of new research confirming age-old wisdom in terms of seed selection. The native Americans always cut the top and the bottom of their corncobs and planted the remainder, which are termed middle flats. This became standard practice amongst early farmers but was ridiculed around the time of the development of hybrids. If you are saving your own seed, you can always find a use for the discarded portion, but this was a major loss to commercial seed producers. Growers were 're-educated' to accept the full range of kernels. Recent research has highlighted the folly of this 're-education'. It's particularly important for organic growers to select these medium flats, because they are far less likely to be contaminated by GM corn. Apart from this, the medium flats have many benefits, including lower disease pressure and higher yield potential. Sometimes it takes hard science to rediscover the wisdom of the past.

Graeme: Thank you for giving up so much of your time today. It was a real pleasure to speak with you. You may find you'll get an invitation to come to Australia once this interview has been published.

Klaas: We would love to come if that was to happen.

Mary: The only condition would be that our children would have to come along, as they would have an opportunity to see your country.




SOIL HEALTH - MICROBE MANAGEMENT



There is a critical relationship between calcium, phosphate and fungi.

CALCIUM RETENTION AND FUNGI

Elaine Ingham's Classic Experiment

 <p>POT 1</p>	 <p>POT 2</p>	 <p>POT 3</p>
<p>Sterilised Potting Mix No Calcium Retention</p>	<p>Added Bacteria-Dominated Compost 2% Calcium Retention</p>	<p>Added Fungi-Dominated Compost 100% Calcium Retention!</p>

PROF ELAINE INGHAM

Interview recorded December 2000



***Dr Elaine Ingham**, Professor of Microbiology at Oregon State University, is one of the world's pre-eminent microbiologists, but her academic achievements almost pale in comparison to her invaluable contributions to sustainable agriculture. Her efforts in promoting practical implementation of research findings are unique in that she has bypassed the alienating ivory tower, intellectual bureaucracy and taken her message directly to the people. **Dr Ingham's** common sense pragmatism, combined with rare communication skills, promise to elevate her to the forefront of the upcoming biological*

*revolution in agriculture. Her international presentations to farmers regularly generate standing ovations, but the importance of her research work was illustrated most poignantly in a recent Internet news bulletin, titled 'Elaine Ingham Saves the World'. This bulletin referred to evidence presented at a Royal Commission on Genetic Modification in New Zealand. At this forum, Dr Ingham referred to a genetically modified bacterium called *Klebsiella planticola*, which had passed the normal assessment process (involving thirteen different labs) and had been approved for field trials. This much-heralded GMO apparently had the potential to replace fossil fuel as an energy source via the production of an inexpensive alcohol alternative. The GMO could produce this alcohol from post-harvest crop residue and the remaining organic sludge, which still contained the GMOs, was destined to be returned to the farms as organic fertiliser. Somewhere in this simplistic scenario, someone forgot to test the bacteria with living plants. Dr Ingham's research team conducted these trials and found immediately that these GMOs could utilise the sugars dumped in the root-zone by the plant (ironically, to encourage beneficial microorganisms) to produce alcohol. The problem was that they produced a lethal dose of alcohol (five times more than any plant could handle) and **Dr Ingham** described trials where, in seven days, all wheat plants turned to slime. If this organism had been released to the world at large (as it almost was), it was quite conceivable that a large proportion of our plant-life could have been negatively affected, which in turn would affect all life on earth. In the recent past, we have mobilised ourselves against injustices like the Vietnam war. What does it reflect about our current state of apathy that there is no uproar against GM abominations which are far more menacing? Where were the headlines when we just came so close to monumental disaster? In the following interview, I seized the opportunity to submit all of my personal questions in pursuit of more knowledge of a*

subject I love intensely. I trust that you will all find this interview as illuminating and enjoyable as I have.

Graeme: I understand that you are setting up a Soil Foodweb lab in Australia.

Elaine: Yes, we are ready to open in a couple of weeks. It's situated at the Southern Cross University in Lismore, NSW [editor's note: this facility is now open].

Graeme: That's nice and close to our head office. It should give us a chance for more in-depth diagnoses with problem soils.

Elaine: That's great. Lets work together on this.

Graeme: You are becoming a regular visitor to Australia, but I've not had the opportunity to talk to you before. You were wonderfully well received at this conference. Are all of your audiences in the US this supportive, or are the Acres people a little more receptive?

Elaine: There're a lot of audiences that are this receptive, some even more. It's really astounding to receive standing ovations, but this has happened to me several times in recent months. On the other hand, sometimes I strike people who are more chemically oriented, and there is significantly more antagonism. They give me a lot cooler reception.

Graeme: Is the cool treatment from growers or chemical salesmen?

Elaine: Often from the salespeople. It's silly, because they must realise that part of the reason that the biological approach is growing so fast is because these people have not offered an approach that works. There is no reason why they can't begin to market biological products, and many of them are beginning to realise this.

Graeme: Well, they would find it a lot more satisfying and probably easier than being involved in the cut-throat, competitive world of commodity dealing.

Elaine: I agree that there is no doubt about that.

Graeme: Some of your findings have been real penny-droppers for our company when working with problem soils. Your beautifully simple three-pot experiment, which illustrated the biological link to calcium retention, is a classic. We are finding that many of these problem soils are deficient in fungi. What do you consider the major factor in the destruction of fungi in our soils?

Elaine: Well, every time you plough, you destroy fungal biomass. When you put out high levels of inorganic fertiliser, you kill off beneficial microorganisms. Even things like pesticides, which we don't consider to be fungicides, are in fact also killing off the fungi.

Graeme: More so than bacteria?

Elaine: Yes, definitely, and herbicides are particularly destructive. Most of them double as fungicides. Actually, many of them are bactericides as well. So you are really hammering the whole foodweb when you are using these chemicals. Nobody really understands this fact, because manufacturers are not required by any government on the face of the earth to put that additional information on the labels of these chemi-

cal. This really needs to change. You need to know that when you put down Lorsban, you are not just killing problem insects, but everything beneficial in your soil.

Graeme: You think there should be cigarette pack warnings?

Elaine: [laughs] Yes, “*Caution, this product is detrimental to the health of your soil!*”

“...herbicides are particularly destructive. Most of them double as fungicides. Actually, many of them are bactericides as well. So you are really hammering the whole foodweb when you are using these chemicals.”

Graeme: Do you see the fungi destruction associated with cultivation as an argument in favour of No-till farming?

Elaine: Yes, in some cases where you don’t want to be destroying the fungi, but on the other hand, sometimes with No-till your soils can move too fungal for the crop that you are trying to grow. So you need to understand those warning signals and then you plough it to bring it back to the appropriate balance.

Graeme: And is this one of the concerns of No-Till farming?

Elaine: It can be, but we have a long way to go until we have to worry about widespread fungal dominance in our agricultural soils. It only really happens when people have overused humic acid or other fungal stimulants. Actually, it usually happens in really intensive horticulture. We see it most often in golf courses.

Graeme: We have developed fungi-building programs which feature humic acid, kelp, fibrous compost, etc., along with fungi-based inocula. You mentioned fish oil in your lecture today as another fungi food. Would there be a gain in applying pure fish oil to the soil?

Elaine: In theory there certainly would be, because pure fish oil is almost perfect fungi food. However, we have never researched the benefits to know for sure.

Graeme: We like kelp as a source of complex carbohydrates for fungi building. What are your opinions of this material?

Elaine: Yes, kelp is a good material for this purpose. It also contains a full range of micronutrients. Many of these are no longer in our soils, but they are required for microbe health.

Graeme: Are there any other fungi-stimulating materials you have been working with?

Elaine: Yes, we have been doing some work with *Yucca shidigera*. This material is a great fungal food and it also stimulates bacteria. In our recent research it has also proven detrimental to root-feeding nematodes.

Graeme: We have been working with another plant saponin product which is toxic to snails. Do you think that this may have similar benefits to *Yucca* as a fungal stimulant?

Elaine: I'd love to look at this. I suspect that saponins in general will have a similar positive effect, it's just that in the US the only saponins available without preservatives are Yucca-based. People really need to be aware that any product that is added to the soil or compost or compost tea should not contain preservatives. A preservative, of course, is designed to prevent microbial growth.

Graeme: That's a good point, because often even organic products are stabilised in this manner. Another question - For some time we have offered simple, inexpensive plate count tests to provide a rough indication of soil life activity. I realise that this is far from perfect, but is there any gain from these basic tests?

Elaine: Unfortunately you miss most of the bacteria and fungi with a plate count. It is notoriously unreliable. Many species simply won't grow on a plate.

Graeme: There is some debate about the appropriate amount of humic acid to apply in one application. Can you help clarify this confusion?

Elaine: Well, in our case we rely upon our soil life audit to determine appropriate applications of humic acid. Humic acid offers other benefits, but as a bio-stimulant it has no effect on bacteria, it is purely a fungal stimulant and the amount required in this context depends upon the test data. If fungal levels are a little low, then one litre of humic acid per acre (2.5 litres per hectare) will be productive. However, if the active fungi are almost zero, but we have a good total fungal biomass, then they need a good kick-along and we might apply three gallons of humic acid per acre (25 litres per hectare).

Graeme: I'd like to ask some details about fungi / bacteria ratios to try and get a better handle on some of these things. You have stated previously that you need 600 million bacteria per gram of soil involving 20,000 species. How many fungi are needed?

Elaine: In a good, healthy agricultural soil we are probably looking at 5,000 to 7,000 species of fungi per gram of soil. We can't grow those fungi on plates either, so we haven't really understood that they were there, that they were functional and doing things. That's why a direct count is so much more accurate.

Graeme: Are you referring to DNA analysis?

Elaine: No, we actually dilute the soil and then measure the length and width of the hyphae that we see in a certain volume of soil. We can measure biomass in this way, and there is a correlation between the amount of biomass and the species diversity. That is why we say that you have to have a minimum of 200 micrograms of fungal biomass, because that means that you probably have this associated species diversity. The DNA method, by contrast, is very expensive. For example, to do fungal species diversity in a gram of soil would probably cost between US\$2,000 and \$3,000, while bacteria counts are around US\$1,000. Our method is not quite as accurate, but it is only a fraction of this price.

Graeme: We recently encountered a NSW avocado grower who had piled 15 tonnes per hectare of lime on his soil over a three year period, but the calcium never seemed to be present in subsequent soil tests. You have demonstrated a connection between fungi and calcium retention. His test with your lab revealed extremely low fungal levels, particularly considering he was growing a tree crop. He had wood chip mulch and other

conditions suitable to fungi, and he practised sustainable farming. What was the likely cause of this fungi deficit?

Elaine: Well, for some reason, sometime in the past, the fungi were killed in that soil, so he will need to put an inoculum of the fungi back in there. The fungi may not be returning because there is residue of a fungicide, pesticide, herbicide or nematicide, or a combination of these, which still remains in that soil.

Graeme: We do a lot of work with orchardists and we often find very high copper levels in the soil as a result of copper fungicide residues. Could this be contributing to a lack of fungi?

Elaine: Absolutely! I'm often amazed at some of the organic growers who are putting on copper sulfate as if it were a harmless material. It is a killer of the organisms in the soil. Problems begin when copper gets above three parts per million in the soil.

Graeme: Only three parts per million! We are dealing with citrus growers with 500 ppm of copper. Under a microscope you can actually see the blue flecks. Is there any point in trying to address fungi shortages in these soils?

Elaine: Yes, most definitely. The trick is to get organic matter back into those soils to tie that copper into the structure of the organic matter so its no longer in a biologically available form.

Graeme: Would humic acid be ideal for this?

Elaine: Yes, this is the material to use. The copper becomes sequestered inside the complex structures of the humic acid or fulvic acid.

Graeme: Is fulvic acid an option in the soil? We recently had a potato grower mix his nitrogen side-dress with fulvic acid, and this nitrogen appeared to disappear over the following days. We wondered whether it had bonded with the fulvic molecule and rapidly leached, due to the very small molecule size of the fulvic acid. What do you think?

Elaine: I suspect that you were looking at a bacterial bloom. Fulvic acid does feed fungi, but it is a very effective bacterial food. You would have generated such a bloom of bacterial growth that the bacteria were sucking up the applied nitrogen. Typically, nitrogen is not absorbed very effectively in the fulvic molecule. NO_3 and NH_4 are not really that reactive with fulvic acid.

Graeme: During your presentations, there is very rarely mention of the mineral link to microbe health. I am always insisting on the importance of the calcium / magnesium ratio to provide oxygen for microorganisms. You have highlighted calcium retention. How important do you see calcium and other minerals for microbe welfare?

Elaine: I agree that it's extremely critical. The only reason I don't cover this mineral link is due to lack of time during my presentations. It's not a simple subject - it would take several hours to explain. It's not just the effect of minerals upon the microbes. It's a feedback system. Microorganisms will influence the way micro-nutrients are held, where they are, and uptake of those minerals in the soil. However, if the calcium is not there to flocculate the soil, there is simply inadequate housing conditions for microorganisms, particularly bacteria, to flourish. The bacteria need to get in there first, to pave the way for the fungi. In high-magnesium soils, for example, the housing conditions for bacteria are so poor that they become very vulnerable to all kinds of environ-

mental changes in weather, temperature, moisture, dry conditions, etc, but probably more importantly, without soil flocculation and the associated provision of good living quarters, bacteria and fungi are vulnerable to the predators. They get eaten and then they're gone. It's like the homeless having to live under a bridge in winter. There's no place to be safe and secure. When you bring in the calcium and flocculate the clay structure, now you have all these little apartments for the bacteria to grow in.

Graeme: Another question about microbe health and safety. The eco-agronomists are strongly against muriate of potash, due to the microbe killing potential of a material containing 50% chlorine. You suggested that the damage potential was governed by soil type. What limits or magnifies chlorine damage, and how much can be applied safely?

“It’s a feedback system. Microorganisms will influence the way micro-nutrients are held, where they are, and uptake of those minerals in the soil. However, if the calcium is not there to flocculate the soil, there is simply inadequate housing conditions for micro-organisms, particularly bacteria, to flourish.”

Elaine: This is a topic we really need to look more closely at. There are other variables involved here. For example, the amount of organic matter plays a role in damage potential. Potassium retention is also so dependent upon the type of clay present. Kaolinites, for example, adore potash, and it ends up inside the clay structure, and it's like a never-ending storage compliment for potash. Whereas, in a montmorillonite soil, you can't tolerate much potassium going into that system, because there's no place to store it. It's highly variable - then you add organic matter to the equation. How much potash is going to be absorbed onto the reactive sites on that organic matter? We need to do some in-depth work here, but who is going to finance this? Really, the US or Australian Governments should be offering funding to look at these critical questions regarding how does biology and chemistry work together?

Graeme: In a soil with high electrical conductivity (EC), with high EC irrigation, is it possible to establish a viable microbe population and get them to flourish?

Elaine: You can choose bacteria or fungi that tolerate those high EC or high salt concentrations. We work with some sandy soils in California, where we are trying to get decomposers working to increase organic matter and tie up the salts in the structure of the organic matter.

Graeme: Can humic acid play a role here?

Elaine: Yes, it certainly can, but ideally you need more reactive carbon to initiate this whole process. Humic acids can be brought in after things have been started - after the bacteria have become established through stimulation with simple carbohydrates.

Graeme: After some of your lectures in Australia, we have growers, with soil pH's of over 8, who are trying to breed and apply fungi. Is there any point when the pH is completely unsuitable? Can a correct bacteria to fungi ratio ever be developed in these soils?

Elaine: The fungi will still grow at those high pHs. That's not a problem, but what the fungi will do is gradually reduce those high pH conditions. Fungi produce organic acids that have a pH between 5.5 and 7, and these acids will move the soil towards neutral. The fungi just need the right soil. Growers have often been concentrating on bacterial food rather than fungal food.

Graeme: I know that many people have been influenced by the American consultants recommending sugar and molasses, but this may sometimes be counterproductive, as it only feeds bacteria.

Elaine: That's right. This is bacterial food, and the bacteria outcompete the fungi every time. If anything, they will be magnifying their poor biological balance. In many cases these sugars will leave them worse off than if they had done nothing. Then they can watch their pH go to 9.

Graeme: You have suggested that inocula are questionable, because they will not necessarily perform in localised conditions. We have an Azotobacter product with which we've had exceptional results in all soil types, and we also have several other problem-solving microbe products, which have also proven very reliable. How is this happening?

Elaine: Well, in the case of Azotobacter, there are only a limited number of strains. If someone could include all 126 strains in a single blend, it might work in any conditions all around the world.

Graeme: That's exactly how this blend is formulated. In fact, a development team has identified a total of over 200 strains and all of them are included in one blend.

Elaine: If you can supply a functional group covering all strains, you are potentially covering every condition. If you introduce this type of blend to a soil that has been really hammered, then there are a lot of niche spaces there and nobody to compete with them. Indigenous species were often not designed to survive in a ploughed field. They often can't thrive in conditions with so little organic matter. There is a place in these situations for an inoculum with more versatility. However, when you have reclaimed that field by building organic matter and biology, then the natural species will compete more effectively with the introduced species. When you concentrate on an inoculum featuring just one genus, you have a far higher chance to succeed.

Graeme: What about inocula containing a wide variety of species?

Elaine: Again, in poor soils they may be of benefit, but in a soil with well-established foodweb they will probably fail to compete with the indigenous species.

Graeme: Is there any risk that, by adding a huge amount of bacterial inoculum and feeding the newcomers with sugar, that the entire foodweb can be thrown out of balance?

Elaine: We can often assume that an inoculum is used because of a lack of soil-life. If the housing conditions aren't there, how do we expect the new additions to survive? I have sometimes seen completely inappropriate species included in inocula and they can cause imbalances. If they overwhelm the system, we can see root symptoms similar to a disease. Here we have to come back in with a compost with a huge diversity of microorganisms to restore balance.

Graeme: Another question about fungi / bacteria balance - When making compost tea, the bacteria breed far more rapidly than the fungi. Wouldn't the end brew be completely unbalanced for this reason?

Elaine: You can encourage fungi growth in that medium, so long as you supply a surface for the fungi to grow on. This is why it is important to add kelp or humic acid to the brew. It is also important to restrict brewing time to 24 to 48 hours from a fungal point of view. After the fungi have germinated, they don't survive well in this medium beyond two to three days. Some of the more recent compost brewer designs use a vortex effect rather than putting the mixture through pipes. The vortex oxygenates the mixture without dislodging fungi from the surfaces. These designs are more effective in ensuring a good fungi to bacteria ratio in the end brew.

Graeme: How important is the design factor in the efficiency of the compost tea brewers? Is there any potential for growers to construct their own inexpensive equipment, using 1000-litre tanks and spa heater / blowers? These could be constructed for a fraction of the price of commercial modules.

Elaine: As long as the aeration is good, they would probably be acceptable, but I would like to test the compost tea to determine how well these DIY machines perform. The 'Soil Soup' people produce a really good aerating / mixing nozzle, which they sell separately. You supply the tank and pump. They can supply nozzles to aerate tanks as large as 2000 gallons. I've tested tea made from their 500-gallon tank, and that's wonderful stuff.

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Graeme: We often explain herbicide damage in terms of destruction of algae and associated loss of this carbohydrate food source for soil-life. We recommend the use of fulvic acid with herbicides to isolate residues and speed the biodegradation of those residues. Do you consider this a worthwhile practice?

Elaine: I've never done this before, but it does sound like a very good idea, and in theory it should work well. However, I'd still like to test the idea. I always like to have test data. It would actually be quite simple to test. We would just need to measure foodweb differences with and without the fulvic detoxifier.

Graeme: Do you have any tricks to replenish the algae which have been decimated by herbicides, or are there additives which can substitute for this disruption in carbohydrate production?

Elaine: We have had very good results when researching *Yucca shidigera*. This is a steroidal saponin, which is a particular complex carbohydrate that we have found to be very effective in this context. It is really a band-aid to some extent, because algae can

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breed and increase and continue to supply food indefinitely, while Yucca is just correcting an immediate deficit.

Graeme: Yucca is very expensive in Australia, but could our inexpensive saponin product, which I mentioned earlier, be used to compensate for algae losses?

Elaine: In all likelihood it could be. We would be very interested in testing that material to determine its potential. In general, I would prefer to see growers reduce or remove herbicides by improving the balance in their soils. Weeds are a symptom of a poor mineral and microbial balance and, the more balanced the soil, the less the weed pressure.

Graeme: Yes, sometimes it can be quite dramatic. I have photos of a timber tree crop where we were only asked to fertilise and balance the 1.5-meter wide growing strip which contained the trees. In just four months, the inter-row area (which was pretty rough, recently cleared scrub) was a jungle infested with weeds and regrowth. The grower was intending to herbicide following his return from an extended holiday. The area, which had been minerally balanced and microbially activated, contained just the occasional weed. It was like chalk and cheese.

Elaine: Yes, it can happen quite rapidly. You're getting rid of those weeds because they do better when there's low oxygen concentrations in the soil or if you set up the right conditions for weeds to prosper, like high nitrates.

Graeme: The problem is that, when you are dealing with broadacre crops, there is simply no budget for major soil corrections, and the potential to balance soils for weed control just isn't there.

Elaine: Yes, I admit that this can be a problem.

Graeme: If there is a shortage of fungi in most soils, would it be safe to assume this biological deficiency, and to begin a program to rebuild fungi without prior testing?

Elaine: Yes, we often suggest that a fungal food feeding regime is instigated, and a year down the track we begin testing and see how far we've gotten.

Graeme: I always like to try to tie in various systems, to take pieces from everywhere in an attempt to gain a deeper understanding. There are times when we have completely balanced a soil, yet brix levels remain inadequate. We often use a LaMotte test at this stage and find a lack of biologically available calcium, and leaf tests will also show a calcium deficiency. It seems that this widespread lack of fungi may be contributing to the calcium shortage. What do you think?

Elaine: Yes, quite often it is a lack of mycorrhizal fungi on the root system, and this is a very important problem which should be addressed. The fact is that, if you use pesticides or herbicides regularly, it is unlikely that you will have healthy mycorrhizal fungi. In fact, in many cases you won't have any at all. This is where you will need a mycorrhizal inoculum to get them back in there.

Graeme: Is an inoculum based on these fungi difficult to produce?

Elaine: It is very easy to produce a very stable mycorrhizal inoculation, because they produce some great external spores, and so you just harvest those spores and there's your inoculation.

Graeme: Would it be applied in liquid or dry form?

Elaine: You can apply it in a carrier. Sometimes we will grow seedlings in mycorrhizal spores before transplant, or we can dribble a row of spores underneath the seed at planting. For established plants you can put cores down next to the root system and refill that core with a combination of compost and mycorrhizal spores. If you want to introduce mycorrhizal spores to a compost tea, then you introduce them immediately before applying the brew. If you introduce them before brewing, then they will germinate and the brewing cycle will kill them. It is important to use indigenous mycorrhizal fungi, so an effective inoculum would probably need to be manufactured in Australia.

Graeme: The problem, of course, in conventional agriculture is that you inoculate and then move in with herbicide and you're back to square one. The cotton growers in Emerald are having problems with something called 'Long Fallow Disorder', which is essentially a shortage of mycorrhizal fungi called VAM. They believe that the only good plant is a dead one if it's not cotton. During fallow periods everything is killed off and nothing remains to sustain symbiotic species like VAM. There seems little point in trying to correct a situation like this, when there is no accompanying change in management practices. Is there anything these guys can do to improve things?

Elaine: I bet they have fusarium problems as well.

Graeme: Yes, they do.

Elaine: Well, that's why. Yes, there is something they can do about it, apart from the obvious solution of removing the toxins from the system. They could plant an understory - underneath the cotton plants - of some real short-stature, fungal-dominated plants. There are a number of very hardy plants like this, which you can drive over and abuse to your heart's content, but all the while they will be supplying mycorrhizal fungi to the root-zone of their cotton crop.

Graeme: What sort of species would you suggest?

Elaine: There are some really short mint plants that work. There's lavender - basically very short-stature, perennial plants. Typically, you under-seed with these plants when you are planting the cotton. These plants don't get any higher than a half inch to two inches, so they are never a problem. If it gets too dry, they may become dormant but they leave a good mat of roots, so there's no erosion. More importantly, these roots are dominated by the right kind of mycorrhizal fungi, so there's your inoculum all the time - even when you rip up the cotton, the mint or whatever will continue and you can replant amongst it.

Graeme: So it becomes no-till, in effect?

Elaine: Well, if you want to plough, then you plough down the strip where you are going to plant the cotton, so you don't have the erosion or loss of nutrients associated with constantly working the soil. I just don't understand why growers don't do these sorts of things. They work.

Graeme: Well, it certainly sounds like something the cotton growers should be looking at. Actually, while we are talking tillage - Are you familiar with Don Schriefer's tillage methods, ie leaving corn roots in the ground to rot and planting the next crop,

like soybeans, in between the old corn rows with deep-ripping, to break the hard pan below the new crop each year, if needed. Is this approach more sustainable from a microbial perspective?

Elaine: You mentioned the concept of deep-ripping to remove the hardpan at four feet or four inches or whatever. The reason the pan is formed is because the soil got compacted, then went anaerobic. It always is the microorganisms getting the life back into that hardpan that opens it up and prevents it from reforming as a compacted hardpan zone. Soil-life is the key. It needn't take very long with biology. Work at Ohio State University shows that you can break up a hardpan at four inches in six weeks by just getting the right kinds of fungi into that soil. You can break up a hardpan at four feet in six months.

Graeme: Do the beneficial microbes work at that depth?

Elaine: Yes, but you need the 'taxi cabs' to move the organisms down to that depth, so you have to have the micro-arthropods functioning in that system. They are the ones that cart the microbes down there. You can't rely upon water. Earthworms, centipedes, millipedes, beetles, beetle larvae, springtails - these are the taxicabs to get the beneficial microbes down deep.

Graeme: Everyone talks about the top six inches as the aerobic zone where the biology happens - This is a new perspective.

Elaine: There are some misguided ideas about how far down soil goes. If you haven't messed up your soil structure, it is actually possible to sustain soil-life down to twelve miles. That's how far we've gone. It's only because we have messed up the soil and put in those hardpans at four inches that we have this idea that it is naturally anaerobic and not alive below that level. Anaerobic organisms are alive, but they don't allow root growth. In agriculture, when we moldboard-ploughed, we only went down four to six inches, so that was where the hardpan developed. Now we go in and deep-chisel or we rip and we go down to four feet, so that's where the hardpan is forming. Now the USDA only defines soil as going down four feet - Duh! I wonder why! [laughs].

Graeme: Can plant roots grow in anaerobic conditions?

Elaine: Anaerobic bacteria produce organic acids with an average pH of 2. There is no plant that will grow its roots into this kind of acidity. That's why I talk about aerobic bacteria with a pH above 7. I talk about fungi with pH buffered between 5.5 and 7. How does a soil get below 5.5? - Anaerobic processes - You're messed up big time when you see your pH go below 5.5.

Graeme: You have suggested that anything more than 200 kg of salt fertilisers per hectare in a single application is detrimental to microbes. Most conventional growers apply more than this. How detrimental is it, and can damage be reduced by buffering with compost or humates?

Elaine: It is quite destructive and it can be buffered by humates or compost, but, in a lot of work that we are doing all over the United States, we have taken growers to the point where they don't apply any fertiliser. Probably the best research example is 'Eco Systems' at the University of Georgia - a project that started back in 1981. In 1984 they stopped using pesticides and herbicides. There are no insect problems and minimal

weed problems. In 1986 they stopped using fertilisers. The green manures that they use in those systems supply the nitrogen needed. Their yields of corn are higher than the conventional system every year. If you can supply a very good compost as an inoculum of full biological diversity and if you supply the foods to feed all of these organisms year after year, then you don't have to use fertilisers. Good compost is the key here. If you go anaerobic while you are producing compost, then you just lost all of your nitrogen. It just left as ammonia - it was volatilised. You also lost all of your sulfur as hydrogen sulfide - the gas that has that rotten egg smell. You also lost most of your iron as iron sulfide. You simply don't have the nutrients left in something that is in essence 'putrefied organic matter'.

Graeme: That's a romantic way to describe any compost not up to your standard! [laughs].

Elaine: [laughs]. Well, you have to make it messy. You have to make people understand.

Graeme: Yes, I know - and that's your great gift. You can really drive home these issues. Another question I have been wanting to ask you - You'll have to excuse the number of questions - I use this interview series as a tool to increase my own knowledge. The readers are basically forced to share in my learning process [laughs]. I wanted to ask you about organic matter testing, as this is a major issue affecting microorganisms. There is some debate about the respective validity of different organic matter measuring techniques. Can you clarify the confusion?

“Good compost is the key here. If you go anaerobic while you are producing compost, then you just lost all of your nitrogen. It just left as ammonia - it was volatilised. You also lost all of your sulfur as hydrogen sulfide - the gas that has that rotten egg smell. You also lost most of your iron as iron sulfide. You simply don't have the nutrients left in something that is in essence 'putrefied organic matter'.”

Elaine: The whole issue of measuring organic matter is in a state of flux at present. I look at each lab and try to interpret them based upon their own limitations. The standard USDA-type tests, for example, tend to underestimate the amount of usable organic matter available, while some of the Albrecht-style labs, like the Perry labs, tend to overestimate the actual microbially active organic matter which could be utilised by bacteria and fungi. The reality, from a biological perspective, is somewhere between these two numbers. The bottom line is that, if your organic matter level is above 3% on any test, then you have a decent amount of organic matter feeding your organisms. Ideally, I would like to see organic matter up around 8%, because then I know that I have the full smorgasbord of food to feed the full spectrum and to promote nutrient retention, nutrient recycling and disease suppression.

Graeme: Unfortunately 8% organic matter is a fairly rare occurrence in Australia.

Elaine: Well, your soils in Australia are very weathered. They're ancient soils, so you really need to put an effort into building organic matter in these soils. The parent

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material, the clays which confer storage capacity, are old - they are essentially worn out and you've got to use organic matter to get the fertility back.

Graeme: There are small pockets like Northern NSW, for example, which have exceptionally high organic matter, we have seen soils that contain up to 18%. Are there any problems with excessive organic matter?

Elaine: There can be a problem in these soils in maintaining structure. If you start compacting 18% organic matter, it's really easy to have it collapse. Then you have stinking, smelling, putrefying organic matter. You have to maintain the life in that soil to maintain the structure. I love soils like this - If you can build a good foodweb within them, then you can grow spectacular produce - Alaska-size vegetables, 200-pound pumpkins, two-foot carrots and wheelbarrow-sized cabbages.

Graeme: From a grower's perspective, green manure crops and cover crops are a far more cost-effective proposition than compost, if you are trying to build organic matter - do you think there is a role for inocula to speed the conversion of organic matter to organic carbon, particularly if the grower is just starting in biological agriculture and there is no guarantee of a good microbe base?

Elaine: Yes, definitely. It's almost like you have to inoculate in those conditions, because you're not going to have your own premium compost available. Get it started, hedge your bets and give it a chance to get as much starting diversity as possible. Once the wheels are in motion, you will develop your own sets of organisms.

Graeme: How do you feel about adding a little commercial nitrogen to the picture before you shallow-incorporate your green crop? If there is any doubt about the amount of nitrogen present in relation to the large bulk of organic matter, we usually recommend some extra nitrogen to really make the most of your limited opportunity to build carbon efficiently.

Elaine: No, I don't have any problems with this. It's a good idea, as long as you have a healthy foodweb and you don't exceed 100 kg of nitrogen per hectare.

Graeme: One more question regarding inocula. I'm always a little concerned about their use in cold temperatures. We have numerous growers using our Bio-N and Bio-P products for seed treatment. Often, when they plant in winter or early spring, the soil temperatures can still fall below 5°C, which would normally slow down the bacteria. There is still a gain in treating seed, regardless of climatic conditions, because the juices that house the dormant cysts in these products contain a range of growth hormones that kick-start seedlings. However, I'm always wondering just how well the Azotobacter survive this cold start.

Elaine: The organisms form dormant structures in freezing conditions and they literally wake up in spring. You don't actually lose them. The better the soil structure in terms of aggregates, the less likely they are to actually freeze. However, if you have no aggregations, then many species may not survive a freeze.

Graeme: Thanks for giving me so much time. I've really enjoyed talking to you. I'll send you a copy of Acres Australia when the interview is published.

Elaine: It was a pleasure. I'm looking forward to you coming down and visiting the new lab at Lismore. I'd love to show you around to see what we are doing.

MALCOLM BECK

Interview recorded December 2001



Malcolm Beck, author of *'The Secret Life of Compost'* and founder of a leading Texan compost company, Garden-Ville, was one of the most delightful interview subjects I encountered during my research for this book. Looking disarmingly like Buddy Ebsen, the actor who played the Texan hillbilly Jed Clampett in *The Beverly Hillbillies*. Malcolm shares the same Texan drawl and manner, but this is where the similarity stops. Malcolm has been a tremendously successful businessman, with his Garden-Ville company producing around 200,000 tonnes of compost annually and marketing a variety of other products, most of which he has personally designed. An afternoon with Malcolm is like a lesson in the supreme importance of keeping things simple. Why waste the time and money to perfect the energy-intensive art of windrow composting when some basic tricks can produce a static compost with a more desirable end analysis. The secret to successful agriculture, according to **Malcolm Beck**, is to ask a single question before any management decision. That all-important question, "Does nature approve?" has become the basis of Malcolm's educational programs and consulting career. Sit back and marvel at the practical wisdom of this terrific Texan and recognise that 'The gold in them there hills' comes not from the ground but from the mouth of this self-made observer of nature.

Graeme: I have really enjoyed your presentations. Thanks for putting aside some time for the interview. It seems like perhaps half of the conference crowd are certified organic growers. What is your opinion of the current state of organics?

Malcolm: I used to be a fanatic about organics, but now I've come to the conclusion that I don't want to put labels on anything. I want to look to nature and see what she approves of. Who are we to outguess nature? We are supposed to be working on national standards in organics. It's been going on ten years and they are up to thirty-two thousand pages costing millions of dollars. You've got all these pages that are telling you what you can't do but very little of what you should do. They should tell you what you have to do, what you need to do - what you need to do to build a soil up. Once you get your soil built up, you don't need all of those things that you can't do. Another problem is that there is now a wide gulf between the chemical farmers and the organic farmers. Now they hate each other. That's no good.

Graeme: I don't think it's quite the case in Australia. Of our several thousand clients, there are only about three hundred organic growers. The rest of them are conventional growers benefiting from the best of both worlds.

Malcolm: How it works here is, if a guy is a casual farmer or an absentee farmer with some other job, he might be interested in hearing about organics, but if he is farming for a living, he doesn't want to hear anything about organics. You come and talk

organics to him and he won't even give you the time of the day. Now, if I go and talk to him and tell him I've been going to a few farm conferences and been doing a lot of study and that I've discovered some things that might increase his production and cut his costs, now he says, *"Tell me about it."* So I tell him the same thing, I just don't call it organics.

"I used to be a fanatic about organics, but now I've come to the conclusion that I don't want to put labels on anything. I want to look to nature and see what she approves of. Who are we to out-guess nature?"

Graeme: We do the same sort of thing. Often, after adopting a few of these ideas, the farmers suddenly realise, *"Gee, I can get half as much more for organic produce, I only need to do a couple more things and I'm there."*

Malcolm: The certified growers are just a little speck compared to all others. Charles Walters, the father of all this, told me, *"Malcolm, we are just peeing in the wind until we get mainline agriculture understanding these ideas."*

Graeme: The change is happening a lot faster in Australia.

Malcolm: Well, you probably don't have the big agricultural institutions which govern how we farm.

Graeme: Perhaps, but I am inclined to think that cronyism is more the problem. I don't think the multinationals have progressed as far in Australia in terms of having the government in their pocket or the learning institutes so beholding to them. Unfortunately, we are heading down that path, but there is still hope.

Malcolm: The multinationals finance all of the institutions' research, and all of this grant money is what they survive on. They have got into a position where they can't antagonise the people they get the grants from.

Graeme: They can't bite the hand that feeds them.

Malcolm: Yes, they are caught between a rock and a hard place. Texas A & M is the big agricultural land grant college in the South - they get a certain amount of money for every acre of land that's in cultivation. They would like to go organic or nature-approved, but they can't afford it. Who would pay their wages? The other issue is that, for some of them, particularly the old-timers, it's very hard to say, *"I've been teaching it wrong and practicing it wrong for sixty years."* How do you do a 180-degree turn? It's very hard to do. They've got a lot of good research in drawers up there. At one point, they did a lot of research on coal - lignite, leonardite - it was good research. It works as a slow-release energy in the soil. They used local lignite, so it had good potential. When they put it in a drawer, I asked them why and they said, *"there was no industry out there supporting it, so why should we publish it?"* How can there be an industry to support it if they don't publish? The only way we can move forward is with conferences like this. Charles Walters doesn't push organics he promotes eco-agriculture. I push, *"Does nature approve?"* There are things that are really valuable that organics will never consider. I'll give you three examples. The first one is urea. There is a certain way you can use urea in small amounts, with humic acid and molasses, and

it's great! The microbes accept it the same way they do urine. The second thing is that we have to learn how to use bio-solids.

Graeme: What about the issue of heavy metals?

Malcolm: All of our food comes from our best farmland. It's the minerals and the nutrients and energy from our best farmland and it's being buried in the landfill. That's violating nature's law as far as you can violate them. The Asians have maintained soil fertility for forty centuries, because they use human waste. We've got to learn to keep it clean. We've got to learn to process it properly, because every community, every city in the world everywhere is making bio-solids. This is our best resource and we are locking it away from its natural cycle forever. We've got to learn to use it! Composting is the trick, but not with windrows. Windrow turners are a waste of time. You need static piles.

Graeme: That's a pretty controversial statement. At the moment, Elaine Ingham has had a big impact in Australia. There are many growers who have set up their windrows, and they are doing CO₂ monitoring and watering and checking temperatures. They are turning every day. It's a pretty intensive process and you're saying it's a waste of time.

“All of our food comes from our best farmland. It's the minerals and the nutrients and energy from our best farmland and it's being buried in the landfill. That's violating nature's law as far as you can violate them. The Asians have maintained soil fertility for forty centuries, because they use human waste. We've got to learn to keep it clean. We've got to learn to process it properly, because every community, every city in the world everywhere is making bio-solids.”

Malcolm: Have you ever seen nature make a windrow? I'll come back to that later. I'd like to talk more about the potential of composting bio-solids first. I like to compost for around six months. At one point, we sent off four of our composts to one of the leading universities, for analysis. After a couple of months, I got a call from the Professor friend who was organising the tests. He said, “Do you ever have any problems with insects in your compost piles?” and I said, “No, it gets too hot.” He told me that 28% of the microbes he had isolated were well known insect pathogens which keep troublesome insects under control. Then he called back a couple of months later and said, “you've got some valuable stuff in that compost,” and I said that I was always trying to tell people that. He said 18% of the microbes he had isolated were well known microbes in industry to degrade toxic materials. Even heavy metals can be neutralised by microbes. In California, some years ago, there was a problem where farmland was drawing into a dry lake and they found deformed animals around that lake bed. They know that something genetically toxic had caused the problem, so they tested the soil in that lake. In the first six inches, they found 700 ppm of selenium. At four parts per million, it's a necessary nutrient, but at these levels it was highly toxic. The Bureau of Land Reclamation said that the area had to be covered with two foot of topsoil, until a biologist suggested composting away the toxins. They decided to introduce truckloads of citrus pulp from the juice factories to the damaged soils and then tractors would till it

down to depth. Then they watched and monitored. The first thing that happened was that the microbes went to work on the selenium before they even started breaking down the pulp. It was as if they realised that this stuff was a problem and they had to reduce the levels. They had it charted out and they could show that, at the current rate, it would take ten years of in-ground composting to get down to the 4 ppm. At 4 ppm, the microbes leave it alone. That's nature at work. They couldn't figure where the selenium could be going, so they put a canopy over the area and tested the air. They found out that the microbes were taking the selenium and combining it with three other elements and dissipating it as a gas, which then settled out all over the earth and supplied selenium as a nutrient instead of a toxin. Isn't nature beautiful? My point is that you do the same thing with bio-solids, if you do it right, and that's not using windrows. You have to use static piles. I used to have a bio-solids permit. When I got it, they said to me, "Okay, Beck, we know you use static piles, but you gotta do windrows, because that's a proven method." I said, "No, I ain't!" They said, "Yes, you are!" and I said, "You ain't gonna stop me!" and I walked away. So I used three parts of ground up tree trimmings. I used a tub grinder to break it down to two-inch [approx 5 cm] pieces. Most of them use four to six-inch [approx 10 to 15 cm] pieces, but you need surface area. I used three parts of this with one part of bio-solids. Bio-solids come with 60 to 80% water. I blend it up real good. I push it onto a pile as high as the tractor, pick it up and drop it on. I don't drive on the pile, because that compresses it. I don't ever push it onto the pile - just run up to it and drop it on. This is the secret to it not going anaerobic - you blend it up first and then pile it up without pressure.

"That's nature at work. They couldn't figure where the selenium could be going, so they put a canopy over the area and tested the air. They found out that the microbes were taking the selenium and combining it with three other elements and dissipating it as a gas, which then settled out all over the earth and supplied selenium as a nutrient instead of a toxin. Isn't nature beautiful?"

Graeme: So the key to not going anaerobic is the particle size and the pile-building?

Malcolm: Yes, and I have never ever had the rotten egg smell Elaine talks about, and yet I have static piles that are thirteen foot [approx four metres] high. If I was to take a whole heap of old fruit or whole vegetables and put it into my pile without breaking it up, then I would go anaerobic. The proteins and sugars are sealed in the whole fruit, and it has to go anaerobic because it can't get any oxygen to it. If you grind this stuff up first, you never have any problems. In West Texas, just like in parts of Australia, you might get six inches of rain. In East Texas, you get sixty inches of rain. You can do static piles in either. In East Texas, you never have to worry about water, and as long as you've got the pile loose enough, it never goes anaerobic. If you are sitting in a hole, then you will have problems, because anything sitting in water will go anaerobic if it has a little bit of protein.

Graeme: What about leaching in high-rainfall areas?

Malcolm: If you got that big, big static pile, it absorbs all the rain, but in a windrow you get a lot of leaching. The bigger the pile, the more moisture it can hold, until it can

dissipate the moisture with its own heat. My main compost site is five acres and it drains towards the neighbours. As long as I kept the sites full of big static piles, there was never any run-off. When they clean up most of this compost, suddenly everything is running back into this guy's yard. Those big piles take it and release it real slow. The only problem I ever had was when we had 58 inches. One fall alone was ten inches, and then I had compost tea running out. If I had windrows out there, I'd have rivers running down between them - you have to make static piles as high as the tractor can reach.

Graeme: The main appeal of windrowing is the shorter production time...

Malcolm: My compost takes six months, and they can make theirs in six weeks with windrows. A windrow turner costs \$250,000. Remember, you only have one waiting period. We are bringing in 250 yards of waste material to compost six days a week. So I start to stagger all my piles. I don't have anything to sell for six months, but during that six month-period I just made myself \$250,000, because I didn't have to buy that compost turner.

Graeme: It's not just the cost of the turner, it's the labour, the machinery running costs and the fuel...

Malcolm: That's right - we buy a big loader that comes with a four-yard [approx 3.7 m] bucket and we increase it to a six- or seven-yard [approx 5.5 to 6.4 m] bucket, because the stuff we are handling weighs half of what sand, dirt and gravel weighs. So you save by buying a smaller tractor and enlarging its capacity. I do that in my own shop. I get some grader blades and weld them on the bottom, put quarter-inch [approx 6 mm] steel or half-inch steel [approx 13 mm] and weld it around the sides. You just make it a bigger scoop. If you have a good operator, it takes 35 feet [approx 10.7 m] to operate that tractor. You go into the pile, pick up a scoop and turn around behind you and dump it within 35 feet. Each time, you effectively move the whole pile 35 feet. I start the pile 130 feet [approx 40 m] away from my screen. By the time of the last turning, it's right at the screen. I never have to water it and it's never too wet.

Graeme: Do you do any monitoring or check temperatures or CO₂, any of the standard management practices recommended by Elaine Ingham?

Malcolm: No, no, no. When you turn a compost heap, you lose a lot of moisture. In a dry area, you can't afford to lose that moisture. Any bottles that are in there are getting broken up into little pieces. You break up styrofoam cups into little pieces too small to screen out. Now you've got glass and styrofoam in your compost. Anything from the stables and racetracks is full of that stuff. Every time you turn that pile, there goes your ammonia, there goes the carbon dioxide. You have lost nitrogen and carbon. You want that carbon dioxide to stay there and turn into carbonic acid. We need the carbon more than anything else. The atmosphere is already too full of carbon dioxide. One of the most polluting things in the world is windrow composting. You are loading the air with ammonia and carbon dioxide. Keep it in the pile and give the microbes time to mess with it. Isn't that common sense?

Graeme: It does make sense. Have you actually tested your compost with Elaine to see if it's as good as you think it is?

Malcolm: Yes, it has the perfect balance of fungi and bacteria. I just sold my company and the new people are trialing windrows. The fungi to bacteria ratio is way out of balance and there are no fungi.

Graeme: That's a big problem in windrow composting in Australia.

Malcolm: Well, think about it. Every time you go through with that windrow turner, you speed up the bacteria, but in the process you break up all the fungal mass. Now they gotta reorganise. Of course you'll have bacterial domination. How else could it be? When you get through with the windrow, you got a lot of hard wood that the fungi never got a chance to work on, and your nitrogen material is all dust. So you've got wood and dust. The dust blows away and you got hard wood. I never have any dust in my static piles, because the fungi have it all tied together. There is no dust in it, even when it's dry. Windrow composts - man, the wind blows that dust. The one time we do use windrows is in our Austin, Texas yard, when we are dealing with all-wood chips. We put this in windrows first, because it's all wood. Then we open up a little furrow in the windrow with the bucket, and every day we get two loads of table scraps from the prisons. It's nice and clean - no spoons or anything. We take these scraps and insert them in the wood chip windrow. When the windrow is full, we go through with a windrow turner and blend it all in. Then we get around a hundred big animal carcasses each - cows and horses. We dig a hole in that hot compost pile and we bury them in the windrow and cover them.

Graeme: You bury them whole, without even chopping them up?

Malcolm: That's right, and we go back through with a windrow turner in seven days time and there's nothing.

Graeme: What, the whole animal's gone in one week?!

Malcolm: Sometimes in as little as four or five days. The first guy that told me that, I said, "*You are crazy,*" but it happens. I watched a demonstration once after five days. Everyone gathered around the spot where the cow went in and there was nothing.

Graeme: Not even a skeleton?

Malcolm: Nothing! Sometimes you might find a horseshoe or a plastic ear tag.

Graeme: You wouldn't want to push your arm too deep into a pile that active...

Malcolm: What better way to use dead chickens, roadkill and things.

Graeme: The large poultry farms have huge numbers of dead chickens.

Malcolm: I've seen chickens disappear in three days. You are right - you don't stick your hand in there or you'll draw back with bare bones [laughs].

Graeme: I guess I'd better start on some of my prepared questions now. I noticed in your CV that you've researched the use of natural phosphates in alkaline soils. Conventional wisdom would suggest that you are wasting your time in alkaline soils, as you need acidity to get release. What were your findings?

Malcolm: I found that, if you know how to use it, you can double production. I was using soft rock and hard rock. The trick is to band the natural phosphate right under the plant. Phosphate is made available by microbial activity. The roots are growing right in

the stuff, and the carbonic acids from the plants and the microbes crowded around the roots are making the phosphate available. I increased production in tomatoes by 112% using this technique.

Graeme: Did you use it in granular form or as a powder?

Malcolm: I used it as a powder.

Graeme: What machinery did you use to band it? That's the big problem usually.

Malcolm: In the trials, I applied it by hand, but you could design a planter box to do it. In the trials, I also broadcast it using a belt-spreader and got only a 5% production increase. Banding is the key.

Graeme: Did you mix compost with it?

Malcolm: Not directly, but the soil had had compost and a cover crop.

Graeme: We market soft rock phosphate in Australia. Do you think compost should be blended with it?

Malcolm: It becomes a completely different product with compost or humates added to give the microbes an energy source.

Graeme: I see that you produce 250,000 yards [228,600 metres] of compost a year. Is that mainly for the home market?

Malcolm: Yes, it is. Agriculture hasn't really discovered the stuff. A lot of them think you need twenty tons an acre [approx 50 tonnes per hectare] to do any good. Research has shown that, if you band it on the row in horticulture, the most productive rate is two tons per acre [approx 5 tonnes per hectare]. There is not much gain in applying much more than this. It's not cost-effective for the small gains you get. In that same trial they mixed trace elements and other things that were needed with the compost, and it worked beautifully. When you mix chemical fertilisers with compost, you have a powerful, natural fertiliser. It might not be organic as such, but nature accepts it. She approves, so let's do it.

Graeme: That's exactly what we do in all of our prescription blends and we have had great results for years.

Malcolm: You need the carbon, you need the energy, you need the structure, you need the microbial activity and you need the minerals. I don't care if they come out of a bag.

Graeme: All fertilisers work better in a compost base.

Malcolm: That's because, when you throw the compost in, there you throw the life in with it.

Graeme: Yes, it's a living fertiliser - that's the key. Your Gardenville company has a reputation as an innovator. Can you tell me about some of the new things you've come up with?

Malcolm: Me and my wife and kids have come up with forty-four things that didn't exist before in agriculture. A lot of these are composting techniques and tools. We found out that you can use ashes. We came up with new spreading tools, we learnt how

to control insects with other insects. There is no end of things you can come up with if you think outside the box. You have to understand nature and understand how she works and then you lay awake at night in bed and all these ideas come rolling in. Knowledge is universal, it doesn't belong to anyone. All you have to do is tune into nature. But you have to relax and not think you're a smart Alec and know-it-all. You just tune into nature and think. But you have to live clean, you can't be mad at anybody, you can't be bitter. One other thing - you can't do it on your own. I've been with my wife for forty-four years, and without her I couldn't have done nothing. You need that support system. A man is only half a person unless you've got a good woman. If you've got a bad woman, you're only a quarter of a person [laughs]. It's so simple to make a marriage work. You do everything you can do to please her and she does everything she can do to please you.

“There is no end of things you can come up with if you think outside the box. You have to understand nature and understand how she works and then you lay awake at night in bed and all these ideas come rolling in. Knowledge is universal, it doesn't belong to anyone. All you have to do is tune into nature. But you have to relax and not think you're a smart Alec and know-it-all. You just tune into nature and think.”

Graeme: One of the biggest issues confronting conventional growers contemplating organics is the problem of chemical-free weed control. We've been able to develop solutions for every other problem, but we are yet to discover a cost-effective, chemical-free herbicide. Are you aware of any new developments here?

Malcolm: If the weed is a true weed, then it will gradually disappear when you balance the soil. However, in Texas we have a forage crop that's our biggest weed. It's called Johnson Grass. It's a high protein forage crop. The richer you make the soil, the better it grows. It has deep rhizomes. It's really difficult to control this plant mechanically. It uses huge amounts of energy. This is a case of “*does nature approve?*” I just about wore out a tractor trying to control this plant when it would have been so easy with glyphosate applied at the right time. Sometimes you have to weigh things up. I talked to Elaine Ingham about what happens to glyphosate and she said that the bacteria eat it right up as long as you still have the life in your soil. The warmth of the soil is also important. It only takes three days in a good Texas soil to get rid of Roundup, but it can take up to 18 months in Canada, where the soils are cold. I also talked to Dr Don Marks. He was the first guy to really do a lot of research on mycorrhizal fungi. He has won all kinds of awards for his work. I asked him, “*If I was trying to protect my mycorrhizal fungi, would you rather me fight the Johnson Grass with a plough or herbicide?*” He said, “*When you plough, you destroy the host and you tear the mycorrhizal fungi apart before they get a chance to spore. When you use glyphosate as soon as that plant stops photosynthesising and not delivering sugars to the fungi, it immediately puts out spores.*” You think about it, which would nature approve? Me, putting all that carbon dioxide into the air, wearing out a tractor, oxidising all of that carbon from the soil or using a little glyphosate in the right way? Forget organics - let's look at nature. If you have to use glyphosate, use it at night to avoid drift with the thermal rise

in the morning. I use an ounce [approx 30 grams] of molasses per gallon [approx 3.8 litres] of mix. It acts as a sticker but it also provides energy for the microbes to break down the glyphosate.

Graeme: We have a similar pragmatic approach. We get great results combining fulvic acid with glyphosate. It is a very small molecule with a CEC of 1400. It complexes with the glyphosate and enters the plant more rapidly. Fulvic acid is a powerful bacterial stimulant, and the bacteria converge on the fulvic and in the process devour the glyphosate enclosed within. I call it the ‘honeypot effect’. You can reduce glyphosate rates due to the improved uptake and it’s out of your soil in a very short time.

“I’ve been with my wife for forty-four years, and without her I couldn’t have done nothing. You need that support system. A man is only half a person unless you’ve got a good woman. If you’ve got a bad woman, you’re only a quarter of a person [laughs]. It’s so simple to make a marriage work. You do everything you can do to please her and she does everything she can do to please you.”

Malcolm: You’re my buddy! Most of the purists won’t even look at some of these alternatives. If it’s a chemical, it must be all bad. It’s not necessarily the case.

Graeme: So you don’t know any non-chemical options for the organic growers?

Malcolm: Yes, there is one. It’s glacial acetic acid.

Graeme: You mean vinegar?

Malcolm: This is 98% acetic acid. The microbes can only build up a certain percentage of acetic acid in the fermentation process, then they can’t work with it any longer. It’s commercially distilled or concentrated in some way to build the strength. You dilute this material with three parts water to one part acetic acid. This gives you a 20-% strength acetic acid. It has to be a clean, filtered water. Acetic acid is considered an inert material. It’s not going to do any harm. However, you have to have an active [for certification], so I add citric acid. Citric acid is on the active ingredient list. I got it approved as an organic herbicide!

Graeme: At those kind of dilutions, the acetic acid is not really cost-effective, though, is it?

Malcolm: Well, this stuff costs about \$4 [US] a gallon if you buy enough of it. You dilute it down so it costs about \$1 [US] a gallon. It’s economical if you come in when the weeds are really small - it knocks them out. If you let those weeds get up, then forget it. There is no way you can afford it. The good news about this stuff, though, is that it doesn’t hurt one-year old wood. I was looking for something non-chemical to prune my grapevines. That’s when I found out it didn’t hurt one-year old wood. That acetic acid burns them right off and it kills all the weeds.

Graeme: Have you had any experience with metarhizium?

Malcolm: No, I’m not familiar with that.

Graeme: We work with it - it's a fungal species that attacks and destroys a huge range of insects. It causes a highly contagious disease called Muscadine disease, which can wipe out an entire problem species.

Malcolm: I once developed a type of compost tea, which was really effective against a whole range of insects. Maybe it contained something like this.

Graeme: How did you formulate it?

“Let me tell you the lessons of life. First of all, you’ve got to keep yourself healthy, whatever you do. You can’t do anything if you are not healthy. Secondly, you have to do what you like to do. Everyone’s got a god-given talent. Then the next thing is to study, not necessarily reading books, though. Talk to people, ask questions, listen to the answers - study.”

Malcolm: I made it for sweet potato white fly in the Rio Grande Valley. I used molasses, liquid seaweed and humic acid and then I took the leachates out of bat guano. I had to drop the pH with phosphate to keep it stable. I sent it down there with an agent and they sprayed it on twenty acres on Sunday night. On Monday morning, the agent rang me so excited, he could hardly talk. He said, “*Malcolm, this is the cleanest field in the whole valley!*” The agent was going to sell the stuff for me, but he went cold after pressure from the big chemical companies. Everyone who tried that product had the same results, but it never came to anything. It worked really well in citrus. The trick was to use about an ounce per gallon [approx 30 ml per 3.8 litres], but you need a lot of water - about 500 gallons per acre [approx 9500 litres per hectare]- to get good coverage on the trees. Put molasses, humic acid and liquid seaweed with a good compost tea and see what happens.

Graeme: You are well aware of the link between soil health and human health, but you have taken the argument further than most. You suggest that poor nutrition limits the intellectual capacity required to develop a harmonic existence with one’s environment. Can you please elaborate on this idea?

“I wrote an article on this. It’s called ‘Food for Thought’. The study of history and civilisation shows that those who took care of the soil survived, while those who mistreated the soil didn’t.”

Malcolm: I wrote an article on this. It’s called ‘Food for Thought’. The study of history and civilisation shows that those who took care of the soil survived, while those who mistreated the soil didn’t. I watched my own five kids who had good nutrition. They never whined or grizzled, they had good grades, they were never any problem. They were never sick! They could roam in the woods and the insects didn’t bite them. My sister would visit - her kids were always whining and sick. If they went outside, the insects would eat them alive. As the quality of the soil falls, so does the quality of the life it supports - it’s that simple. If you let the soil degrade, the life it supports will degrade to the same extent - that includes plants, animals and humans. The problem is

that, as that degradation advances, you lose the ability to think logically. I see so many highly educated people in our society who can't think logically. Life is so simple, it's just common sense. Let me tell you the lessons of life. First of all, you've got to keep yourself healthy, whatever you do. You can't do anything if you are not healthy. Secondly, you have to do what you like to do. Everyone's got a god-given talent. Then the next thing is to study, not necessarily reading books, though. Talk to people, ask questions, listen to the answers - study. Talk to experts or talk to anybody - if you listen, everyone has something to offer. Finally, you have to ask God for help. Look - nature is a master design - it's not accidental. If you ask for help, you have to believe you're going to get it. You have to have faith. The next thing to realise is that you will get it and succeed. You may not get it when you want it or how you want it, but you will get something. You may get something better than what you asked for, but that help will come. And, finally, if you ask for something from someone, you always say thanks or he isn't going to give it to you next time. You don't have to get down on your knees and pray, just talk to him like he was your Dad.

Graeme: Thanks for the tips - what a nice philosophy! I have some other questions here. You quote some fascinating research highlighting animal response to the level of processed food in their diet. Can you tell us about this?

Malcolm: Well, there was this dairy farmer who noticed the link between food and herd health, so he decided to go back to his soil and fix that up first. Pretty soon he was helping his neighbours and none of them hardly needed the vets anymore. Then he was asked to teach a course in soil and animal nutrition down at A & I at Kingsville - there's a little college there. At one point, he made a statement to his students that half of the food on the supermarket shelf is not fit to eat. The students were upset and challenged him, so he agreed to set up a trial. He used college pigeons. One group was fed polished white rice and the other brown rice. He predicted in advance that the white rice group would be prone to five different degenerative diseases. Sure enough, the trial results came in and he was dead right. However, there was a surprise no one expected. In the pigeons with the white rice, at the very first sign of malnutrition, the birds became irritable. That made me think. We had always bought wholewheat bread from the health store. I wouldn't eat that white bread stuff. I decided to take six of my own baby chickens, separate them and feed them different diets. One group got only white bread and water and the other group got the wholewheat bread and water. On the thirteenth day, the first of the white bread group was dead and on the seventeenth day, the last of them was dead. The wholewheat group was fine and went on to become good layers. I watched these groups closely. At the first sign of malnutrition, the animals were discontented and irritable. Doesn't that tell you something about our society?

Graeme: I think it does.

Malcolm: I repeated that test recently, thirty years after the first test. This time, the white bread group didn't die - they weren't well, but they didn't die, because white bread is now enriched with vitamins and minerals. The problem was that the wholewheat group didn't do as well as last time. It reflects ongoing soil degradation - it frightened the hell out of me!

Graeme: I think it probably also reflects the toxins that are in the wheat, which weren't so prevalent thirty years ago.

Malcolm: You're probably right. I wouldn't want to bring any children into this world today.

Graeme: Don't go all negative on me now. We have five children and one of them is only five years old. I always like to stay positive, you bastard [laughing].

Malcolm: Think about it. Our soil has gone to hell. Our air is full of carbon dioxide. Seven thousand square miles of the Gulf of Mexico is dead, due to nitrate poisoning.

Graeme: Getting back to positive solutions - in your article on carbon dioxide you suggested that an increase of 1% in organic matter in US croplands alone could account for 50% of the eight billion tonnes of carbon dioxide produced in the world each year. What would you consider the most productive approach to build that 1% of organic matter on a large scale?

Malcolm: There is only one way we can do it. We have to stop ploughing. It's the only way. When we plough, we're oxidising the organic matter, turning it into carbon dioxide. We're tearing up the mycorrhizal fungi. I heard a guy speak once, who had been commissioned by the President to study the effect of the automobile on the environment. The recommendation of the study was that, if we could increase the organic carbon content of our farmlands by one tenth of one percent every year, we could take all that excess carbon out of the air and put it back in the soil, but he didn't know how to do that. Nobody came up with any ideas. You can't use compost, because you're just taking carbon from here and putting it over there. We need to take it out of the air and put it in the soil. Joe Bradford, with the USDA down at the Rio Grande Valley, has been studying no-till agriculture for twenty-seven years. He has farmers in South Texas' dry areas taking money to the bank while their neighbour across the fence might have a complete crop failure. They are doing complete no-till. They let everything lay on top of the ground and then they use a coulter to open up the seed bed. You've got mulch, water retention, composting at the soil level. You've got earthworms feeding on the mulch. When it rains, all the water now stays out there when it used to run off. It can't evaporate either. When they used to keep the soil bare, the wind would sandblast the young crops. Sometimes they would have to replant. Nitrates are less likely to run off the fields into the waterways. Any pesticide is held there. All of that microbial activity beneath the mulch can break down those pesticide residues. No-till can be a fantastic thing.

Graeme: There are problems with complete no-till. How do you correct the natural stratification of nutrients, which happens over time if you can never plough? I prefer minimum-till.

Malcolm: I don't mean never plough. You're quite right. I guess I'm talking about minimum-till. If you have to work the soil in anyway, you do it when it's dry. Then you don't disturb the microbes or oxidise the carbon to the same extent. It shatters the soil. There are drawbacks, but if you want to make it work, this conservation tillage, then you can do it successfully. I asked Dr Bradford about what's happening to the organic matter in no-till or minimum-till. He told me that the farmers he had been working with had lifted their organic carbon figures from 0.7% to 1.5% in eight years. He has been achieving the 0.1 of 1% that is required.

Graeme: One other important link to carbon dioxide - you have suggested that there is reduced transpiration as CO₂ emissions from the soil increase. How important is this biological link to water conservation?

Malcolm: NASA scientists were studying global warming and they found out that, when there was a lot of carbon dioxide in the air, the stomata don't stay open for very long. When the stomata is open, the plant is pumping moisture from the soil through transpiration. Carbon dioxide is exuded from the roots and the microbes and it floats up and is absorbed by the stomata on the underside of the leaf. When a lot of carbon dioxide is coming from microbes, then the plant opens up, gets a load and then quickly closes again. The plant will transpire to the air 99% of the water it takes out of the soil. If you can get it to transpire 10% less, think of all the water you will save.

Graeme: We have been promoting a photosynthesis emphasis in all of our education work. No one seems to talk about photosynthesis and chlorophyll management, and yet these are the most important things in crop management. 95% of the plant comes from photosynthesis. These are Don Schriefer's figures. If you burn 100 kg of plant matter, you will have 5 kg of ash. That ash is the 5% minerals.

Malcolm: And photosynthesis doesn't happen without carbon dioxide coming from microbes in the soil.

Graeme: Yes, everyone is a biological farmer, in effect, whether or not they admit it. I'd like to ask a couple of questions about composting now. How important do you consider the Lübke idea of including 10% clay with the compost to build a stable clay/humus crumb?

“Carbon dioxide is exuded from the roots and the microbes and it floats up and is absorbed by the stomata on the underside of the leaf. When a lot of carbon dioxide is coming from microbes, then the plant opens up, gets a load and then quickly closes again. The plant will transpire to the air 99% of the water it takes out of the soil. If you can get it to transpire 10% less, think of all the water you will save.”

Malcolm: I love it. It's more than just the stability of the compost - remember that clay has a very high cation exchange capacity and ammonia is a cation. It's a great way to retain nitrogen in your compost.

Graeme: In your book, 'The Secret Life of Compost', you refer to the 'Law of Return'. I like that concept. In this context, the recycling movement simply mirrors the natural solution where there is no waste and everything is reused. Why do you believe that we have failed as a society to abide by such an obviously important law?

Malcolm: Bad colleges and chemicals have played a big role. William Albrecht used to say, "Throw the books away and study nature." Nature recycles everything. Nothing escapes, everything is recycled. It's that simple.

Graeme: How can we practically encourage this recycling, particularly in terms of composting and carbon building?

Malcolm: 38% of farmers' income in the US is government subsidies. The governments are paying them to destroy the soil in a lot of cases. If they paid them based on the amount of organic matter they had built into the soil, wouldn't that make more sense? Pay them x number of dollars for every increase of a tenth of one percent. When you have built up one full percent, you get a pat on the back and your name in the paper.

Graeme: That's a good, simple idea. We all promote the idea that plant health influences pest and disease pressure. Can you relate some of your experiences of this phenomenon?

Malcolm: Okay, understand this - everything is dependent on plant life. If it hadn't been for the destructive insects seeking out and destroying the weak and the sick in the plant kingdom, we couldn't be here. The plant world would have degenerated away without the insects to clean up the rubbish and allow the strong to survive and breed. These insects are incredibly important, because they tell us when something is wrong with the plant. Every insect has something to tell us, but you have to study nature, just like Albrecht said. You have to understand what they are trying to tell you.

Graeme: I agree. Brix levels can also be a reliable indicator of plant health and pest pressure. How important is the role of humus in terms of brix levels? Brix is often considered in terms of relative mineral levels rather than humus.

Malcolm: You can put the minerals there but if you don't have the microbes or energy for the microbes, you're not going to do much good. First you have to concentrate on the life in the soil - the energy in the soil - then the minerals.

“Okay, understand this - everything is dependent on plant life. If it hadn't been for the destructive insects seeking out and destroying the weak and the sick in the plant kingdom, we couldn't be here. The plant world would have degenerated away without the insects to clean up the rubbish and allow the strong to survive and breed. These insects are incredibly important, because they tell us when something is wrong with the plant.”

Graeme: Is there a place for foliar fertilising in your system when your emphasis is all about soil building?

Malcolm: Yes, definitely. If you have a mineral deficiency, foliar feeding will turn that plant around faster than anything else you can do. You are treating symptoms, though, and at some point you need to look for the cause.

Graeme: How does vermicompost compare to conventional compost, in your opinion?

Malcolm: I have a good microscope connected to a large screen. I can put wormcastings under that microscope and you can hardly believe your eyes. Those castings are at least ten times more biologically active than compost. You see so much stuff on that screen that you will never see in compost. Earthworms kill off destructive microbes in their gut. They are magic creatures.

Graeme: What is the mechanism by which healthy soil determines the quality of the water we drink and the air we breathe?

Malcolm: If you have a good, healthy soil and the rain falls on it. The microbes have already detoxified the soil. They have used up the nitrates and they have neutralised the heavy metals. As the water filters through, it acts like a carbon filter. By the time it gets past the root zone, it's clean. This only works in a healthy soil, it won't work in a dead soil. When air is taken into the soil through diffusion and utilised by the plant, the by-product is carbon dioxide. This gas is, in turn, used for photosynthesis, from which the byproduct is oxygen. Air is detoxified after passing through a healthy plant. Once again, this can only happen in a healthy soil. There is a book by Bill Wolverton, called 'Growing Fresh Water', which covers this whole thing.

Graeme: Have you had much experience with the use of raw humates - lignite coal in agriculture?

Malcolm: Yes, there was a guy I knew, named Dr Porter, who used to produce a fantastic fertiliser. He used to say that it contained secret microbes from the Amazon, but that was just marketing. I knew his employees and there was definitely no microbial inoculum used. He took lignite and put a pinch of urea in there. Then he added a lot of animal protein, like bonemeal and a lot of vegetable protein, like cottonseed meal. He would add rock phosphate or trace elements if you needed them. This stuff worked miracles. The urea was in there to jump-start the microbes who then went to work on the proteins, then the raw humic acid. If lime or phosphate was needed, then it could be solubilised in this mix when it hit the soil. He didn't compost this stuff. The action happened when it hit the soil.

Graeme: Sounds very similar to our Life-Force™ program. We use basalt, soft rock and lignite and activate the blend with microbes.

Malcolm: That would work well, too. See, this Dr Porter had learned how to use urea, which wasn't accepted by organics. But the microbes will accept it if you use it right.

Graeme: Have you had much experience with the use of paramagnetic basalt dust as a fertiliser?

Malcolm: Yes, I've never used this stuff anywhere where it didn't show some benefit, but it's best if you mix it with compost or humates. I have a product called Volcanite. The minerals are slow-release in rock dust, so you never get out of balance. It might be different with micronised basalt - you would use much less.

Graeme: Yes, we do a liquid, micronised basalt and it's applied at around twenty litres per hectare, with good results.

Graeme: Can we consistently produce high-yielding crops by just stimulating and feeding Azotobacter in the soil without the need for commercial nitrogen?

Malcolm: Yes, we can, but it's a moot point. I don't like nitrates, but urea has a role to play. If it's used right, nature approves! All nitrogen in nature is tied up into protein. When the microbes go to work on a protein, the first release is ammonia. Then it takes on hydrogen ions and becomes ammonium, then microbes make nitrites and then ni-

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trates. We can put the ammonia out there with urea or animal manures or a combination.

Graeme: Thank you for the interview. We will have to get you out to Australia sometime, to spread some of your wonderful common sense. Would you be interested in coming?

Malcolm: Why, hell, yes! I've always wanted to go to Australia!

BOB SHAFFER

Interview recorded December 2002



Bob Shaffer is a highly regarded horticulture consultant working mainly in California, Oregon and Hawaii, with crops including table grapes, wine grapes, rice, numerous vegetable and herb crops, stonefruit and nut crops. In Hawaii, his emphasis is on coffee, pineapples, bananas and ginger. He has recently purchased a farm in Hawaii, which will become a research centre for sustainable agriculture. Bob began his career as an organic farmer with a passion for compost making. He became fascinated with understanding the science behind this process and, as his knowledge grew, so did the demand for his advice. This growing demand eventually culminated in a new career as a crop consultant, beginning in 1989. Bob's thirst for knowledge and ongoing love of research have helped to promote his career to the point that he has become a leading, hands-on problem-solver in the burgeoning field of sustainable agriculture. Bob's presence as a speaker at the 2002 Acres USA Conference in Indianapolis represented a much needed boost in high-quality horticultural advice at a conference sometimes dominated by broadacre and pasture issues. This interview contains some of the best practical advice I have encountered during my info-seeking tours of the world. I trust that you will enjoy the learning experience.

Graeme: I was interested in your seminar comment that “*rock phosphates ain't rock phosphates*” but rather that their response is determined by the particular crystalline structure of the rock phosphate in relation to specific soil types. Most people assume that mineral analysis is the chief determinant when selecting a natural phosphate, but you are saying otherwise. Could you please elaborate?

Bob: That's a good question, because rock phosphate is such a critical material in sustainable agriculture. As I have studied this material over the years, I have found that the terms ‘soft rock phosphate’ and ‘hard rock phosphate’ are very confusing. These are mining terms and we should be looking more toward the dissolvability - the solubility of the actual crystalline structure that the phosphate is captured in. If you check out the agricultural databases - and Australia has done a lot of work in this area - you will find that there are different solubilities, depending on what crystal is found in the mineral that contains the phosphate. At a given particle size, there is a marked difference in relative solubility. Dissolvability is linked to three things: The actual crystal that is involved - the size of the grind or fineness of the material and the soil to which the phosphate is introduced. It needs to be applied to a living soil in an integrated manner. Many of the trials that have questioned the availability of rock phosphate were actually trials where numbers one and two were taken care of, but they put the material onto a sterile soil - without using compost or cover crops. They concluded that the trial material was insoluble. I find that it is quite soluble, or at least soluble enough. I don't want it too soluble, or else it will get away from me.

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Graeme: The traditional belief in sustainable agriculture circles has been that soft rock phosphate is a clay-based material which is much more available than a hard rock phosphate or reactive rock phosphate. What's your opinion?

Bob: I don't necessarily agree with this. We should look at the crystalline structure and then use solubility studies to determine availability.

Graeme: But the argument with soft rock is based on the fact that it is a lot easier for microbes to chew up a fine, clay-based material than it is to chomp on a rock.

Bob: You're right - biology plays a huge role here. Materials like compost, humates, sugar and cover crop residues are important catalysts. The fact is that, if we had a completely sterile soil, rock phosphate would simply never be available - of course, complete sterility is not possible. A lot of farmers say, *"I don't want to use rock phosphate, because it becomes available so slowly,"* so instead they use triple superphosphate. This super-soluble material releases phosphate immediately, which then bonds with calcium and becomes insoluble. Which direction would you prefer to be heading in - slow release or rapid lockup?

Graeme: The more astute grower could argue that his triple super gave him the best of both worlds. He gets complete solubility at planting and then, as the majority of the material locks up with calcium to form insoluble tri-calcium phosphate, he gets a second bite at a slow-release cherry (remembering that rock phosphate is tri-calcium phosphate). There's a flaw in this logic, though, isn't there?

Bob: Yes, there is. The tri-calcium phosphate, which forms as a result of calcium combining with soluble phosphates, is actually a lot more insoluble than the original rock phosphate parent material.

"A lot of farmers say, "I don't want to use rock phosphate, because it becomes available so slowly," so instead they use triple superphosphate. This super-soluble material releases phosphate immediately, which then bonds with calcium and becomes insoluble. Which direction would you prefer to be heading in - slow release or rapid lockup?"

Graeme: Is there a relationship between how well a rock phosphate works and the clay characteristics of the soil?

Bob: Yes, there is. Soils that contain a clay species like vermiculite or smectite, are very fine grained and tend to hydrate with water and reduce their pore space. As a result, they reduce the entry of oxygen. Beneficial soil life is aerobic - oxygen-dependent. In these soils, where the biology is compromised, so is the potential to release rock phosphate.

Graeme: And arguably these tight, closed soils are often very alkaline, which further reduces the chemical release of phosphate.

Bob: Yes, good point.

Graeme: You’ve worked extensively with compost and compost teas, in an effort to create what you term a ‘disease-suppressive’ soil vs. a ‘disease-conductive’ soil. I love these terms - are they your own?

Bob: No. I wish they were, because they’re beautiful, but they’re very much attached to soil science literature. A disease-conductive soil is a soil that has poor mineral balance, low organic matter and has a less diverse, less active microbial biomass. These are the conditions under which plants succumb to diseases. The soil foodweb or the living microbial biomass, as I prefer to call it, performs seven functions in the soil. One of these is disease suppression, which is unobtainable any other way. There is no product, there is no technology, there is no tool we can buy that replaces the compounds and the chemical and physical effect in the soil that microbes perform. The University of California did a beautiful study not long ago on phylloxera. Phylloxera, of course, is the louse-like insect originating from the Eastern United States, which attacks the grapevine roots. They were trying to find out if a disease-suppressive soil would be beneficial to vineyards affected by phylloxera. They found out that, although phylloxera was obviously a problem, the far more severe problem that affects the phylloxera-attacked vines are the secondary pathogens. These include pythium, phytophthora and rhizoctonia, which enter the wounds made by phylloxera. This is the work of Don Lotter and Prof Jeffrey Granett, PhD from the University of California Davis. They found out that, by applying compost and cover crops, they still had the same number of phylloxera on the roots but there was less damage and more productivity. The disease-suppressive soil was able to hold down the secondary infections. A simple analogy is that, if I cut my finger, it’s unpleasant, but if I pick up a secondary infection I could die. It is the active biomass which reduced this possibility in the soil.

“A disease-conductive soil is a soil that has poor mineral balance, low organic matter and has a less diverse, less active microbial biomass. These are the conditions under which plants succumb to diseases.”... “There is no product, there is no technology, there is no tool we can buy that replaces the compounds and the chemical and physical effect in the soil that microbes perform.”

Graeme: That’s good. I particularly like the emphasis on the fact that this is something you can’t buy.

Bob: No, you can’t buy it. You can buy products to help, though, and I prefer these to be non-refined where possible.

Graeme: How has the compost tea concept been performing? Has it been a success in the field?

Bob: In the 70s, when I had my first organic farm, the only tools we really knew how to use were hand-pulling of weeds, building compost and making compost tea. It was a natural process to think that we could take our compost and add it to water and then apply it to the soils. It was far more convenient when we couldn’t get out and apply compost. We could see the greening effect and increased growth within three days.

Graeme: Did you apply the tea to the soil or the leaf?

Bob: It was the soil rather than the leaf. We really didn't know about the leaf. For most of my clients right now I say, "Let's build compost tea - let's teach ourselves how to do it." They need to learn this for themselves. Let's build a good compost inoculum and apply the tea through fertigation onto the soil. When we have really learnt the craft, then we can spray it on the leaf. It's much safer to spray on the ground if you haven't got it right.

Graeme: Yes, it can be quite phytotoxic if it's a poor tea. We have developed an approach in Australia, which we call MEND™, which is an acronym for Microbially Enhanced Nutrient Delivery. The essence of this approach is the increased nutrient uptake, which microbes facilitate. In the case of foliar-applied compost tea, there is a phenomenon at work where billions of new microbes on the leaf, release carbon-dioxide which stimulates the stomata to dilate, to absorb the CO₂ for photosynthesis. If we apply nutrients with that compost tea, we can take advantage of this increased absorption capacity. We never apply a compost tea as a stand-alone. It is always attached to a nutrient and we find that we can reduce the amount of fertiliser applied by as much as 90%. We don't seem to see many American consultants utilising this nutrient-assist function...

Bob: Well, you've met one here. We never apply compost tea by itself. I've worked a lot with Brad Biehl from King Estate Winery in Oregon. We had similar needs in terms of applying a lot of materials at once. We've found that, as long as we don't osmotically shock the microbes with too much salt in the water, we can apply many materials with the compost tea and still have a viable tea. From a mineral perspective, there is also a chelation effect. I like to use foliar early in the season for best effect. The pollen is the first thing that we ripen in the springtime, and this is a management issue in itself. Boron and calcium are critical to the ripening of the pollen grains and the establishment of the pollen tube. Once the pollen lands on the stigma and starts to grow through the style toward the ovary, it only has about half an hour. If boron levels are not high enough, you can't get the pollen tube to grow and that individual fruit won't form. Boron is needed at as much as ten times more than normal in the growing pollen tube area. In apples, for example, the boron requirement in the leaf is 35 to 50 ppm. The problem is that the phloem in the leaf doesn't translocate the boron over to the reproductive parts. Not only are both calcium and boron poorly translocated, but also the requirement for both goes up during the reproductive cell-division stage. Leaf analysis does not measure this poor translocation. The solution to this problem is to foliar-spray boron and calcium directly onto the parts where they are needed.

Graeme: We have a standard policy that it doesn't matter what crop it is, we advise a boron spray prior to flowering. Do you think calcium should always be recommended with this boron application?

Bob: Yes, I think it's a good idea if you want to set maximum fruit. I try to get two sprays of both in before flowering and usually another just after.

Graeme: What sorts of materials do you use?

Bob: Well, typically I'll use an amino-chelated calcium, involving perhaps twenty to thirty ounces of chelated calcium per acre [approx 1.5 to 2.5 litres per hectare].

Graeme: We would typically use a soluble boron like Solubor at 1 kg per hectare.

Bob: Yes, that's about right. That's about a pound per acre. We include fifty to one hundred gallons [approx 500 to 1000 litres per hectare] of water and a little sugar. The best thing here is to add some humates, some seaweed and, of course, the compost tea. This is a recipe that works well. My exact recipe, which I apply to thousands of acres in the spring, is this: Twice before flowering I'll use four ounces of soluble seaweed powder, combined with a few ounces of a humate material which includes humic, fulvic and ulmic acid, and I'll include a pound of sugar [Metric conversion is roughly 300 g of seaweed powder per hectare, 300 ml of humic acid and around 1.2 kg of sugar]. You must remember that, if you are working with grapevines, as they approach flowering and petal desiccation and you have any threat of botrytis, then don't apply the sugar. The sugar can actually stimulate the germination of the botrytis spores. To these ingredients I'll add the pound of boron and a quart of calcium [1 kg of Solubor and 2.5 litres of chelated calcium per hectare] and I might add just a touch of phosphate - fish for organic or MAP for conventional. I'll also add a touch of aqua ammonia. I don't use large amounts of anything. In my opinion, the foliar approach at this time is not about supplying large amounts of nutrition, it's about stimulation - stimulating a reproductive response and improving the flower to fruit ratio. I tend to have less focus on foliar later in the season, unless they are needed as problem-solvers.

Graeme: Can you clarify your exact timing for these pre-bloom foliar?

Bob: Well, the first spray is not pre-bloom. As soon as there is enough leaf surface in springtime, I like to apply my first foliar. Often, the roots have not fully activated in the cold temperatures, so the foliar can help compensate for this. Also, the young, tender foliage is particularly receptive to foliar nutrients, and the response can be exceptional. The second spray will come about ten days before antithesis. If I'm running late, I'll go and spray right during bloom. As long as you are not mechanically blowing off the pollen or the flower itself, there is no problem with this. There is a folklore that you should do nothing during bloom, but you need the boron to stop fruit drop and you can get away with late applications if there is no choice.

Graeme: What is the timing for the third spray?

Bob: I'm going to wait until after I have a small fruit set, which happens quite rapidly after antithesis. The third spray is really only days after the second. On grapes and many other crops we get shatter. All plants appear to have a genetic, built-in time bomb that shatters them. We have definitely been successful in getting better petiole attachment to the young berries with this foliar approach. The benefits of this foliar approach are further magnified during bad weather. On rice, for example, hot weather causes blank grains. The pollen can't operate at high temperatures. We'll call helicopters and planes out on large acreages to foliar-spray this recipe and ensure that we're getting the best leverage we can against this poor weather.

Graeme: The young fruit, cell-division stage is where we really focus on foliar calcium in all crops.

Bob: The non-ability of calcium to translocate through the phloem in most plants is always a problem.

Graeme: You suggested that you reduce your foliar emphasis during the fruit-filling stage. We have also had great results from calcium sprays later in the season.

Bob: It's true, particularly for apples. I've seen apple growers who were geniuses with calcium right through the season. I'm just saying that the greatest stimulation is early. If you need correctives later, then of course you carry your program on.

Graeme: You mentioned rice earlier. What sort of results have you achieved using foliar in rice?

Bob: Well, we use a similar approach, even though the rice physiology is a little different. Once again, we're trying to support the early growth of the plant and then make sure that we're ripening pollen grains. Eight years ago, I worked with Josiassen Farms. Curt Josiassen had farmed all his life, having inherited the farm from his father. There were some major mineral corrections required, so I asked him why he wanted to embark on such a costly project. Curt wanted better nutrition in his rice. He wanted to sell into a niche market, with high nutrition. I was very excited and we set into the program. We started out with very heavy soils, 50/50 smectite and vermiculite, with a small percentage of kaolin. They were difficult soils, which cracked very wide and very deep. These soils hadn't been limed in eighty years, and the University of California had advised the rice growers against liming, because the pH was mild at 5.5. I believe that we had to increase the calcium base saturation and reduce magnesium levels so that we could get more flocculation and more air into the system. After all, we are in a flooded system. The cultural practice in Sacramento Valley didn't involve liming. Growers were unaware that there was a difference between pH and calcium and magnesium levels. They had never used foliar sprays and they had typically used urea, potassium chloride and zinc as their only fertiliser inputs. We changed this considerably. We limed our soils, we started to bring up our phosphate levels, which were previously sitting around 50 pounds per acre [23 ppm]. We increased phosphate to the 300-pound range [140 ppm]. Sulfur had only been applied at very low rates, so we applied sulfur. When we had raised all of these levels, we found we were yielding just shy of double the previous yields.

Graeme: A 100% increase is impressive. Were you able to sustain that increase over time?

Bob: Oh, yes. There was no accident about it. We've done it for four years in a row. We're getting better milling quality and higher betacarotene and calcium. We're growing Akita rice for Japan. There were eighty growers in the Sacramento Valley who were involved in the Akita program, and our fields were the only ones that passed the full 50-point test the Japanese used. We were graded the best rice. I got to see the eighty sample bags on the back of the truck before the testing. Anybody at all could have walked up to that truck and pointed to the rice from our fields. It had larger grains, it had more rice and it had a beautiful colour. You could see how much better it was.

Graeme: Did you use foliar with the rice?

Bob: Yes, we did. We had to use aeroplanes at about eight bucks per acre [approx US\$20 per hectare] each time, and there were a lot of complaints about this. However, the end result justified the effort. We reached our goal of building the nutrition in that rice. There is some public education desperately needed about the importance of mineralised food. What is life about? If I wake up in the morning and I'm not healthy, there is no life any more. It's about health, and, where do we get our health? We get it from our food. Rice is a primary grain and you can buy it cheap, but for a few dollars extra,

you can buy nutrient-dense food, which makes such a huge difference. Calcium is very important for building nutrition in the plant. On two occasions, the University of California has visited Josiassen Farms to run tests. The first time, they tried to determine whether there was any benefit from applying calcium. They scanned off all the properties in a five-mile square radius. They found that in each case where there was higher calcium and less magnesium, they had less weeds and higher yields. Where they had high magnesium and lower calcium, they had lower yields and they had higher weed pressure. On the second visit to check calcium, they set up a beautifully replicated trial where there were different levels of calcium applied during the winter, and then rice was planted in the springtime. Often in trials like this, it's hard to recognise any difference. I got a call in the spring and Curt said, *"You drive up here right away, because you won't believe what's happening!"* When I got there, there was a huge, clear difference between the emergence of the rice where we had applied the higher rates of calcium compared to lower rates. This has caused quite a commotion in the rice industry, and I think that we are going to see some major changes. The business of confusing pH and calcium has been a big mistake, particularly on heavier, high-magnesium soils, and this applies to all crops, not just rice!

Graeme: I couldn't agree more. I'd like to ask you a couple of questions now about the mechanics of your compost tea manufacture. There are a lot of people out there playing around with compost teas, who would appreciate some tips.

Bob: It's a wild and chaotic scene out there. I naively thought I knew everything about compost teas in the 70s, but I was wrong. Now it's chaotic and we're all learning. Ultimately, we start out with the compost. The compost has to be well cured. This is the critical thing that a lot of people don't understand about compost. We have to bring compost through its thermal phases and then allow enough time for the recolonisation of that compost during the curing phase with fungi and bacteria, etc. Assuming that we've started the compost right, cured it and ensured that it remained aerobic, we've huge numbers of microbes and a lot of secondary metabolites. Those materials are water soluble for tea-brewing. Next is the brewing equipment. We need brewing apparatus that will hold oxygen levels at 8 ppm. During the brewing process, there's the question of food. Here there's a lot of room for experimentation, but because of my close association with Dr Ingham, we've been able to use her research to develop our food, and it's proven very successful.

"The compost has to be well cured. This is the critical thing that a lot of people don't understand about compost. We have to bring compost through its thermal phases and then allow enough time for the recolonisation of that compost during the curing phase with fungi and bacteria, etc."

Graeme: In Australia, almost every soil tests fungi-deficient. The brewing of fungi-dominated teas is much more difficult than achieving high numbers of bacteria. Do you have any tips you can share?

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Bob: Well, first of all you have to have a fungi-dominated compost. The starting point here is to ensure that you have enough woody material in your compost. The woody material slows things down a lot.

Graeme: How long do you compost in that situation?

Bob: In high management systems using turners, etc, we can generate good compost in 90 days, but then we also have static piles that have been going for up to two years.

Graeme: Do you find a difference in fungi numbers in short-term vs. long-term composting?

Bob: Actually, the long-term static piles are more reliable, but we've been able to produce good fungi numbers in our 90-day piles. Getting the 3 mm or greater diameter of hyphae has been a challenge. We started with 2.5 mm in Hawaii, but we're increasing size. In both Hawaii and California, we've been going back up into the forest and accessing leaf litter for our piles. This material should be introduced at the curing stage.

Graeme: Is there anything different you do during the brewing process in terms of feeding to encourage fungal proliferation?

Bob: I like hydrolysed fish powder. This is a good fungi food. I use humic acid, too. I'm very careful about using liquid fish, though, because of the oil content. I think that we can get a suffocant effect.

Graeme: Have you experimented with aloe vera? We've found this to be an exceptional fungi food. In fact, we're the first to have developed a cost-effective aloe concentrate for agriculture.

Bob: Actually, we've been using yucca extract, which I believe is similar.

Graeme: Yes, it is. In your seminar, you mentioned the work of Dr Harry Hoitink.

Bob: Dr Harry Hoitink from Ohio State University is a compost researcher. In 1986, Dr Hoitink began investigating compost to demonstrate what was causing a disease reduction effect. He did trials where they took plants and split their root system. Then they would infect one side of their root system with pythium or phytophthora or other organisms. On the other side of the root system, they introduced disease-suppressive compost. I've already mentioned that this is an aerobic compost, using proper starting materials, which is correctly cured. What they found was that the microbes and secondary metabolites in the compost created a systemic effect in the plant, which allowed the plant to be tolerant of disease. It caused the plant to utilise something that's called SAR, which is Systemic Acquired Resistance.

Graeme: Yes, we've been looking closely at SAR. It's a fascinating field of research, with tremendous potential for chemical-free farming.

Bob: Sometimes, if we have disease problems and the grower can't afford a decent compost application, I'll side-dress compost right onto the problem area and the irrigation or rain will carry the soluble metabolites and microbes right into the root zone. Here I know that it will help the plant to generate an immune response and resist the disease.

Graeme: I'm really interested in your work with rotating cover crops and perennials. There are some people in the grape industry currently using inter-row cover crops, but you seem to have taken it to a whole new level. Could you please detail your approach here?

Bob: When I first started to grow cover crops, we noticed that, if we put out one species of plant, we were limited to that one plant's interreaction with the environment, and sometimes we might lose our cover crop. When you move to multiple species in seed mixes, you don't have that problem.

Graeme: What are you looking for when you design your species mix?

Bob: Well, first we're looking for a diversity of root profiles. We want some tap-rooted plants and some with a more fibrous root system. We want plants with a different profile above ground. Grasses and legumes, for example, architecturally fit. They support each other in their physical growth and, of course, the nitrogen produced by the legumes feeds the N-hungry grasses. When we have numerous different species growing in the same stand, we also have the ability to attract a lot more beneficial insects. There isn't just one food source. There isn't just one period of time where the pollen or the nectar is available. We have different bloom periods, different exudates, which support the growth of different microbes - then, below ground we have more diversity. As Dr Ingham will tell you, diversity above ground begets diversity below ground. Each of these plants have different chemical signatures, which they release with their root exudates into the soil. So we're not only getting a more healthy, viable foodweb above ground, we're also seeing that situation mirrored in the root zone. There are other things we can do beside mixing species. In perennials, we can alter the mixture from one side of the row to the other. Typically, I go through a routine I call the A row, the B row and the C row. The A row and B row I'll alternate - one row of A mix, one row of B mix. When I do this, I'll design the A row to be a low-growing species and I'll design the B row to be a high-growing species. This way, once again, I'm getting a profile difference. I'm getting maybe five species of plant on the left and five species on the right. I can manage these differently now. One side I can let grow to full maturity and maybe never mow it and use it as a wind block, on the other side I could till it in or I can leave it stand - now I've got options. I'll repeat this A row, B row, A row, B row pattern for about ten rows, then I'll go to the C row. A C row is where we learn. The C row is the wild thing. Anything can go on here. I'll put in up to fifteen different species of plant in the C row, on only 10% of my land. Here I'm trying to keep ahead of things. I'm trying to learn what will grow well and I'm also going to use this 10% as my beneficial insectary. I'm not going to mow, disk or till these plants for three years. I'll have a habitat for beneficial insects and a habitat for wild life while I trial the best species for my farm. I've found that these C rows are incredibly attractive to wild life. We raised thousands of quails, but I've found the coyotes also hang out in the C rows, so there's a little recycling of nutrients going on there. Also, the C row can beautify your land. They're a really beautiful feature. I bring workshop after workshop out to C rows.

Graeme: Is it all perennials in the C rows?

Bob: No, it's a mixture. There are mixtures of perennials and annuals. I'm trying to get plants in there that will bloom all year long. It's not just beneficials I'm trying to attract. I need somewhere for aphids so I can keep good numbers of predators.

Graeme: What would be typical species mixes in your A, B and C rows?

Bob: Every year I switch the C row composition, but typically we might have dwarf sweet peas. I use an old fashion variety called old spice, which has five or six different colours of flowers, which are nice for picking off the farm. They're also a great insectary plant. I find high numbers of persimilis mites. They're the predatory mites we're looking for. I include yarrow and common vetch. Actually, there are fifteen plants that I have identified by going back through all the old research. I'll email you the list. [Graeme - here is the list Bob emailed us:] Sweet Peas, *Lathyrus odoratus* var; Old spice or Royal Vetch *Vicia sativa* var, common; Black Eyed Susan, *Rudbeckia hirta*; Carrot, *Dacus carrota* var. emperor 58; Cilantro, *Coriandrum sativa*; Brome *Bromus mollis*, var. Blando; Oats, *Avana barbatavar*. Slender wild oats; Wheat, *Leymus Trachycaluvar*. Yolo slender wheatgrass; Parsley, var. plain; Dill, *Anethum graveolens*, var. mamouth; Fennel, *Foeniculum vulgare*, var. florence; Alfalfa, var. dormant, semidormant and non-dormant 1:1:1; Cosmos, *Cosmos bipinnatus* var. White sensation; Sweet Clover *Melilotus officinalis* var. yellow and white 1:1; Annual sweet alyssum *Lobularia maritima*, var. Dwarf white; Phacalia, *Brassica tanacetifolia*; Red Clover, *Trifolium pratense* var. Kenland; White Clover, *Trifolium repens*; Mustard, *Brassica hirta* var. White mustard and Brassica jun Brown 1:1; California brome, *Bromus caromatis*, var. Mokelumne River; Blue Wild Rye, *Elymus glaucus*; Yarrow, *Achillea millefolium* var. White.

Graeme: Is this mix specifically for viticulture or do you use it in other orchard crops or row crops like ginger, for example?

Bob: In Hawaii, we grow ginger with a mound and gully system. I usually plant buckwheat in the gully. We turn that down, let it stand for a little bit and then bring it back up on top of the ginger. In Hawaii, we have sandy soils with low fungi content, so this serves to give us a bit of lignified material to feed fungi.

Graeme: We do a lot of work with ginger. In fact, our factory in South East Queensland is very near to the Ginger Factory, a popular tourist attraction based on the ginger industry. One of the major issues with this crop is nematodes. Do you have problems with this pest in Hawaii?

Bob: Actually, I was going to mention that buckwheat is only used in conditions where you don't have plant parasitic nematodes, because buckwheat is one of the host plants for root knot nematodes. When you have a nematode problem, you should be using compost and building your active foodweb. We want our plant colonised by VAM and we need to use cover crop plants like fodder radish and canola, which release certain chemicals that act as nematicides in the soil.

Graeme: I've always been concerned about these plants with a fumigant effect. Wouldn't they affect the entire foodweb rather than just the unwanted nematodes?

Bob: That's a good question. I talked to Dr Ingham about this, as I was also concerned. When we incorporate a plant like canola or the residues from the root material, they break down and release isothiocyanates, which break down to cyanide gas in the soil. I came away from my conversation with Elaine, aware that these materials may be causing selective damage to the soil foodweb. However, there are times where we simply have to take corrective measures. If we have high levels of nematodes, this is still far softer than the chemical options.

Graeme: And with our approach we can come back after cleaning the decks and repopulate with compost teas and other inocula...

Bob: Yes, that's correct. I think that the German hybrid fodder radish is the one to go for, though. The fodder radish is new technology. It has a root exudate that is incredibly attractive to root knot nematode, so they migrate and take up residence in the root. The females lay their eggs in the root, but the chemistry of this plant will not allow the juveniles to exit. This is a true trap crop. We don't have to incorporate this crop to get the nematode populations. This is a trap crop as opposed to a bio-fumigant. Actually, I'll have a field day in conjunction with the University of Hawaii on January 7 [2003], to demonstrate the efficiency of this trap crop. This plant grows three or four foot above ground and can grow a three or four foot root in sandy soils.

Graeme: I liked your seminar statement that cover crops can often serve as a disturbance or an interruption, which is often required in soil, animal and human health to catalyse the healing process. Can you elaborate on that concept a little?

Bob: The concept of disturbance is a popular idea in medicine. To heal, there really has to be a change. We are calling that change a disturbance right now. We might look at it in our own health as the changing of a habit. It was a medical doctor watching me down in the backhoe pit who made me aware of this parallel. He said we have to change the pattern of behaviour to begin healing. In soils, the ripping practice can be part of that, and the cover crop can also be a disturbance. It's an introduction of something very new into most cropping systems, and the action of roots going through soil breaking up layers and redistributing minerals is a disturbance.

Graeme: In your presentation, you referred to the need for a protein addition to soils. You listed seeds from cover crops and the potential tonne of insect bodies associated with cover crops as a welcome source of extra protein for the soil. It's often argued, in conventional agriculture, that there is an oversupply of protein via commercial nitrogen and thus we get a good response when we balance the inputs with carbohydrates like sugar and molasses.

Bob: We're talking about different forms of nitrogen here. The protein content is the difference. I'm largely concerned with feeding the biomass in the soil, and when you analyse requirements for this soil life, you realise that it is the introduction of amino acids and natural proteins via death of animals, birds, insects, etc, which is important. When we use cover crops, there are three distinct protein sources that we get. One of them is fixation of nitrogen, which makes fungi and bacteria proliferate in the soil. This is a big protein source being grown. Second, if we're allowed to take a cover crop all the way to seed - seeds have a lot of protein with a diverse amino acid profile. I kept thinking that what we need is meat. If I personally only eat sources of protein with narrow amino acid profiles, I tend to get sick. I can't heal my nerves and build new tissue. Whereas, if we have full amino acid profiles from other animals and fish, we are able to better maintain our health. Fish in the soil is wonderful, because it provides a much needed full amino acid profile in the soil.

Graeme: This is what you term 'a full amino acid panel'...

Bob: Yes, it is.

Graeme: We have an amino acid concentrate based on hydrolysed fish, but we're currently looking at another amino acid product based on various plant proteins. Do you see any gains in this type of product?

Bob: I really think that you're onto something here. If I was involved in products, I would be aiming to create a plant-based amino acid food for soils.

Graeme: We work with many banana growers in Australia. What have you found to be the most important mineral requirement for this crop?

Bob: Well, I would argue that they are all important, because it is the balance of minerals which is the critical thing. In human health, we're aware of the need for a balanced diet, but we don't apply that back out in our fields. Nitrogen, potassium and zinc are often the only inputs in this industry and others and this is a big mistake. I've seen companies go out of business growing bananas, using this narrow nutrient focus. We want to balance nutrients for the chemical, physical and biological benefits associated with this balance. However, we do need to make sure that there is an adequate supply of nitrogen for this crop. They're a big plant, an exciting plant to grow, and they need nitrogen. I have bananas on the farm I just bought in Hawaii. I knew this property for seven years before I bought it. I was a consultant for other crops - not the bananas. The bananas had never been fertilised and they never produced fruit. A year before I bought the farm, I suggested an application of gypsum, potassium, phosphate and some compost. Now they're producing giant hands of bananas. That's balanced fertility.

Graeme: I'm constantly amazed at how much potassium bananas use. What's your potassium strategy for this crop?

Bob: Yes, I agree. My approach here, recognising the importance of potassium for this crop, is to guard my potassium. I'm going to guard my potassium by side-dressing potassium, and I'm going to understand my clay chemistry. I need to know if I have a potassium-fixing clay that is robbing my applied potassium from the soil, and, thirdly, I'm going to use compost. Compost increases the activity of the soil foodweb, which levers open clay platelets and allows access to much more potassium than was present in the applied compost.

Graeme: And, of course, there are large amounts of unavailable potash present in all but the lightest soils.

Bob: Yes, there is a bunch to work with. You can run a soil test which shows you total reserves of potassium - then you realise how big your reserve is and you may be motivated and try and get it out.

Graeme: We've also had good results with foliars on bananas. Do you include foliars in your program?

Bob: You know I've never applied foliars to bananas. It has got plenty of leaf surface but you would need a good sticker.

Graeme: Yes, we always use a sticker. The compost tea stomata stimulation also seems to be productive in helping to push nutrients into the leaf.

Bob: Actually, there is new research about nutrient uptake in the leaf. It was always assumed that the stomata was like a little mouth, sucking in dew and applied nutrients.

Now we know that the stomata is covered by cutin, just like the rest of the leaf surface. The reason that the stomata picks up more nutrients is because of the depression - it's like a little mud puddle. Nutrients have a longer exposure time, sitting in this puddle, to get picked up and taken into the plant. It's actually the ectoplasmata (often called ectocytodes), which are the vehicle responsible for direct uptake. It can be seen now, with electronic microscopes, that this structure uptakes minerals off the leaf surface and takes them to active parts of the leaf. There is great literature, which supports the fact that it is the ectoplasmata rather than stomata which is directly responsible for uptake.

Graeme: We always suggest that the underside of the leaf is the target area for best uptake. Are you suggesting that this is not necessarily the case?

Bob: Not necessarily the case. As I mentioned, the stomata play a role as collection points, but there are other, more subtle organs in the plant, which have evolved to uptake bird manures, dust and other materials that fall onto the top of the leaf surface. It's logical, if you think about it in this way.

“Actually, there is new research about nutrient uptake in the leaf. It was always assumed that the stomata was like a little mouth, sucking in dew and applied nutrients. Now we know that the stomata is covered by cutin, just like the rest of the leaf surface. The reason that the stomata picks up more nutrients is because of the depression - it's like a little mud puddle.”

Graeme: A main role of the stomata is to pick up carbon dioxide as it diffuses from the soil.

Bob: That's right, but it is covered by the cutin layer all the way through. It's not like the mouth exactly, it's like a mud puddle. It does have that gas exchange ability, but it is covered by wax and cutin.

Graeme: We've not had good results controlling powdery mildew with compost teas. We usually have to include something like *Bacillus subtilis* or milk to help do the job. What has been your experience with this?

Bob: In general, I think that in terms of powdery mildew control, there's been really lacklustre performance from compost teas. Some growers might disagree, but in general I've seen some miserable failures. For me, powdery mildew protection is best achieved with plant health. The next best control technique is wettable sulfur. Timing, monitoring and air drainage are also important. I haven't had the opportunity to add specialist bacteria like *Bacillus subtilis* to our teas at this point, but I have no doubt it would be of value.

Graeme: I was really interested in other aspects of your work with cover crops in viticulture, particularly with your concept of planting directly beneath the vine. Is there any problem with competition for the vine?

Bob: There can be. We are trying to learn which plants to use in which situation. If I take allysum, rose clover or crimson clover, I might be very successful at one location,

but at the next site it stresses my vines. It has to do with the vigour of the site, the age of the vine and soil textures. The tendency is, if it is a young vine on poor soil, I won't consider cover-cropping right underneath the vine. On young vines with a vigorous root stock, on good soil with a drip system, I can actually get by with planting crimson clover at fall, grow it into the winter and then come in with any type of mechanical tillage and kill it in springtime. On older vines, we've had great results letting these three cover crops grow out to maturity.

Graeme: What is the reason for planting directly beneath the vine?

Bob: This is the area where most of the herbicides are sprayed, so weed control is the number one consideration. Number two, I've found that often the least healthy, most compacted soil is underneath the vine, because it has had a lot of herbicide applied to it and it has had low growth of plants. The cover crop plant is what heals the soil. It pushes its roots through and physically loosens the soil. It also deposits carbon underneath the soil, which feeds the soil foodweb, which in turn causes aggregation and better soil structure. Above ground, we're looking for residues on the soil surface for protection. It's normally bare soil beneath the vine.

Graeme: Have you had any experience with the use of paramagnetic materials in your programs?

Bob: I usually find that it is a luxury that doesn't fit my budget, as these rock dusts are expensive in the areas where I work. I've been involved in several trials and there is a definite response. I'm not sure if it's a mineral response, a paramagnetic response or a biological one.

“The cover crop plant is what heals the soil. It pushes its roots through and physically loosens the soil. It also deposits carbon underneath the soil, which feeds the soil foodweb, which in turn causes aggregation and better soil structure. Above ground, we're looking for residues on the soil surface for protection. It's normally bare soil beneath the vine.”

Graeme: It's all of them. We are perhaps more involved with the potential of paramagnetism than most. In Australia, we promote a tremendously successful concept called the Life-Force™ approach. It's a do-it-yourself fertiliser used mainly in broad-acre where the farmers bring in raw humates, soft rock phosphate and one of the world's best sources of highly paramagnetic volcanic basalt in truckloads. These materials are spread out on the ground in layers and then pushed up into a pile with a front-end loader. Then a microbial blend called Nutri-Life 4/20 is brewed with our brewing unit for 24 hours. This unit has a transfer hose and the finished material can be pumped directly onto the pushed-up pile and mixed in. Then it's left for two weeks where it might warm slightly, but it's not a composting process as such. The microbe counts increase around seven times during that two-week period, then the material, which is essentially an inoculum, is applied at around 200 kg per acre. It's cheap and it's been tremendously successful. There have been almost unbelievable rises in organic matter associated with this Life-Force™ program.

Bob: Wow, that's the stimulative effect.

Graeme: One grower, who's used the Life-Force™ program for three years, has gone from 2.8% to 4.4% organic carbon. That's an average over seventeen blocks.

Bob: Wow, it's cool, some of the stuff you are doing! I'm glad I got the opportunity to meet with you.

Graeme: Have you played around with silica at all? We've been getting some good results in our trial work. It appears that, even though there may be large silica reserves in the soil, it is not necessarily plant-available. One of the Australian labs we work with has begun to test for available silica and they're finding that the majority of soils are deficient in plant-available silica.

Bob: Actually, I've been beginning to think that this might be a missing link in my rice program. I've actually applied liquid potassium silicate in small test plots in rice and grapes and there is a response.

Graeme: We've pioneered something called Micronised Mineral Suspension in Australia, where we take natural mineral materials and crush them down to five microns. Then they are held in liquid suspension with special gums. The water that holds them in suspension is a microbial brew and we also add fulvic acid, which is a mineral solubiliser. It's a great concept which works remarkably well. We've taken diatomaceous earth, containing over 80% silica in unavailable form, and turned it into a Micronised Mineral Suspension. The silica becomes plant-available at this minuscule size and the diatomaceous earth also acts as an insecticide in the soil and on the leaf, and it also appears to have a fungicidal effect. Turf and pasture respond particularly well to silica, but there are several other crops which are responsive.

Bob: What a good idea! That's exciting. I love what you guys are doing. I keep hearing about Australia and now I see why.

Graeme: Yes, we are a resourceful bunch over there. I'd like to move on to your clay research now. Can you explain the significance of permanent charged clays vs. variable charged in terms of soil nutrition programming?

Bob: That's a great question, and I'm not sure I can answer it completely. I find no one talking about permanent charge and variable charge clays except soil chemists. I found it in the literature and I became aware of it. It's all to do with understanding base saturation response. If you are looking for a calcium base saturation of 65%, there will be a different success rate when adding lime to different clays. Your soil test might say that you need two tonnes of limestone to bring it up to 65%. If that soil is a clay species that's a permanently charged clay, like smectite or vermiculite, we can apply that two tonnes that's recommended and, in my experience, it will not bring it up to the 65% base saturation. There are going to be numerous applications required to bring it up. Part of the reason for this is that, when you apply calcium to a permanently charged soil, it increases the TEC [total exchange capacity] and the relative level of calcium drops, so we have to come back with more and more until the TEC stops climbing.

Graeme: So what's the solution? I can think of many growers with this problem. What's their plan of action? Do they keep applying lime until they bust the bank?

Bob: On one rice farm we started out with a TEC of 59. After applying lime, the pH didn't go up, it actually went down and I went into trauma. I talked to Perry Labs and Bob Perry suggested that on really low-calcium, high-magnesium, high-TEC soils comprising vermiculite and smectite, they weren't really getting accurate TEC readings. It was outside the range of the ability of the tool to read the TEC accurately. Once we got more calcium and more flocculation, the machine could actually read the TEC more accurately. As we lime these soils, though, there will be incremental benefits as we build calcium, even though the TEC is only increasing very slowly. The fact is that there is more calcium in the system, and this will benefit plant growth over time. In the tropical series, such as allophane, the application of lime will bring the base saturation up very quickly. This also applies to kaolinite, which is also non-permanently charged. This is just the opposite of the permanently-charged clays. If I know my clay species, I can better predict how quickly I'll get up to ideal base saturation. The other thing about allophane series clays is that iron is fixed. This also sometimes applies to kaolinite. As I apply calcium in these particular soils, it will further reduce the availability of iron. This is where it goes back to a whole system. I want to get my calcium up there in the variable charged clays like allophane and kaolinite, but it's going to depress my iron levels. So I'm going to have to go out there with foliar to address iron shortages, and I'll use compost and good soil health practices.

Graeme: We usually find that humates are the best option in this situation, as humic acid has such a strong affinity for iron.

Bob: I find exactly the same thing, so I always use humates in my foliar spray, so I have plenty in my plant. In the soil, I find compost can give me production of siderophores, which are the iron chelating materials produced by bacteria.

Graeme: I wonder if you can throw any light on a mystery that I've never been able to explain. You'll be aware that, when we increase calcium base saturation, there is a corresponding decrease in magnesium base saturation. In fact, this displacement is virtually a one-to-one relationship. Why is this? Do you understand the mechanism at work?

Bob: Sometimes there is a sulfur link. Looking back through the literature, I reviewed Malcolm Sumner's work from the University of Georgia. In his leaching studies, he found that he could get magnesium to leach out of the soil by the application of sulfur, but it was only if he had enough calcium in the soil. It fitted really well with Neal Kinsey's experience. The practical side of this is that calcium causes flocculation, which gives more air space and the ability to drain. Then, when you add gypsum, you get magnesium sulfate forming and then, with adequate rainfall, it will leach downward.

Graeme: That's interesting, but I'm really talking about plain calcium carbonate rather than gypsum. Calcium displaces magnesium without sulfur. Why?

Bob: Absolutely. I don't know the answer to that either. I'm still looking. There's no doubt that it happens. I've done thousands of soil tests and there is no breaking that rule. One goes up, the other goes down. One thing we did find out about wine grapes: In 1985 or 1986, Paul Skinner and Mark Matthews from the University of California Davis did studies trying to answer a question we all may have had. Why do grapevines growing in a high-magnesium soil have low magnesium in the tissues? What they

found out was that, in low-phosphate conditions, many wine grape root stocks will not translocate the magnesium out of the roots up to the upper portion of the plant. However, if you raise phosphate levels in the ground, then they would set translocation of magnesium up into the plant.

Graeme: There's also the fact that magnesium is a phosphate synergist, so it's a two-way relationship. We often find that you can get as much of a phosphate rise in the leaf spraying magnesium sulfate as you can by applying actual phosphate. One of Gary Zimmer's findings relates to this phenomenon. He uncovered four minerals that should be maintained at luxury levels in the leaf to ensure maximum production and quality. We've taken his findings to a new level in 'The Big Four', as I call it, which forms the backbone of our Plant Therapy™ system. The four elements are calcium, phosphorus, magnesium and boron. There is a synergy with two matched pairs. Boron is a calcium synergist and magnesium is a phosphate synergist. From a photosynthesis perspective, calcium is the trucker of all minerals and boron is the steering wheel. All of the stripes, blotches and anaemia associated with poor chlorophyll management are caused by mineral shortages that are linked to the absence of sufficient calcium (and boron). Sugar can't be produced without phosphate. There are five phosphate compounds, including ATP, involved in the sugar factory. Magnesium is the central molecule in a chloroplast and it also improves phosphate response. It doesn't matter whether you are dealing with a pear tree or a pumpkin, if you can achieve luxury levels of the Big Four, you'll do well.

Bob: I agree with this Big Four concept. Boron was the first one. I found that, when I lifted boron above what was considered reasonable, it was always worthwhile. I see so many wine grapes deficient in magnesium and they are also deficient in phosphate and you know that those two are linked.

Graeme: We've done thousands of soil and leaf tests over the past eight years, and I'm always looking for patterns. One thing we have discovered, which is not yet recognised by agronomists in general, is this: If magnesium and potassium are balanced at somewhere near the same ppm level on the soil test, there will often be an associated increase in phosphate uptake in the leaf.

Bob: Wow, that's interesting. I love the repetitive thing. If you can get enough repetition, you can see the trends easily.

Graeme: Yes, when you think you have found a pattern, you can just go to the computer and check back. I'd just like to ask you a couple of other questions about compost tea. This material has been heralded as something of a panacea. One problem with growers trying to adopt a biological approach is the challenge of trying to encourage earthworms back to the farm. Cover crops are the best trick, but it has been suggested that compost tea can even be of value for this. What have you seen?

Bob: I haven't seen this with compost teas. If you were to make me choose one thing - cover crops or compost tea - I'd choose cover crops every time. I've seen tremendous increases in earthworms using cover crops. On the other side of the coin, soils where urea, muriate of potash and zinc have been the only inputs, are usually devoid of earthworms. When we add rock phosphate, swap to sulfate of potash and add some compost tea, we can see incredible recovery of earthworms.

SOIL HEALTH – MICROBE MANAGEMENT

Graeme: We find that vermicompost makes the best base for a compost tea. Have you used it in your teas?

Bob: Yes, definitely. It makes a wonderful tea. At least half of the compost tea that we put onto several thousand acres this last year was from vermipost. The cost of vermipost has risen as a result of the compost tea thing. It used to be \$250 a tonne. Now it's a buck a pound - almost ten times the price!

Graeme: You mentioned the use of fish oil as a penetrant. We import a super-penetrating Omega-3 orange roughie oil for use in a wetter-sticker we have developed. Would it be a good idea to emulsify this oil and use it as a soil penetrant?

Bob: Yes, definitely. When I use oily fish in my programs, I'm really looking for the penetrant effect - the aggregation effect as much as the nitrogen. I use yucca and fish oil for this penetrant effect. I think that it is the saponins in the yucca that are doing the work.

Graeme: We have a saponin product and a fish oil. It sounds like we need to put them together to offer a natural penetrant product. Thanks for the tip. I guess we had better wrap up now. It's been a lot longer interview than I intended. I have loved every minute of it. Thanks for your time.

Bob: I never thought I would hear myself say this, but I'm so impressed with your ideas and products, I think I'd like to talk about becoming your agent in Hawaii.

Graeme: We would love to have you on board. We'll talk again soon.

STEVE DIVER

Interview recorded December 2000



Steve Diver is a technical specialist with a US Government-funded information centre for sustainable agriculture, called **ATTRA**. His role involves in-depth research into all areas of sustainable agriculture, and he is an accomplished eco-educator. Steve is a regular contributor to the Sanet discussion list on the Internet, where his postings are invariably well-reasoned and illuminating. His passion for sustainable farming is evident

on his personal webpage, which includes a huge variety of invaluable links to eco-ag-related sites. Steve has specialised in comprehensive web research, and his page offers a rare opportunity to access the 'cream' of these sites without the pain and frustration of 'rudderless' web-surfing. The ATTRA website is also a wealth of information and includes several of **Steve Diver's** publications. The ATTRA address is www.attra.org. Steve's personal webpage address can be accessed by emailing him on steved@attra.org. Steve is one of the few specialists in the eco-ag arena who have researched and reviewed the myriad approaches and then had the opportunity to compare their performance in the field.

Graeme: Steve, you are a technical specialist with ATTRA. Could you please explain the nature of this organisation?

Steve: It stands for Appropriate Technology Transfer for Rural Areas. It's a sustainable farming information centre located at the University of Arkansas. We are a non-profit organisation and we receive a federal grant from the USDA to the tune of around two million dollars. We have about thirty people on staff. Our office coordinates extension officers, farmers and education multipliers in all fifty states. It's primarily an information resource centre. We research, collate and summarise information at the request of farmers who are usually too busy to conduct their own research.

Graeme: Sounds like a great idea. It's certainly something I'd be happy to see my tax dollars directed toward.

Steve: Actually, one of our farmers made a similar comment recently. He said that it took the sting out of writing his cheques to the IRS when he knew some of his tax was funding ATTRA.

Graeme: I see that you have authored a publication on biodynamic farming and compost preparation. Is Steiner's system still moving forward in the US?

Steve: Biodynamics has played a prominent role in the organic movement in this country, largely due to the work of Ehrenfried Pfeiffer. He died in the early 1960s, but there is a biodynamic farming association which has kept the light burning. However, the movement is still relatively small. You certainly couldn't claim major growth. It's

really just maintaining momentum and perhaps growing slowly. There have been some new advances, though. Are you familiar with horn clay?

Graeme: Yes, it is a concept that Hugh Lovel is pretty excited about.

Steve: Well, Hugh is doing something a little different and his approach does not meet conventional biodynamic specifications. Hugh calls his approach ‘energy pattern farming’. He is using potentiated biodynamic preparations and broadcasting the energy patterns with a field broadcaster, an instrument that some people would call a cosmic pipe. Hugh is not Demeter-certified, but he doesn’t consider this to be particularly important. He produces a great product and has no problem marketing it. This is a growing trend. Farmers selling clean produce into local markets, where there is a growing demand, often have no need to be certified. There is no financial gain for these guys to be certified.

Graeme: Do you see any potential for the crossover of biodynamic techniques into conventional agriculture?

Steve: There are many organic growers who are not biodynamic growers but use flow-forms or reverse-stirring. However, there is no interest at all from the conventional growers and it is hard to imagine an interest developing.

Graeme: I think that this is a major difference between Australian and US growers. Here you seem to have two distinct groups and never the twain shall meet. In Australia, the majority of our clients are conventional growers and the best of these growers will consider anything that works - without prejudice. Our whole approach is about developing a functional hybrid. You guys seem to see everything in black and white.

Steve: It must really be different in your country, because I don’t see anything like that happening here. Organics is a big growth area, but even though a few conventional growers may have discovered things like foliar fertilising, they could never embrace the more abstract concepts.

Graeme: You are something of a compost specialist. In your opinion, how does biodynamic compost compare with Lübke’s compost?

Steve: Well, that’s the sort of question that could set up a hornet’s nest and I’m not sure that I want to buy into this kind of strife. The composting fraternity are pretty passionate about their craft. I will say this, though - the BD approach has a long, valid history of successful humus management. The BD preps have both a microbial and biological benefit, and they also have a dynamic side. The preps sort of potentise energy - it’s a two-part approach. Lübke compost, or what is called ‘Controlled Microbial Compost’, was developed by Siegfried and Uta Lübke on their farm in Austria. It’s made a huge impact on the compost industry in this country over the last ten years or so - to the point that you can actually talk about before Lübke and after Lübke. The rules of high quality, premium grade compost were virtually re-written following the Lübke findings. Their compost turners, the use of inoculums, compost fleeces, the addition of clay at 10% by volume, the addition of finished compost at 10% by volume and the inclusion of crusher dust - all of these things came from Lübke’s work. Temperature and CO₂-monitoring is also a Lübke concept.

Graeme: I was aware of Lübke’s impact in Europe. I never realised that his philosophy had had such an impact in the US.

Steve: There are still a lot of people who are not familiar with the concepts, but it is the fastest growing approach in the US. Our ATTRA publication is one of the most comprehensive documents available, covering the basic principles of Lübke’s composting.

Graeme: I’ll make sure that the readers have the ATTRA website address, so they can access all your information.

Steve: Thank you. Actually, there is an interesting historical background to the development of Lübke’s approach: Selman Waksman was a famous microbiologist from New Jersey. He was the father of antibiotics - the guy who identified and isolated streptomycin. Soil microbiology was also his thing and he had written that, amongst all of the important characteristics of humus, and its contribution to the soil, it is the combination of clay and humus which is most important. He suggested that one of the most important ways to achieve this clay / humus crumb was to combine clay with animal manures and other organic matter in compost. Waksman published that back in the 1950s. Ehrenfried Pfeiffer, who was a keen microbiologist and humus worker, picked up on this concept and he included this in his work on biodynamic composts. Siegfried Lübke, who is a genius microbiologist / farmer, absorbed all of the work of Waksman, Pfeiffer and others and he is the guy who has brought clay to the modern compost industry. This concept is so important. I see compost all over the country. Often you will see a compost and the guy will be real proud of his creation - you pick it up and it’s real fluffy with no structure, because there was no clay in the recipe. That’s the difference with Lübke compost. They put the clay in there and the other basic ingredients. They have a consistent way of making compost. Wherever you see Lübke compost - whether in Australia, the US or Austria - if it’s made according to CMC (controlled microbial compost) standards, it will all look similar. It will have this structure - these clay / humus crumbs.

“Selman Waksman was a famous microbiologist from New Jersey. He was the father of antibiotics - the guy who identified and isolated streptomycin. Soil microbiology was also his thing and he had written that, amongst all of the important characteristics of humus, and its contribution to the soil, it is the combination of clay and humus which is most important.”

Graeme: We use 10% soft rock phosphate in all of our composts, which is a colloidal clay.

Steve: It’s a good idea you’re including the clay, but you are also making what Pfeiffer called mineralised compost. The organic acids produced by microorganisms during composting, solubilise the rock phosphate materials. There is some really solid research published in several journals which shows that, if you put rock phosphate into compost, the phosphorus availability is equivalent to single superphosphate.

Graeme: It certainly works well. We use these composts as the basis for most of our prescription blends. Do you feel that the Lübke compost has anything to offer from an energetics perspective?

Steve: Yes, that's something I'd like to discuss. The BD composts embody this idea of energetics or what Steiner called the etherial life force. I feel that there is good evidence for a biological energy field. This concept is not discussed, but this energy source is generated from the sum of the total actions of the microbes. The Lübke compost certainly qualifies in this context.

Graeme: I've often heard about the amazing phenomenon of an Alaskan spring, where the plants burst from the ground and grow at a mind-boggling rate. It appears that the microbial energy has almost worked like a pressure cooker over the long winter, to the point that you almost have to stand back when spring arrives. That's a fairly obvious energy field at work.

Steve: I think there is an energy comparable to paramagnetism or Steiner's life force, which should be looked at more closely.

Graeme: Do you feel that the biodynamic system delivers? I mean, is it more cost-effective? Does it consistently produce higher quality produce?

“I've often heard about the amazing phenomenon of an Alaskan spring, where the plants burst from the ground and grow at a mind-boggling rate. It appears that the microbial energy has almost worked like a pressure cooker over the long winter, to the point that you almost have to stand back when spring arrives.”

Steve: Well, in your neck of the woods, Professor John Reaganold from Washington State University published a paper called 'Soil Quality and Financial Performance of Biodynamic and Conventional Farms in New Zealand'. All parameters showed that BD farms have higher soil quality and, from a financial point of view, they were more profitable than conventional farms. As far as food quality is concerned, BD has a rich history of qualitative assays. For example, we have Circular Chromatography, which came out of Ehrenfried Pfeiffer's work, and Sensitive Crystallisation, which was also developed by Pfeiffer. Then there is Capillary Dynamolysis developed by Lily Kolisko.

Graeme: Who is Lily Kolisko?

Steve: She wrote a classic book called 'Agriculture Tomorrow', which covers a lot of research on biodynamics. She researches the effect of moon phases on plant growth and she investigates concepts like potentiation. Basically the research gives some scientific validity to some of Steiner's claims. Returning to the qualitative assays I mentioned, they were developed by the BD people and they are still widely used in Europe today. There was a UK Soil Institute conference earlier this year, and one of the papers published for the conference was fascinating. There's a food quality research institute based in Switzerland, and they had side-by-side examples of all three qualitative techniques to compare conventional and organic produce. There was no comparison in terms of food quality.

Graeme: Do you believe there is a benefit in combining Albrecht soil balancing principles with a biodynamic approach?

Steve: Yes, definitely. Hugh Lovel combines the concepts. It is definitely an advantage, but in general they are different approaches and the BD purists don't necessarily agree with fusing systems. They are often more concerned with silica. Silica has a tetrahedral structure. It is an important element that is often overlooked in conventional situations or in other areas of organics.

Graeme: It's also becoming the flavour of the month in conventional agriculture in Australia. There's no doubt that some soils and, more importantly, some specific crops will show a very positive response to applied silica, but I think it's been oversold a little. It is promoted by some consultants like it was a 'magic bullet' and that's simply not the case. Just returning to the qualitative assays you mentioned, I'm not familiar with Sensitive Crystallisation. Can you explain it to me?

Steve: Actually, a lot of the papers I've mentioned are on my personal web page. Check it out, because there is a huge list of web site links there. There's a really good paper on the nutritional quality of organic food. There's a fantastic web link to a German company involved in Sensitive Crystallisation. I discovered the site and wrote to them and they translated it to English. It includes an incredibly beautiful slide show based on Sensitive Crystallisation. I'll explain about Sensitive Crystallisation: Steiner was this mystic, scientist / philosopher from Austria. He was walking in the village square of a European town, somewhere around 1915, when he noticed the formation of ice crystals on the shop windows. He observed that they were completely different patterns of ice crystals on the butcher shop window vs those on the florist shop window. The patterns on the florist window were much more refined - almost like the veins of a leaf. Steiner thought about this and that is when he came up with the idea of subtle energy patterns expressed in crystalline form. He passed that information on to Ehrenfried Pfeiffer, and Pfeiffer came up with the technique known as Sensitive Crystallisation in the early 1930s. The technique has many uses. It can be used with blood analysis as an early warning cancer detector. It's a really cool website. There's a Swiss company that uses Sensitive Crystallisation to evaluate health products, organic foods, fertilisers or water. You can send product to them and receive an in-depth analysis and interpretation.

Graeme: What is the website?

Steve: It's called the Hegalus Association - there are links on my web page. Look out for the article called 'The Nutritional Quality of Organic Food.'

Graeme: You have reviewed dozens of approaches in sustainable agriculture and analysed their relative value. Do you consider any to stand out? I mean, if you were to farm organically, which way would you go?

Steve: I'd definitely use a combo. I would use Albrecht mineral balancing combined with humus management, which would include Lübke compost, and I would use energetics. When I am consulting, I like to give growers confidence. There are some very good tools and concepts available and growers have every reason to be confident of good results if they utilise these tools and ideas. How do you guys approach it?

Graeme: Well, we are very much into the best of all worlds. We look at everything that works well and we fuse it together. We look at synergies and we approach mineral, microbe, plant and pest management from a holistic viewpoint. It has been a very successful approach.

Steve: I've followed the postings on your website - it's very impressive.

Graeme: Another question about compost. How do you rate vermicompost in the overall scheme?

Steve: Well, it's used here in conjunction with large-scale commercial composting. Often large producers might produce 5% worm compost on the side for nurseries. It's a very good product but much more expensive, so there is not much large-scale production.

Graeme: In Australia, there are a couple of companies now producing worm compost on a large scale. It's priced at around the same price as conventional compost.

Steve: That sounds like a good deal. Worm compost still needs good management skills - just like conventional compost. If it gets too wet, it can putrefy. You get a lot of high sulfides and a bad situation.

Graeme: What about compost tea? Are you as confident as Elaine Ingham about the potential of this material for disease control?

Steve: We did a survey of the literature when we put together our compost tea publication for ATTRA. There is no doubt that you can control a range of diseases with compost tea. It's a fascinating thing to realise the number of different microbe species that live on the leaf. It's amazing - there is this huge ecosystem living there. Biological control is about managing this ecosystem. It's about competition or occupying the surface of an area or antagonism. I think that it's useful to talk about Rhizosphere agriculture [the root-zone] and phytosphere agriculture [the leaf surface]. Rhizosphere agriculture involves tillage systems - compost, cover crops and mineral balancing, while compost teas and foliar fertilising are related to the phytosphere.

Graeme: Is foliar fertilising widely accepted amongst conventional growers in the US?

“Biological control is about managing this ecosystem. It's about competition or occupying the surface of an area or antagonism. I think that it's useful to talk about Rhizosphere agriculture [the root-zone] and phytosphere agriculture [the leaf surface]. Rhizosphere agriculture involves tillage systems - compost, cover crops and mineral balancing, while compost teas and foliar fertilising are related to the phytosphere.”

Steve: It's still considered worthless by many conventional growers. Some of them might spray calcium nitrate if they needed calcium, but they haven't discovered the full potential of this form of nutrition.

Graeme: I think we are quite a bit further down the track in Australia. Most of our growers are conventional and the majority of them use foliar - not just to correct major element shortages. They are aware of chelation, they have seen the benefits of natural hormones, enzymes, amino acids, humic acids and broad-spectrum trace elements. Many of them have experimented with biological control techniques and increasing

numbers have experimented with botanicals to control insects. It seems a lot more sophisticated.

Steve: Yes, I think it is. Perhaps that's why so many American consultants enjoy visiting Australia.

Graeme: I'm sure that you must have looked at radionics in your review work. What is your opinion of this approach?

Steve: I studied radionics with Dr Arden Andersen, and my co-worker, George Kuepper, is a radionics expert. I come from Arkansas, where energy workers are dime a dozen, because we have the Ozark Research Institute in that state. This is a world-famous research institute. Energy is almost second nature to me, it doesn't involve a big paradigm shift. Organics, without these sort of tools, is what I call 'Plain Jane Organics', but when you take advantage of these techniques, it becomes sophisticated organics. Foliar feeding is a perfect example. You may have five or six varieties of kelp, humic acid, fulvic acid, fish and trace elements. This might total thirty different possibilities to formulate your foliar. If you don't have a way to ascertain the compatibility and the synergy of these products with each other and with your particular soil, then it is guesswork and the odds of making the best choice are very slim. If you can use radionics to match these products, it is a fast track to the most productive choice. Reams was the first eco-consultant to start talking about energy. He talked about the Reams biological theory of ionisation. Reams didn't work with radionics himself, but most of his students, like Dan Skow, Arden Andersen and Phil Wheeler have all adopted radionics to improve their consulting capacity.

Graeme: In a perfect world this might be true, but the technology tends to lend itself to abuse. Ego is the biggest problem, and then the results become unreliable. It is this lack of consistency which has impeded widespread acceptance of this technology, and unfortunately I don't see any signs of that changing.

Steve: That may be true, but it is used much more than you think in the US, it's just that most of the work is behind curtains. A lot of formulation involves radionics, it's just that most of it is undercover. Often it's a question of legality and potential litigation.

Graeme: How would you rank European farmers compared to US farmers?

Steve: Well, I think it's important to state that those involved in the Lübke approach are so far advanced from US conventional growers that they are virtually over the curvature of the earth. They are so far ahead - they are out of sight. Organic agriculture in Austria, for example, is on its way to becoming the norm. Over 15% of the Ag sector are involved in organic agriculture, and many conventional growers are considering the change. The Lübkes started teaching humus management back in the early eighties, and there are so many organic farmers in that country who have been trained by the Lübkes or by one of their trainees. While I was in Switzerland on a recent compost study tour, they had humus interest groups where people get together to share ideas. In Europe, they test for nitrates. Nitrate levels are controlled in all agriculture, but the allowable levels are much lower in organics. The Europeans also use inputs like Effective Microorganisms [EM] on quite a scale.

Graeme: Actually, I was intending to ask you about the EM approach. I know very little about these microbes. I am aware you have published information on this input. Can you tell me about them?

Steve: It's part of the 'Nature Farming' concept, and this comes from Mokichi Okada, a Japanese philosopher and holistic health advocate from the 1930s. He had an idea of creating what he called 'a paradise on earth', where civilisation would be in balance and in harmony with nature. The 'Nature Farming' approach has gained wider recognition through innovative use of microbial preparations, known as 'Effective Microorganisms' or EM. EM was developed by Dr Teruo Higa, a research horticulturist at the University of the Ryukyus in Okinawa, Japan. They are incredibly versatile.

Graeme: Aren't they anaerobic rather than aerobic?

Steve: Yes, but it's a fermentative anaerobic system. It's based on really unique, photosynthetic bacteria that are combined with yeast and lactobacillus. It's like a microbial cluster. Remember when you think about different microbial pathways - there are three - there's aerobic, which is what we normally talk about. Lübke compost, for example, is 100% aerobic - they are totally against putrefactive conditions. The second pathway is anaerobic - putrefactive, which is when things start rotting and smelling. That's what we are trying to avoid at all costs. The third pathway is anaerobic fermentation. This is the beneficial fermentation that Higa works with. If you think about silage, misu, tempeh or even sauerkraut, they all involve this beneficial fermentation. The EM microbes have many benefits. They can be used, for example, on food waste. If you spray them on the waste, it won't start rotting, it'll stay in a fresh condition. When we were in Switzerland, there were food processers with huge piles of vegetable waste that would sit for weeks without rotting, after it had been inoculated with EM microbes. Then, after it had accumulated, it would be trucked off to make CMC compost. They have effectively integrated the EM approach with normal aerobic composting. You can use EM microbes in your bathroom to control mould. The microbes have antioxidant properties. This is Higa's big thing - he is totally into the antioxidative properties of these microorganisms. They have a human health product, which can be used from pregnancy onwards. Aging is an oxidative process - it's like rust. EM microbes can apparently halt the oxidate regression. They are also using EM in building structures. They produce a ceramic material which extends the life of building materials. Of course, the agricultural applications are also a big part. The 'Nature Farming' people believe that conventional organic agriculture is immature. You should see their Powerpoint show on their website - the site is called www.emtechnologynetwork.org. I must point out that the 'nature farming' approach involves a lot more than just EM microbes. They promote things like pest control habitat strips. They promote alleyways between crops, which are planted with things like alfalfa and red clover to attract beneficial insects, which will then migrate to the crop to achieve natural, biological control. Sometimes they use a bug-vac to suck up beneficials from the habitat strip and then apply them to the crops.

Graeme: When we visited Kununurra in WA to deliver a seminar recently, there was great success with lucerne strips. Cucurbit growers had been fighting a losing battle with pumpkin beetle. Chemical spray rates had gone from every two weeks to every ten days to every five days. They were down to every three days when a grower called Michael Eppler trialled the habitat strips every 50 meters. It was an immediate success

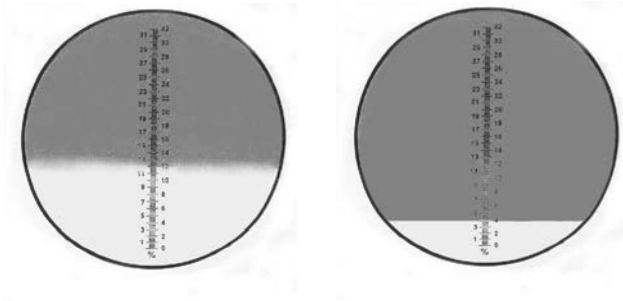
and now the entire valley has adopted that approach. Some of them don't need to spray at all any more and some get by with just a single spray.

Steve: It's a rewarding experience to achieve these results without chemicals.

Graeme: Thanks for talking to me. I always enjoy your postings on the Sanet newsgroup. Keep up with the good work. I'll see you at next year's Acres Conference.

Steve: It's been a pleasure.

PLANT HEALTH - ENERGY MANAGEMENT



BRUCE TAINIO

Interview recorded December 2001



*I had heard about the exploits of Washington consultant, **Bruce Tainio**, from a variety of sources, including Victorian organic farmer, **Ross Carter**, and had always intended contacting Bruce to arrange an interview. During the 2000 Acres USA Conference, I spoke with **Bob Pike** from Pike Lab Supplies and he detailed Bruce's revolutionary discovery of a link between plant sap pH and pest and disease resistance. Bob had thoroughly tested the concept and was convinced of its validity. Furthermore, Bob, who had personally known **Professor William Albrecht** and studied under **Dr Carey Reams**, made the statement that Bruce was perhaps the only true genius he had ever met. My curiosity was ignited at this point, and the following winter we visited **Bruce Tainio** and his wife, **Teena**, in Spokane, Washington, USA. In a glass-sided restaurant, surrounded by gently falling snowflakes, I marvelled at revelations which, if correct, could have a serious impact on the rapidly evolving discipline of sustainable agriculture. **Bruce Tainio** is a rare breed, a prolific inventor, microbiologist and Ag consultant who has developed his own unique approach based on his own research, rather than influence from the founding fathers in this field. Bruce is an inspirational consultant who strongly believes that we need an alternative to conventional or organic, where the sole guideline is the production of nutritious food. I trust that you will enjoy the interview as much as I did and I hope that you will be inspired to work with some of Bruce's concepts to validate them for yourselves.*

Graeme: Thanks for agreeing to the interview and fighting your way through the snow to get here. I've been really looking forward to speaking with you. Many of the leading consultants I have spoken with during this interview series have come from a common background in the sense that they have all been strongly influenced by William Albrecht and Carey Reams. You are something of a maverick. You've come out of the left field with an approach that is quite unique in many ways. Your approach toward nitrogen, for example, is quite different. While many of the consultants favour ammonium sulfate as a commercial nitrogen source, you are a big fan of calcium nitrate. Can you explain this preference?

Bruce: Our research has shown that what people think they are getting and what they actually get, in terms of nitrogen uptake into the plant, are two different things. In some cases, only ten percent of the applied nitrogen is utilised. We are heavy users of calcium nitrate because this material is 98% bioavailable. It's chemically bonded together - the nitrate is attached to the calcium. This is not the case with something like calcium-ammonium-nitrate, for example, because here there is not the same molecular bond. This molecular bond is extremely important in high-magnesium soils, because magnesium can't oxidise that nitrogen ion as long as it is attached to that calcium. The other thing is that the calcium nitrate ion is a macromolecule - it's very large. It doesn't

leach, it doesn't break apart unless it's enzymatically reacted with the root cap of the plant. Once that happens, the plant takes the nitrate up immediately. We can use just three pounds of N per acre in the form of calcium nitrate vs. sixty units of N in all the other forms of commonly-used nitrogen, and yet, in the springtime, we can show a higher plant N level and a higher soil residue of nitrogen.

Graeme: So the key is to put it right under the plant so this enzymatic reaction can occur when it comes in contact with root exudates and root zone microbes?

Bruce: Yes, it must go under the plant. With conventional N you can put on sixty units, yet you are still deficient in springtime and there is no soil residue left after harvest. In our standard dryland program, we use between three and six pounds of actual N, as calcium nitrate, for the whole season, depending on how dry it is. We have this huge problem with nitrate contamination of waterways and it's due to the fact that we are using the wrong kinds of nitrogen. They use ridiculous amounts because they think they are still seeing a plant response, but the plant is actually responding to a very small percentage of what they are applying. We see corn farmers using 450 units of N to produce maize - it's ridiculous! The fertiliser salesmen have become very good at perpetuating the myth, saying, "*You have to do this to get yield.*" I've walked into fields where the corn is twelve to sixteen feet tall and they're struggling to harvest the ears off these huge stalks. The equipment was so covered with red spider mites that you couldn't tell that the John Deere corn picker was green - it was so covered in spider mites it looked red. A nitrogen overload will bring in the insects every time. You don't need sixteen-foot corn to produce two ears per stalk - this is a nitrogen excess. When protein is oversupplied, there is always a problem as proteins can't be stored in the green plant. When they're in that green tissue for too long they begin to putrefy. Those proteins begin to break down and cause cellular weakness to occur. The element responsible for the proper breakdown of that protein into carbohydrates or sugars is potassium. Nobody wants to talk potassium. Everybody says there is plenty of potassium according to their soil analysis, but you have to look at the tissue tests. I don't care what crop you are growing - if you look at a plant tissue analysis and the manganese is through the roof and zinc is low, then that will be a potassium issue. It's not a zinc deficiency or a manganese excess. There is a little recognised relationship where, if the plant is deficient in potassium, the plant will take up excessive amounts of manganese and then it can't take zinc up - period. That ratio is so overlooked. There are so many times that consultants advise zinc when that's not the problem - it's potassium! We have had many years of history on many, many thousands of acres of crops to justify these findings. People can't believe the quality improvements when we design their programs. I'm not an organic nut, because I see too many fallacies in the organic system right now. There should be a third group out there called 'nutritionally balanced food'.

Graeme: I have coined the term 'Nutrition Farming' for that exact reason. There is a huge opportunity for a more pragmatic approach where food quality is the principal goal.

Bruce: There are restrictions in organics that are unnecessary. There is far more emphasis on chemical-free than nutrition-rich, which is absurd because the two are interlinked. The consumer gets flawed, nutritionally unbalanced organic food and it's not good for anyone. The ultimate goal is human nutrition. I've been an advocate, for many years, of the idea that we don't need a national health care program - we need a

back-to-basics agricultural program to get everyone eating decent, nutritionally balanced food. Then the health care program will take care of itself.

Graeme: We argue that families would be better off spending the money they spend on bottled supplements to pay a retired person or perhaps their own children to grow mineralised food for the family. People need to take charge of their own health.

Bruce: They certainly do.

Graeme: Just returning to the calcium nitrate issue. Are you effectively using this material homeopathically, as an energy source, rather than a source of calcium or nitrogen specifically? Carey Reams used to use small amounts of calcium nitrate to kick loose or activate soil calcium. Is the same principle involved here?

Bruce: No, not really. In most of our heavy cropping systems, the plant does require some kind of external nitrogen input. Eighty percent of N used for plant growth comes from the atmosphere. We can only input or affect twenty percent of the N going on.

Graeme: Are you referring to photosynthesis and the production of sugars that sustain root zone nitrogen-fixers?

Bruce: Yes, there's Azotobacter and there's nitrogen from storms, but there's also the leaf life. The microbial communities living on the leaf surface of the plant is another whole realm that nobody is really taking a look at. The yarrow plant is a good example - one of my favourites. They have identified over six thousand different microbes living on the yarrow leaf. My question for the herbalists is this: When you dry that leaf out and make herbal tea, are you benefiting from the yarrow extract or are the benefits coming from all the microbes that you are ingesting, which are improving the microbial balance in your intestinal system?

Graeme: Misuse of nitrogen is an issue. Poor management is almost par for the course. Split applications and applying nitrogen closer to planting time would seem like plain common sense.

Bruce: I've looked at Californian soil tests with a CEC of 3 and around 0.1% organic matter, and the fertiliser consultants are telling them to put their nitrogen on two months prior to planting their crop. This is obviously ridiculous. So often, large applications of nutrients are made at planting and I liken it to the Thanksgiving feast. If we were to sit down at Thanksgiving and give you all you were to eat between now and next June, when we are ready to harvest our wheat - what would happen? Why do we think that we can do that to plants? There's no logic here.

Graeme: We've had some real success with an alternative approach to the use of urea. As you are aware, urea can be a menace in the soil at times, because it converts to nitrates very rapidly and overloads the plant. There are important issues regarding the balance of ammonium nitrogen and nitrate nitrogen within the plant. The ratio is supposed to be 75% ammonium and 25% nitrate. Unfortunately, that ratio has been inverted with the misuse of nitrogen and most of the produce we buy from the supermarket will contain 75% nitrate nitrogen and 25% ammonium nitrogen. This is a problem because nitrates are proven carcinogens. We find that, when urea is stabilised and buffered with humic acid and then applied as a foliar rather than a soil application, we can apply ten to twenty kilos per hectare, depending on the crop, and we seem to be addressing this imbalance. Certainly we are getting a great reproductive response.

Bruce: Yes, urea and humic acid are very good together and the urea amine does give a reproductive push. There is also another issue with urea. When you look at fertiliser programs, most consist of NPK and zinc. If the grower is progressive, there may be another six or seven trace elements and the other majors involved. Our research shows that there are 57 to 59 elements that are required by plants. In the case of urea, there is a trace element link. Urea can't be broken down in the root zone of the plant without nickel. Nickel is the core ion required to produce the urease enzyme required to break down urea. How many people ever look at nickel? A USDA survey of fifty soils in the US found that 99% were totally devoid of detectable nickel, yet most of these areas used urea heavily. We have an obvious problem here. The other problem is molybdenum and its link to the nitrate reductase enzyme, which is essential for nitrogen fixation. Very few farmers are aware of the molybdenum link to natural nitrogen supply. Each of these 57 elements is required in small amounts, but they are essential. If we inoculate microbes and don't get a response, we go into science mode. Usually we will do an ICAP Mass Spectrometer run with every element on the atomic chart. We will soon find our answers with this detective work. Selenium may be missing. Selenium is the core ion for the formation of B₆. Bacteria in the soil have to form B-complex vitamins or they die out.

“Our research shows that there are 57 to 59 elements that are required by plants. In the case of urea, there is a trace element link. Urea can't be broken down in the root zone of the plant without nickel. Nickel is the core ion required to produce the urease enzyme required to break down urea. How many people ever look at nickel? A USDA survey of fifty soils in the US found that 99% were totally devoid of detectable nickel, yet most of these areas used urea heavily.”

Graeme: What is an ICAP Mass Spectrometer?

Bruce: It's equivalent to atomic absorption. Midwest Laboratories in Omaha, Nebraska, do an incomplete ICAP, but we use a company out of Vancouver, Canada, for complete analysis. All they do is ICAP.

Graeme: We always argue that the first cell that oozed from the Precambrian ocean contained seventy-seven minerals and nothing happens by accident in nature. Many of these minerals will play a role in plant growth and we are currently unaware of that role. To cover the broad-spectrum mineral bases, we use things from the ocean - kelp and fish are built into most of our products.

Bruce: Yes, that's always a good idea but be aware that there is a marked variation between the mineral levels in different kelp sources. The popular Norwegian kelp doesn't necessarily offer the most balanced mineral profile. If you look at some of the multiple-coloured kelp, you find different mineral profiles. Reds, for example, are very heavy in the platinum group elements. Platinum is required for plant growth, at very low levels. Rhodium is also required. The best approach is to make a kelp fertiliser containing a range of different kelp species to cover all your mineral bases.

Graeme: We might just look at that. Rock dust is another source of broad-spectrum minerals, as is brown and black coal. These materials come from minerally dense vegetation that predated the dinosaurs. We have a full analysis of black coal, which shows luxury levels of seventy elements.

Bruce: There is much more going on in coal - lignite and leonardite in particular. Look at Gaston Naessen's work with his dark field microscope and his somatid discovery. He discovered these tiny light or energy scenarios in every living cell. He went through numerous experiences to try to destroy these 'energy bundles' but couldn't. He found that leonardite contained a concentration of these energy bundles. No one has focused on this aspect of humates. We talk about minerals and organic acids, but there is a life force there that seems to be the key. People should start researching this.

Graeme: Is this similar to Leonard Ridzon, author of 'The Carbon Cycle', who has that product called Nutricarb. He speaks about something called biogenic carbon - a key energy source in coal, which he believes is indestructible. It sounds like another name for the same thing.

Bruce: There are six or seven scientists who have verified Naessen's findings but they all call this life force something different, depending on what country they come from. Coal is a concentration of this life force energy and it is not destroyable. It sits there, in this case for millions of years, until it can become organised into another living cell. Gaston has photographed these things and they are fascinating.

Graeme: And you believe that this is the reason why humic acid and fulvic acid work the way they do?

Bruce: Yes, I think that's probable, but there are other things. When you combine humic acid with your urea as a buffering agent, you're setting up a good carbon to nitrogen ratio, which is one of the keys to microbial balance. We did experiments with major chemical companies in California. They heard me talking and said, "*You've got a big mouth, why don't you prove what you are talking about?*" I had told them that we could control nematodes 100% in any field without chemicals. They gave me 800 acres of test plots. There were cotton, sugar beet, potatoes, beans and orchard crops. They sent me dozens of faxes quantifying the numerous varieties of detrimental nematodes that were present in these various soils. I phoned them and said, "*I don't need to get to know these guys personally, they are all there for the same reason.*" We viewed the presence of the nematodes as an indicator of the suppression of beneficial microbes. The key to that is the carbon to nitrogen ratio in the soil. If you look at that carbon to nitrogen ratio first and then inoculate with broad-spectrum beneficials, that will take care of the problem. You need to go in with a high-carbon material prior to the inoculation. In every one of the fields, we reduced the detrimental nematodes to zero with this approach. These people were sitting there with their mouths open when the results came in. It scared them more than anything, because some of their biggest products were Vapam, Talon and methyl bromide for soil fumigation. We had demonstrated complete control simply by correcting the biology. I was still worried about what would happen the subsequent season on these plots, because of the chemical mindset of the farmers involved. One of the ladies in the trial had had her cotton crop devastated by nematodes the previous season and we were able to reduce the numbers to zero. We organised her program for the next crop and she was criticised by her neighbours because her cotton was too light in colour under our program. They were

used to the blue-green of excess nitrogen. Eventually she said she had to buckle to the pressure. I said that she could put on more nitrogen, but only if she agreed to include three gallons of 12% humic acid with every hundred units of nitrogen. She agreed and we were able to keep out the nematodes because we had still addressed the carbon to nitrogen ratio.

“We viewed the presence of the nematodes as an indicator of the suppression of beneficial microbes. The key to that is the carbon to nitrogen ratio in the soil. If you look at that carbon to nitrogen ratio first and then inoculate with broad-spectrum beneficials, that will take care of the problem. You need to go in with a high-carbon material prior to the inoculation.”

Graeme: One of the old remedies in Australia was to apply molasses for nematode control. Was part of his response based on improving the carbon / nitrogen ratio with the molasses?

Bruce: That’s right.

Graeme: We have a nematode program that combines molasses, liquid vermicast, humic acid and kelp with a microbial inoculum, called RootGuard, which contains five nematode-trapping fungi.

Bruce: That’s the sort of thing that would work. The problem in most agricultural soils is that herbicides and other chemicals have killed off major proportions of beneficial microbes or they’ve selectively killed key actors in the equation. Here in the Northwest, we’ve been losing 600,000 acres of wheat each year that was killed by a disease called Takeall. The only reason that Takeall did this damage was because everyone was using Roundup in chem-fallow or no-till programs. Roundup kills the pseudomonas types in the soil. Pseudomonas is the guardian of the wheat plant when it comes to Takeall. If you overwhelm the plant with pseudomonas to fight off the Takeall, then the aschochyta will attack the wheat plant, because you have overwhelmed two of the bacilli in that soil, which are part of the balancing mechanism that prevents Aschochyta from attacking. You would think that the herbicides should be labelled. Monsanto is well aware of the problem, because they suddenly poured three million dollars into a Washington State University research program on genetically altering a Pseudomonas fluorescens so they could come out as the saviour of the farmers with Takeall.

Graeme: It seems to be a business strategy of the multinationals. They create a problem and then sell you the cure.

Bruce: Yes, it’s a no-lose proposition.

Graeme: If you have to use glyphosate, we usually recommend the inclusion of fulvic acid to detoxify residues and to magnify the effect. We use about one third less glyphosate, and the bacteria-stimulating effect of fulvic draws bacteria in to rapidly biodegrade any residues. I call it the ‘honeypot effect’. It’s essentially a sustainable practice that is free-of-charge as the cost saving in glyphosate covers the cost of the fulvic acid.

Bruce: We use a different trick to increase the effectiveness of Roundup. Remember that this material, like most chemicals, is very pH-sensitive. I ran into a situation down in Utah, where this one company had been spraying Roundup on a large scale and they couldn't seem to kill weeds which are normally very easy to kill - pig weed, lambsquarter and amaranthus. I asked them about application rates and they were using three quarts per acre.

Graeme: That's over seven litres per hectare!

Bruce: Yes, they had spent over \$250,000 on weed management the previous season. I would normally consider a pint an acre to be excessive - there should never be a need for three quarts! I checked the pH of the water they were using and it had a pH of 8.2. I told them to go to the store and buy some vinegar. They had a 300-gallon tank and it took two quarts to drop the pH down to 5. It may take more than this if there is a high mineral lode in the water. In the end, we dropped down to about 4.5 pH and they cut their Roundup application down to an eighth of a pint per acre.

Graeme: That's almost fifty times less! I bet they were happy clients.

Bruce: I got a call from the farm manager in the fall, thanking me. He said that whenever they had complained about a lack of response previously, the dealer had told them to put more on. These guys think the farmers are morons - they have this 'more on' theory [laughs].

Graeme: I hate to see farmers treated like this. We have an approach where we tell them everything. If they can do it themselves without us, all the better. Once I was called by the head of another fertiliser company in Australia and he told me that "*loose lips sink ships.*" He said we were stupid to give away so much information. He said, "*The farmer should only ever be told exactly what you want him to know.*" That will never happen in our company.

Bruce: I agree, we also share everything we can. Education is empowerment for these guys. I had another experience in California, with the almond industry. They like the area beneath the trees to look like a freeway, because they shake the nuts to the ground at harvest. They had a big problem with nutgrass. They sprayed Roundup at incredible levels underneath those almond trees, which I disagree with because, as I said earlier, it takes out pseudomonas, which play an important protective role against root diseases like phytophthora. This time, I got them to use glacial acetic acid, which is a powerful vinegar concentrate, with the Roundup. They also got down to an eighth of a pint and they achieved 100% control of that nutgrass. In this case, we brought the pH down to 2.5. When you come down this low, the acid shock burns a whole in the cuticle to allow easy access for the Roundup. We have a plant called Morning Glory, which can only be killed by acidifying Roundup. My only goal here is to use less herbicide to reduce the impact on the soil microflora. Some of the old-style chemicals were horrific in this regard - they actually took out all soil life in some cases. I came out publicly and reported the damage caused by one chemical in particular and I had an attorney show up in my office a few days later.

Graeme: What happened in the end?

Bruce: The product was withdrawn from the market six months later because it became such a scandal.

Graeme: Elaine Ingham is pretty condemning of Atroazine. She believes that it is a better microbicide than it is a herbicide.

Bruce: Atroazine is also the most leachable herbicide known to man. It's always going to wind up in the water table.

Graeme: It's hard to comprehend why anyone would ever use a material like this. I hope that it's because they don't understand the problems. I'd like to ask you some questions about your sap pH technique. One of the reasons that we travelled all the way to Spokane from Queensland in Australia was because I consider this finding of yours to be a major breakthrough. Our research department has been working with the sap pH concept for the past twelve months and we've yet to find an exception to your rule that acidic sap creates a predisposition toward disease. If a zucchini in the trial plots has powdery mildew, it'll always have a sap pH below 6.4. We promote your concept on a wide scale in Australia. How did you originally come up with this link between sap pH and plant health?

Bruce: Originally I developed a meter to monitor the vibratory frequency or the Hertzian frequency of the plants.

Graeme: That's your frequency monitor?

Bruce: That's correct. With that meter, you can determine the health of the plant by its vibratory frequency. However, walking around waving a frequency monitor was not acceptable behaviour from the perspective of the scientific community and often it would also create a credibility problem with farmers. What I concluded was that every element on the atomic chart has a Hertzian frequency - a natural vibratory frequency, and I have all of those frequencies, for each of the elements. Because all cells in all living organisms have an ideal level of each of these elements, there had to be a relationship between the vibratory frequency and the pH of the plant sap because the presence or absence of these elements determines pH. When we found the link, it covered my rear to a certain extent because I was able to get away from talking vibratory frequency and begin talking pH, which everyone was familiar with. It's not a big step to move from soil pH to plant pH as a valid analysis tool. In essence, I discovered that there was a direct correlation between the hydrogen content in the cell and plant health. At the ideal of 6.4, the hydrogen content of plant fluids is approximately 12%. If you calculate out all of the frequencies attributed to each element - add up their individual frequencies - you'll come to the ideal frequency of a living plant. If there is more than 12% hydrogen and the plant sap is acidic, it will mean that you have displaced one of those elements and usually it turns out to be calcium or potassium. This displacement alters the vibratory frequency of that plant. So this is how I got into the pH concept in the first place.

Graeme: So the frequency approach actually confirmed the importance of balance?

Bruce: Yes, that's right. In some ways I was happy to get away from the frequency approach. Sometimes, after a meeting, there would be forty farmers lined up wanting me to check their health with the frequency monitor. I found it too much of a responsibility having to inform some of these guys of serious health problems. I got to the point where I couldn't keep talking frequency in agriculture. I developed the pH as a correlation factor, which is in every case correct. When I first told Bob Pike about the concept a few years ago, he told me I was crazy - it couldn't be right.

Graeme: I spoke with Bob about it just recently. He is certainly a convert now.

Bruce: Yes, Bob supports it very heavily, now that he has confirmed it for himself. I don't care what crop you check, 6.4 is the key factor. If it's not there, you have an imbalance and potential problems. You can tell what the imbalance is by backing up with brix levels. If your sap pH is low, for example, and your brix is low then that will often be a potassium issue because potassium forms the sugars. We deal with a lot of golf courses in Colorado and a lot of the turf diseases have a potassium link. They have major problems in winter because they have too much protein constipation in that plant, due to oversupply of nitrogen. Those proteins would break down and disintegrate in there, causing a weakened area in the cell and snow mould and the fusarium would move in. When we started going in with high potassium in the winter, to convert all that stored protein into sugar and energy, we've never lost a turf and we've never had another problem with snow mould. Plants don't have to go into dormancy. We've been so University brain-washed that we think that they have to. These turf greens don't have to go brown - if they have enough energy, they can stay green under the snow. Quite a few years ago, we were able to keep peaches, apples, pears and cherries green and growing all through winter, at temperatures down to 10 below [Fahrenheit]. We had the University of Idaho Small Fruits Researchers look at these trees and they shook their heads and assured me that these trees wouldn't produce any fruit in the spring. Dormancy has to occur in these climates if the tree is putting out more energy than what it's able to get from the soil or its surrounding. When temperatures fall, so does the energy delivery. If you adjust that microbe environment in the soil to supply a huge amount of energy flow to the plant, that plant will not need dormancy.

“In essence, I discovered that there was a direct correlation between the hydrogen content in the cell and plant health. At the ideal of 6.4, the hydrogen content of plant fluids is approximately 12%.”... “I don't care what crop you check, 6.4 is the key factor. If it's not there, you have an imbalance and potential problems. You can tell what the imbalance is by backing up with brix levels.”

Graeme: That's a pretty revolutionary idea. How do you account for the fact that you never see a deciduous tree in natural conditions that doesn't lose its leaves?

Bruce: Is that tree in its original environment or is it a second or third generation tree? One of our local power companies burns conifer trees to generate power. They have a problem with the ash, which has been determined as toxic. They have to dump it in a sealed landfill to get rid of it. Why is this ash toxic? It's manganese toxicity. Manganese is well above any disposable levels. Why is that? Because this is a second growth forest. Man has already hauled off the first. What we're seeing here is potassium deficiency, which sends the manganese through the roof. The original forest was logged and then burned and now all of the second-generation forests have problems with disease. It's because they're all potassium-deficient.

Graeme: We're involved in forest farming in Australia, actually, and no one uses potassium.

Bruce: There was an outcry here recently, when they applied nitrogen to the Douglas Fir, in an effort to outgrow disease. All it did was stimulate the disease. Ultimately, their research showed that potassium deficiency was the cause of the disease problem.

Graeme: How do you address potassium deficiency in these situations - with side-dressed potassium sulfate or with potassium foliar?

Bruce: Usually with broadcast potassium sulfate. Some of the deciduous trees don't like the foliar. It can plug the stomata openings on the needles, for example. You have to be really cautious with needle trees.

Graeme: I'm still coming to grips with your sap pH approach, but at this point I see one incongruity. If high sap pH is a precursor to insect attack and high sap is also indicative of a shortage of the nitrate ion, how does this fit with the fact that high nitrates attract insect problems?

Bruce: High sap pH is indicative of an imbalance. If the nitrate ion is involved, it could reflect either an excess or a deficit. Most times it's an excess. There is no incongruity. Excesses and deficits are treated the same way. We have proven that insects only find the crop based on the vibratory frequency of that crop. In one piece of research, we released 1000 Colorado potato beetles on a trial area of potatoes and they immediately went to work. The aim was to adjust sap pH - to adjust the vibratory frequency to the ideal level and observe the response of the beetles. The moment we hit 6.4, the beetles moved on. They find their target crop when the frequency is whacked out, when the sap pH is high. If you overload with nitrates, or you could have also overloaded with phosphates, then the sap pH will be alkaline and you will attract insect pressure.

Graeme: We only had half the picture I never realised that excess nitrates were also related to alkaline sap pH.

Bruce: That's correct it's an imbalance of an anion. A lot of times there is something else that occurs, which you should really be made aware of. If we have an insect attack on a leaf, perhaps due to excess nitrogen or maybe deficient nitrates or whatever, then, at that leaf spot - at that attack site, the insect - the aphid or whatever, might inject a viral substance in its saliva, into that liquid within the cells. As that virus moves into the cells around the aphid sting, the frequency suddenly drops at that point. When it drops down to a certain point, pathogens will move in and take over. People will often query why you can have fungal and insect pressure simultaneously with this sap pH framework. That is the explanation. The injury or the viral injection can lower the pH of those areas on the leaf and now they are subject to infection.

Graeme: Often, low brix levels are related to a lack of both calcium and phosphorus. How does the system work in this situation?

Bruce: I don't see that situation in my work, because we usually have inoculums involved which release the large amounts of tied up phosphate in the soils. We always wind with more P₁ and P₂ after harvest than what we started with. Microbial management is the critical key to that whole realm.

Graeme: Yes, there are usually large reserves to work on. How reliable have you found the sap pH concept in the field? As I said earlier, we've found a one on one rela-

tionship with low sap pH and fungal pressure and there are no exceptions. How reliable have you found the high sap / insect pressure correlation?

Bruce: There is a strong correlation, but the source or positioning of the leaf sampling is important. In California, if we work with grapes, we find that we see acid readings in the older leaves, but the new leaves might have high pHs. The plant is not dumb and potassium is mobile in the plant. It will sacrifice its bottom leaves if there is a deficiency. Hence, most of the diseases move into the bottom leaves of the plant. Late blight in potatoes goes into the older leaves first. Because that potato is stressed for potassium, it's moving it to the tubers for survival of the species or to the growth tips. What we see is that both high and low pH can occur on the same plant. The new growth can be high pH and the old growth can be extremely low pH. You have to use it as a tool, but as a general rule, you will find that it's better for assessing disease potential than likely insect pressure, because not many people are prepared to go out there and make these separate distinctions. When I sample the plant, I try to sample a range of leaves.

Graeme: Acutally, you propose a completely different leaf analysis to the conventional. We usually source leaves from the last growth flush or the latest, fully expanded leaf, but you don't agree here, do you?

Bruce: That's a big mistake.

Graeme: Yes, I read about your idea of taking leaves from three locations - the bottom of the plant, the conventional site and the new leaves, but my question is this: If the ideal levels for conventional leaf analysis have been determined for each crop, based on forty or fifty years of data, how do you correlate the figures derived from an average of three sites to this established single-site data? The new levels will be meaningless, won't they?

Bruce: Well, first of all, it's going to change your whole impression of the importance of potassium when you realise what you thought was sufficient will often be deficient. Potassium, to me, is the most underrated element in agriculture. It's obvious in what we have achieved that we have recognised a problem. I've got growers in Californian specialty agriculture, who feed potassium every time they water.

Graeme: What sort of applications do they use?

Bruce: Just pounds per acre at a time, but they are irrigating frequently. We will also address it in the soil, and during the season we will be monitoring sap pH on grapes or whatever and if there is too much pH spread, we will foliar-apply potassium. There is no guessing involved here. The sap pH technique is correct. I've been doing this for twelve or fourteen years. I was hoping I would find an exception to the rule but I can't. Everyone says you can't compare onion pHs to grass pHs or tree pHs, but you can.

Graeme: The only exception I've seen to date is the rhubarb plant. This plant has a sap pH of around 3.5, even when it looks really healthy.

Bruce: It'll be like grapes. The grape growers in some areas will sometimes insist that the correct sap pH for their crop seems to be about 3. In both cases, you are looking at whacked out vibratory frequencies and you need to do something about it.

Graeme: Really? It seems to me that, if you are correct, and all our research to date suggests that you are, this is a major breakthrough in agriculture. How widely used is it in mainstream agriculture?

Bruce: Not widely at all. Bob Pike from Pike Lab Supplies uses and promotes it and then there's you guys. There are some other companies just starting to use it.

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Graeme: We include it as part of all of our training programs in Australia now. It's slowly becoming accepted in conventional agriculture, at least through our clients anyway.

Bruce: There are some problems. It's extremely hard to get a drop of juice out of some dry leaves. You should try cherry tree sometime, or almond trees. Good luck! People are looking at expensive presses, but there is another way. You can cut a whole cluster of leaves with a razor blade and you can get enough liquid by putting the cut leaf tissue right on that sensor and it will be enough to get a reading. You don't need individual drops of liquid. This is using the special Horiba sap pH meters, not conventional meters. Alternatively, you can use a dilution system with distilled water. You use a crucible and mix in a little distilled water.

Graeme: Do you need to make allowance for the dilution factor?

Bruce: Usually it isn't that critical because most distilled water will run between 6.8 and 7.

Graeme: Is there a direct correlation between sap pH and brix? Can we assume that the ideal sap pH of 6.4 will be equivalent to a brix of 12 or more?

Bruce: Not necessarily. Sometimes the pH balance is okay but the brix can swing a little either way - high or low. Usually, though, a pH of 6.4 will be pretty close to an ideal brix.

Graeme: You are involved in a wide range of enterprises, so I'd like to move on to cover some of these. You started as a plant breeder and you developed your own high-yielding dryland variety of wheat. It sounds ideal for Australian conditions. Has anyone used it out there?

Bruce: No, not that I know of. I've been out of that for some time but I still produce breeder seed, which is sold to people commercialising different varieties. This plant would have good potential for Australia. One of the places I got started with this had less than seven inches of rainfall and most of that never fell during the season. They were getting 25 to 30 bushels per acre normally there, and this took them up to 60 to 70 bushels, simply by changing varieties.

Graeme: That's exciting stuff!

Bruce: Yes, we would need to look at Australian import restrictions. Sometimes it can be very difficult.

Graeme: As a plant geneticist, you are well qualified to comment on the well-worn argument that genetic modification is merely an extension of conventional plant breeding techniques. What's your opinion on this one?

Bruce: I don't buy it at all. Interspecies barriers are there for a logical reason and we are trying to crash them. It just doesn't make sense to me. Ultimately it will come back and hurt us. There are already numerous disasters. The EPA would like to recall some of the early releases, but it's impossible to recall them once they have been released into the environment. There was one case where all legumes were taken out of production in a particular area because nitrogen-fixation was deactivated. I'm not saying that there may not be some potential good, but at the moment it's greed. These companies are just not doing their homework on all of the ramifications involved. Corn, for example, carries six different viruses which never express themselves. They use the cauliflower mosaic virus in the manufacture of many GE plants. What happens if DNA from the injected cauliflower mosaic virus happens to link with the DNA of the pre-existing natural viruses in the corn plant? We could see monstrous consequences. It simply hasn't been researched enough. This garbage about feeding the world for the future! So far, on average, yields have been 25% less. Apart from all the environmental consequences, no one has even looked at the effect on human nutrition. I did an experiment some years ago, adding excess phosphate to observe what happens to the amino acid structures of the proteins. I added extra nitrogen and glutamic acid went through the roof at the expense of all other amino acids. We can so easily make substantial changes to food and not even realise it, but sixty or seventy years down the track we could find the human race threatened.

Graeme: I find it hard to believe that people have allowed such a bastardisation of their food without a huge outcry.

Bruce: People simply don't know. People are kept in the dark. There is no labelling because they know what will happen.

Graeme: Yes, they are dragging their feet with the proposed labelling laws in Australia because they know that a GM label will turn off consumers.

Bruce: I feel like there is a great opportunity for a company to promote nutrition-based food. Put in the research dollars, teach farmers the best techniques to achieve maximum nutrition. Forget organics, just promote nutritionally balanced, chemical-free food. Monitor the people who are eating this food and I am a hundred percent convinced that you will not have the health issues.

Graeme: That's exactly our game plan over the next few years. Our entire system is devoted to the production of nutrient-dense, chemical-free food. We are already heavily involved in farmer training, with our own seminar centre and our four-day Certificate in Sustainable Agriculture course. The next step is to market this concept to the consumers.

Bruce: Yes, that's the problem in the US anyway. We are a junk food society, so how do you get people to eat this stuff?

Graeme: I'm sure they can be educated. I'd like to move on now to some of your other work, specifically your work with electromagnetic radiation. Is there any hard science to support the link between health problems and this form of pollution?

Bruce: The communications and power industries have a huge lobbying approach to control the release of any negative research results in relation to electromagnetic radiation. When the FDA and the EPA had jurisdiction over this issue, they were ready to release around four hundred studies, which were conclusive on the negative effects of excessive radiation from powerlines, conventional wiring in homes and cell phones. Lobby groups got to congress, congress got to the EPA and FDA and said that they no longer had jurisdiction in this particular area. As a result, the reports were kept quiet. At this point, no one is actually regulating the cell phone industry. I didn't believe it till I checked, but it's a fact. There is absolutely no regulation on the number of towers they put up or the intensity of the broadcast. They can construct a tower right next to the bedroom of your house as long as they can get a lease on the adjoining property and there is absolutely nothing you can do about it.

“I feel like there is a great opportunity for a company to promote nutrition-based food. Put in the research dollars, teach farmers the best techniques to achieve maximum nutrition. Forget organics, just promote nutritionally balanced, chemical-free food. Monitor the people who are eating this food and I am a hundred percent convinced that you will not have the health issues.”

Graeme: That's terrible. I'm aware of issues with radiation from computer monitors. Do the protective screens do the job?

Bruce: No, they don't. They usually just deflect. Usually, people sitting in front of protective screens have knee problems rather than hand or wrist problems. The best option are liquid crystal display flat screens, but they are expensive. We have changed to flat screens in our own office - it's better than having an electron gun pointed at you all day. They found that the IBM safety screens were causing problems with the person sitting at the next desk. In the office, there are other hazards, though. The copy machine or the printer can be a problem. I had a little laptop printer that gave off 100 milligauss unless you unplugged it. Copy machines are really bad. The best thing is to keep the copy machine as far away as possible from people. Are you fifty or sixty Hertz in Australia?

Graeme: I've got no idea.

Bruce: I think that you are fifty Hertz, which is better than sixty Hertz. The problem with our system is that sixty Hertz is also the carrier wave for a lot of negative things that can happen to the body. If you have a cell phone strapped to your hip, that instrument is broadcasting at sixty Hertz. You start complexing these influences and it creates total chaos.

Graeme: And your concerto technology has been designed to neutralise this chaos? If we were to plug in one of these devices in our office, would it neutralise all of the electromagnetic pollution?

Bruce: When you plug the Concerto into the wall, it accesses the power current and it sends out its protective field throughout the whole system. Unless you have a very large house, a single unit will cover the entire house. It may take two in a large office with large amounts of equipment. In a business situation, I usually advise people to connect the device without discussing it with staff. It may not be so relevant in your country, but here in the US there is a risk involved with being open. If someone had contracted cancer in the last twenty years, they would sue if they knew that electromagnetic radiation could have played a role. The thing to do is to connect the device and then observe the changes in your staff. How do they interrelate, how do they walk out of there each evening - exhausted or still energised? There is invariably less exhaustion and far less frustration in the workplace. They are actually a great investment for employers because happy workers are more productive workers. There can be some major changes in the dynamics of the workforce, and they are all positive.

Graeme: We will definitely buy a couple for the house and the office and, if we see a change, we would be very interested in marketing these devices for you in Australia. I'll move on to some of your other work. I understand that you have a biological approach for sodium management. Can you tell us about it?

Bruce: Yes, we have a microbial mix which reduces sodium. In one of our Californian trials, we started out with 1500 ppm sodium and four months later we were down to 500 ppm. It's pretty difficult to grow anything at 1500 ppm, but we told them to plant at the same time as the inoculation, basically because we knew it would work. They used 100 grams of a combined microbe mix per acre. They got the crop established and ended up with a good yield.

Graeme: How long does it work for?

Bruce: It doesn't stop working but chemicals are usually the limiting factor. If a customer applies a herbicide, I want to know what he is using because we pretty much know what chemicals will harm our microbes.

Graeme: Is this sodium-managing microbe cost-effective?

“The thing to do is to connect the device and then observe the changes in your staff. How do they interrelate, how do they walk out of there each evening - exhausted or still energised? There is invariably less exhaustion and far less frustration in the workplace. They are actually a great investment for employers because happy workers are more productive workers.”

Bruce: It's somewhere around US\$16 per acre.

Graeme: That's around Aus\$18 per hectare. That's a small price if it allows you to grow a crop where you couldn't grow one before. We've had good results using liquid micronised gypsum for sodium management...

Bruce: That's a good temporary solution, but all you are doing is displacing the sodium in base saturation percentages. You are playing a game, really, because it's really not going. When you use the microbes, they are actually transmutating the sodium into

something like potassium or vanadium rather than just pushing it under the rug as if were.

Graeme: Sounds like something else we need to look at. I wanted to ask your opinion about a humate product. We have been thinking about micronising raw humates to produce a liquid suspension that could bypass many of the incompatibility problems associated with alkaline-extracted humic acid. Do you think such a product would be as productive as potassium humates?

Bruce: Yes, I would think so. I'm surprised that some company hasn't spray-dried potassium humates to produce a soluble powder - that would really increase versatility.

Graeme: That's exactly what we've done with our potassium humate. It's available as a soluble powder or a soluble granule.

Bruce: Could you please send me some information on that product?

Graeme: Sure.

Bruce: There are a lot of sources of humates, and a lot of them are being oversold, in my opinion. There can be a huge difference between the bioavailability of different humates.

Graeme: I couldn't agree more. We found large differences in performance when researching products. The final choice was a Chinese manufactured product, which was head and shoulders above everything else we tested. Do you have any ideas about humates and animal health? We have a product called StockSaver(tm), which is based on sodium humates, fulvic acid and trace elements. Legally, we can only sell it as a mineral supplement, but we constantly get reports about semi-miraculous recoveries of sick animals. What's going on here?

Bruce: It's pure energy transfer from the humate material, because it was living at one time and that energy has been concentrated through compression. It's the same for leonardite shale or lignite coal. You have a concentrated life-force energy and, if you put that into a liquid drink for humans or animals, they're going to respond.

Graeme: We also market a colloidal mineral blend for human health, called LifeLine127, which is derived from humic shale. Is that what's happening there as well?

Bruce: As far as I'm concerned, you can cut out the focus on the minerals in these materials, it's this life force that's creating most of the response. When you feed it to animals, you are going to see some very interesting responses. I've done quite a lot of work evaluating some of these colloidal mineral products to try to establish if their claims are valid.

Graeme: What did you find?

Bruce: Well, we have an agricultural system that no longer delivers many of these minerals and, when you combine that with this life force, there can be some real benefits from these products.

Graeme: How much have you used your knowledge of frequency balancing in the design of your products and programs?

Bruce: At one point I was heavily involved in providing prescription products based on frequency analysis. I could take leaves from a tree, for example, and match the frequency of the tree into the product that was going to be foliar-sprayed onto that tree. It made a huge difference in the receptivity of that tree to that product. That's the key that nobody is looking at. I had a pretty good thing going for a while. I was shipping leaf samples out of Californian orchards, overnight with Fedex, at a major scale. I would fingerprint the frequency of the almond tree or walnut tree into the foliar product and ship it to them immediately. The response was incredible but the people who were dealing with it got tired of collecting and freighting samples on a daily basis and they didn't follow through on it.

Graeme: Could larger growers buy your frequency device and generate their own prescription program in-house?

Bruce: Yes, I guess they could. It's not a difficult procedure at all. It makes a big difference, because many times the crop will reject an input because there may be such a huge frequency difference between the crop and what you are putting on. It's not going to want to absorb this material at all in these cases.

Graeme: You never stop learning in this business.

Bruce: We do do 'normal' things as well, you know.

Graeme: One of your many areas of expertise is the use of sugars and carbohydrates as microbial stimulants. Do you have any secrets you would like to share?

Bruce: One of the little known benefits of sugar application relates to water generation. When the sugar molecule is broken apart, water is one of the byproducts. If you are dealing with extremely dry conditions, you can assist the microbes in establishing their own water base, which they normally do by digesting cellulose. Cellulose is nothing but sugar chains attached to each other and, as they break the sugar molecule, they generate water. If you feed them sugar in the absence of cellulose, they are one step closer to generating their own water environment.

Graeme: That sounds like a great tip for our drought-stricken farmers.

Bruce: We prefer to use sugar rather than molasses because it is easier for the microbes to deal with.

Graeme: I notice that many of your products are enzyme-based. What is the gain of applying enzymes in comparison to applying living microbes, which produce the enzymes?

Bruce: It's similar to the human body. Why do we benefit from enzymes in human health? It's because we are eating valueless food that has no enzymes in it, which means our pancreas has to take a lot of energy from our body to produce the enzymes we are lacking. It actually takes 80% of the energy from our body. If we eat foods with enzymes in them, then the pancreas is not taxed so hard and we have more energy available. In the case of microorganisms, if we apply enzymes to the soil, then they conserve energy because they don't have to produce all of the enzymes themselves. That surplus energy is usually directed toward reproduction and that's exactly what we are chasing. It jump-starts the microbes when the enzymes begin the cellulose breakdown and the breakdown of fats for them.

Graeme: That makes sense. When microbes are stimulated with sugar and molasses, there is always the risk of too much of a good thing. What are your feelings on this issue?

Bruce: You have to reach an equilibrium in each soil, depending on what it can support. I don't like to see a lot of sugar or molasses used as it can easily overstimulate the soil life. You can get a big spike, but then they can die back to less than what you started with. An enzyme-starter approach can help to avoid this scenario.

Graeme: What are the ideal application rates for sugar and molasses?

Bruce: You should apply molasses at 2 to 3 litres per hectare every two to three months. Sugar should be applied at 1 kg per hectare every two months.

Graeme: I'll just switch subjects a little. I'd like to ask you about potassium chloride. There are opposing camps amongst the sustainable agriculture people regarding the negative aspects of this fertiliser. There is a suggestion that you can get away with a certain amount before the chloride begins damaging microbes. Is the chloride content the main problem with this material or is there more to the story?

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Bruce: It's actually the charge of the combination ion that's causing the problem. It's interesting - from a human health perspective - you can do a reflexology test with potassium chloride and have someone hold some of it to their chest while you push down on their outstretched arm. Their arm will collapse immediately. You have to be careful that they don't have a heart condition, because this stuff can stop your heart. They suddenly have the strength of a baby, because the electrical charges of potassium chloride interfere with the electrical systems of the body, just as they do with plants and microbes. I've done all kinds of foliar tests with potassium chloride compared to potassium sulfate. We applied half of a centre pivot circle of potatoes with foliar-applied potassium chloride. Three days later and a week later we were checking the tissue to see if we were getting potassium uptake. There was zero, and yet we had to put on 440 pounds to the acre in total, in several applications. Then we took twenty pounds of potassium sulfate and put it through the centre pivot on the other half, and we had a huge potassium increase. We did the same thing on maize and got the same response. The plant can't take potassium chloride into the leaf and yet most of the foliar products out there contain muriate of potash. It's pretty hard to go past potassium sulfate as an efficient and cost-effective foliar potassium source. I remember an orchard program where we foliar-applied the potassium, but there was very little response on the tissue data. When the grower checked his one-tonne bag, there was no label. When we went

back to his dealer, they had given him muriate because they didn't think it would make any difference. This is a multi-billion-dollar chemical company.

Graeme: Do you have any tricks to get more potassium sulfate to dissolve and at a faster rate?

Bruce: The best thing is to warm the water - it makes a huge difference. You can get from one pound per gallon right up to six pounds per gallon [10 kg up to 60 kg per hectare] if you can get it hot enough.

Graeme: We have a microbe brewing unit with a heater, which would be perfect.

Bruce: Saturated solutions actually stay stable unless you evaporate off some moisture and then they crystallise.

Graeme: I was thinking about that frequency monitor of yours - wouldn't it be a good tool to demonstrate quality differences at seminars?

Bruce: I often used to use it at seminars. You could lay out ten carrots and pick the most nutritious. Usually that wasn't the organic carrot but rather the one where some fertilisers had been used in a sustainable system. I used to use it a lot but then I moved away from it because it was too difficult to explain to the farmer. Recently I was called out to problem-solve in an apple orchard situated beneath high-tension lines. The trees, after five years production, had split up the centre of the trunk and died. I took my frequency monitor and, when I arrived and touched it on the tree trunk. I was amazed to record 98 Megahertz. There were no leaves on the trees and the trees shouldn't have been over 20 Megahertz at that point. I took off the sensor and put on the antenna and it was 98 Megahertz under those powerlines. The trees were virtually on speed and that's why they were burning themselves out. They asked me to do something, so I extended the concerto concept to cover a large area. The changes were spectacular. That orchard block just totally changed. There were 70% of these trees which were scheduled to come out. They all recovered and the trees have never looked so good. This was a dramatic change from day one. I could measure it immediately with the frequency monitor.

Graeme: That reminds me of the results you achieved with the concerto in that wildlife park. Can you tell us about that?

Bruce: Yes, it's an interesting story. A large, privately owned wildlife park called me in because their trees were dying. They also had all sorts of problems with the wildlife. Disease and breeding problems had become a major issue. The park had leased ground for large microwave towers and they suspected that electromagnetic radiation was part of the problem. I built a large, solar-powered version of the concerto and set it up to cover sixty acres. There was, in effect, a sixty-acre zone of exclusion. Well, the changes were incredible. First of all, the reproduction rate began rising immediately. The trees began to recover and the disease problems reduced. The funny thing was that the moose, deer and elk in the park all congregated in the zone of exclusion. Sometimes the rangers would hop off their horses to check a fence a couple of miles from the zone and turn around and find their horses had gone. They would always show up back in the treated area. The most unusual thing was that the animals congregating in the zone of exclusion began to frantically eat soil until the whole area looked like it had been ploughed. For a while we couldn't figure what was happening and then we real-

ised that the animals were chasing minerals. Their natural free-choice ability had been compromised by the electromagnetic radiation. When the cloud was lifted in the zone, they knew that they needed minerals and they needed them now. The soil is the best source of minerals and hence the ploughing. The mineral deficiencies caused the disease and reproduction problems and the problems with the trees.

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Graeme: What an amazing story. It’s a major concern that electromagnetic pollution like this could be affecting wildlife everywhere, and it really makes you wonder about the damage to human health. Well, I guess I’ll have to wrap this up now. It’s been a fascinating afternoon. Thank you for your time. I’ll be in touch.

Bruce: It was good to meet you. Call in and see us again next year on the way to the Acres Conference.

Graeme: We will.

HUGH LOVEL

Interview recorded December 2000



Hugh Lovel is the principal of the Union Agricultural Institute in Blairsville, Georgia. He is one of the leading biodynamic consultants in the US, and he has recently polarised the BD community with his intensive promotion of field broadcasters, which transmit homoeopathic potencies of traditional BD preps rather than the conventional application of Steiner's formulations. During our interview, Hugh presented samples of some of his BD crops and

dried herbs produced using energy manipulation. If 'the proof is in the pudding', then we all should be researching his approach. I tasted one-week-old spinach, which had remained as crisp as the day it was picked. It was definitely the highest brix spinach I have ever sampled. When he unscrewed a jar of his dried herbs, the rich basil aroma virtually filled the room. If quality is the holy grail in this quest, then Hugh Lovel has some important messages for us all. For some time, I have followed Hugh's prolific postings on an Internet news group for sustainable agriculture, called Sanet - this is a great service which I recommend to all readers. The Sanet postings reveal a compassionate, highly intelligent writer and consultant with a true, creative insight and a wonderful turn of phrase. In his role as a regular Sanet contributor, Hugh has answered queries from all-comers, waged raging battles, revealed intimate details of his past life and, above all, he has tirelessly promoted his great passion - the science of biodynamics.

Graeme: I've followed your Internet postings with great interest for some time, but I missed your Australian lectures. What were your impressions of Australia's agriculture?

Hugh: Well, the impressions were both favourable and unfavourable. The most negative impression came as we passed through that cotton region just over the Queensland border in New South Wales. Apart from the pesticide rigs, what really caught my attention were the kids standing outside the high school. They looked utterly, hopelessly lost. The expression on the faces of these teenagers really appeared to represent what cotton farming was all about in this area - farming without a future. However, the exact opposite was true of the people we met throughout the country, who were looking to make a change or were already involved in alternative agriculture. These people were brimming with hope and enthusiasm. Their view of the land, family and people was 180 degrees opposite to those kids at the high school living amongst the laser-levelled landscape and chemical stench - it really was a ghastly scene.

Graeme: Unfortunately, many cotton farmers subscribe to the belief that the only good plant is a dead one unless, of course, it's a cotton plant. Cotton is often grown in the best of irrigated conditions, but even these very good soils have a 'use-by' date, particularly when the most basic biological principles are constantly ignored. Green

manure or cover crops would be of real value to feed these soils, but they are rarely used. The industry is beginning to change, though. We have quite a number of very good cotton growers as clients and the interest is growing.

Hugh: Yes, they have the water and the good soils, but they seem to be devoted to this hopeless chase after death. I really feel for any growers trying to make changes in the midst of that environment. Yes, it would take real conviction and determination, but I have seen biodynamic farms thrive in the midst of pollution. I was really intrigued with Greg Willis' vineyard out in Forestville, California, where he had used the first horn clay. This vineyard is situated beside and below a major highway. When you visit, you literally step off the shoulder of the highway, over a ditch and onto Greg's property. The highway was all overheated break linings, asphalt, rubber, grease, oil and diesel smells, but when you stepped over that ditch and moved down through the vineyard, it was this fertile soil smell. It was pristine - I thought - Wow!! So I climbed back onto the roadside and looked back down upon the orchard, kind of closing my eyes, and I could see a kind of dome over the orchard, like a protective bubble. I feel that the horn clay was responsible. It was like it had integrated the whole thing and set it apart, so all that pollution sort of bounced off.

Graeme: That sounds fascinating. I'll ask some questions about the horn clay concept later in the interview. There seems to be quite a synergy between some of your work and concepts found in radionics, or even Schauburger's 'living water' approach. How do these philosophies dovetail?

Hugh: Well, they do dovetail, these ideas. Each of these approaches deals with organisational, dynamic patterns of energy. In biodynamics, we call these the 'etheric forces'. The other approaches may use different terms for what is essentially the same thing. It's looking at things from the resonant pattern side rather than looking at them from the material, mechanical side.

Graeme: We have promoted what I've coined a 'fusion approach' to farming, where we take ideas from many different philosophies and combine them to produce a more functional hybrid. I know that there can be some rigid, dogmatic, almost puritan interpretations of Steiner's work. As a committed biodynamic theorist and practitioner, you may object to my proposal to use some of the biodynamic principles in conventional settings. You may view it as an unacceptable or unnecessary dilution. But, it seems to me that some of the biodynamic tools have considerable potential for use in any farming operation. The use of reverse stirring machines or flow-forms could theoretically increase the benefits of any liquid or microbial fertilisers. What do you think?

Hugh: Yes, there would definitely be benefits. I think the flow-forms would have more potential than the stirrers. For one thing, it is more aesthetically pleasing to use this equipment, it's got a real appeal to it and, if you could convince conventional farmers to trial this technique, they would notice the difference. In a flow-form, the water forms vortexes. In these vortexes, water separates into laminate layers of different temperatures and density. It is an organisational effect - the colder water - the denser water travels faster down the middle of the vortex, while the warmer water separates towards the outer layers of the vortex. Then it spills over and you've got chaos again, and then order arises again out of chaos and so on. In this process, the water evolves! You have generation after generation after generation of dynamically ordered forms in the water. The water at the bottom end of a flow-form is very different from its

original form. Even if farmers cannot understand what is happening, they can't help but see some differences. One of the things it results in is a densification of the pattern energy in the water and a reduction in the surface tension, giving the water a greater ability to carry larger molecules like amino acids instead of nitrogen salts. The results may be subtle at first, but the main gain is an improvement in quality, and this initial improvement will continue over a period of time.

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Graeme: During your presentation, you showed photos of your own corn crop grown without any added nitrogen. It was certainly impressive. You explained the results in terms of enhanced photosynthesis, which in turn produces plant sugars, a percentage of which is dumped into the root-zone to feed *Azotobacter*, which then provide amino acids for the corn. You never really described how you enhanced photosynthesis. Could you throw some light on this?

Hugh: Well, these things play off one another. The plant is supplying sugars to the root-zone and getting amino acids back, but normally it would get choked up with these amino acids trying to come back up through the stem. The horn clay plays a role in reducing the molecule size and making these aminos more manageable. When the amino acids are distributed, you get greater cell density and more complete protein, which improves the photosynthesis in the leaf.

Graeme: So, the improved photosynthesis comes from soil-based stimulation?

Hugh: Well, which comes first - the chicken or the egg? It's a two-way street. You are starting off when the seed sprouts, with the humus. This is the starter which makes the seedlings burst from the soil, and then photosynthesis begins. Then, when you enhance the pattern energy in the atmosphere with the BD 501, photosynthesis is more efficient, and more sugar is delivered to the roots. Because you've used BD 500 to create humus, you have a good team of microorganisms bunched around the roots, which can fix more nitrogen as amino acids. When the horn clay is also working in there, these amino acids are transported up into the leaf better, which improves photosynthesis. This, in turn, feeds the *Azotobacter*, which produce more aminos, and so on. It's a synergistic thing.

Graeme: That's a neat little summary of the biodynamic approach. Where did this horn clay concept come from? Did Steiner ever mention it?

Hugh: Well, I originally got it from Steiner's work and discussed it with Hugh Courtenay over ten years ago at one of my own biodynamic conferences in Blairsville. I mentioned that *“we ought to make some horn clay”*, and Courtenay said, *“I've made some clay!”* He had made horn clay experimentally back at the time he was studying

making preparations with Josephine Porter. Josephine died and there was no one besides Courtenay who was prepared to take up the work of providing preparations. So Courtenay put his horn clay on the shelf and got busy making horn manure and horn silica and the other biodynamic preparations, and to this day he still hasn't tried out the horn clay. The concept comes right out of Steiner's second lecture on agriculture, where he talks about the role of clay and its importance. He promises that later on he will give recommendations about how to treat the soil with clay, and then he fails to do this in his fourth lecture, where he describes the making of horn silica and horn manure. He does mention, in the making of horn silica, that you can put a plug of clay into the open end of the horn to seal it up. The technique originally involved about three-quarters of an inch of clay as a plug, but this clay was intended to be mixed with the silica to form the end product. The problem was that this information somehow fell through the cracks, and the clay plug was discarded instead of incorporated. For seventy-five years in biodynamics, clay was like the 'missing preparation'.

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Graeme: How widely is the clay used today?

Hugh: I'm really not sure. People are beginning to talk about it. It's no longer a handful of loners who are using horn clay. It is definitely gaining acceptance.

Graeme: Have you monitored many field applications of horn clay, outside of your own trials?

Hugh: Yes, certainly. Greg Willis is one of the pioneers. He had attended a biodynamic lecture conducted by one of the old Germans who mentioned horn clay. Greg asked how it was made and was told that Steiner never provided directions. Greg decided to make some anyway. He made four forms of horn clay: fall-to-fall horn clay and spring-to-spring horn clay, because it really should stand for the same periods as the horn manure and horn silica. Then he made spring-to-fall horn clay for a summer horn clay and fall-to-spring horn clay for a winter horn clay, in case he wanted to accentuate just one aspect of the preparations. Greg started using these preparations in his vineyard consulting work in California. He is a remarkably clairvoyant person. He can see pattern energies in colour and, when using this inner vision, he saw how the horn clay affected the vines - he was almost beside himself! He was saying, “*Oh boy, ooh boy! We've got it! We've got it!*” He started to talk about his experiences on the

biodynamic email list 'BD Now'. I joined this list and contacted him for samples. I made a homoeopathic series of potencies from these samples to use in my broadcasters. Greg advised that the best benefits were when it was used on clay soils. I ended up trying it on my own farm and, boy, oh boy!! I got great results.

Graeme: During seminars, I often allude to the critical balance between minerals, microbes and plants, but you are largely involved in a fourth dimension - the dynamic balance between the atmosphere and the soil. Can you elaborate a little more on this concept?

Hugh: Well, the very existence of the horn manure and the horn silica as opposite polarities shows that there are two sides to this story. A plant may grow out of the soil, but it is growing in the atmosphere, and all your photosynthesis and fruiting and ripening are atmospheric processes and they only occur in the presence of warmth and light. What goes on in the soil that we don't see - particularly in winter - is a digestive process and a capacitor-like build-up. It builds up in the winter until it almost becomes an explosive force. The more you move into the polar region, the more pronounced is this phenomenon. Alaska in springtime is like an explosion. Oh man! They grow cabbages the size of wheelbarrows up there, in six or eight weeks!

Graeme: Yes, I've heard about it before. I really must check out an Alaskan spring sometime in my life. How do we manage the dynamics of the atmosphere?

“A plant may grow out of the soil, but it is growing in the atmosphere, and all your photosynthesis and fruiting and ripening are atmospheric processes and they only occur in the presence of warmth and light. What goes on in the soil that we don't see - particularly in winter - is a digestive process and a capacitor-like build-up.”

Hugh: The dynamics of the atmosphere are related to warmth and light. Australia, of course, is a place with a whole lot of warmth and light. It's real atmospheric, and you see this in the bird life. You've got great bird life there. You come to somewhere like Minnesota here and there is nothing like the bird life. There is much less warmth and light. The places with the most warmth and light will ripen fruit best, or ripen grain well. All of that fruiting and ripening is based on patterns of activities that occur in the atmosphere. We can tell if we have a healthy, dynamic atmosphere by studying the cloud formations. Cloud formation is dense, with very clear boundaries to the clouds in a good environment. When the atmosphere is devitalised and disorganised, then you see very weak cloud formation, and the boundaries of the clouds are very indistinct

Graeme: But what's created this disorganisation?

Hugh: Well, pollution does an awful lot. Check out the cloud formations above a city during heavy smog. The boundaries will be indistinct and the formations very weak.

Graeme: And the broadcasters you are working with - are they intended to organise and vitalise the atmosphere?

Hugh: The broadcasters intensify patterns of organisation for both the soil and the atmosphere. The cloud formations above our farm are invariably more dense, with very defined boundaries. We can spot the difference as we approach our valley from miles away.

Graeme: We have intentionally steered clear of energetics, because some of the concepts are so abstract, they can often tend to alienate conventional growers. Anything that alienates tends to decimate our central purpose, which is to change the mainstream.

Hugh: I'm afraid I agree with you. Even here at this conference, the people who are interested in the use of energy in agriculture rather than the use of material are definitely in the minority. Oh boy, they are passionate, and they crowd around, waiting to hear the latest buzz, but the majority of the people at this Acres Conference want to hear about soils and products. They want to find out about something they can buy and apply. It has to be solid and concrete and they turn off to anything else. You would definitely alienate the majority. From my own point of view, I don't want to alienate people, but people need to understand the nature of reality.

Graeme: Steiner was an amazingly prolific genius. You seem to be cut from a similar cloth, with your multi-disciplinarian background. What is your academic history?

Hugh: Well, astrology to zoology. I've looked at the lot! [laughs]. I studied astronomy and psychology. I've always done extra curricular stuff. I was reading books on particle physics while I was studying organic chemistry. I've also studied religion, and I've always been involved in music. Steiner was really into sculpture and art. My mother was an artist and poet - there are similar interests.

Graeme: Steiner is usually described as a clairvoyant. What is your definition of this term?

Hugh: Well, the dictionary definition is 'clear seeing', but partly a clairvoyant is someone who, when he looks at something, he knows what he is looking at. A clairvoyant is also someone who can see energy patterns, auras or fields. It is also someone who can see at a distance. They can see things in the mind's eye that aren't in the body's physical location.

Graeme: This capacity obviously played a large role in Steiner's creative brilliance, particularly when it was linked to his enormous knowledge base.

Hugh: Yes, while he was studying the sciences, he was simultaneously tutoring in philosophy. He covered all bases - he was my kind of guy.

Graeme: I was intrigued with your quote that 'carbon is the philosopher's stone'. Could you please explain this concept?

Hugh: Well, I've studied organic chemistry, so it has a special meaning to me. Carbon chemistry is organic chemistry. Carbon is the atomic framework for an infinite, wondrous variety of forms. It takes on almost any kind of chemical bond and it manifests almost any kind of structure. The 'philosopher's stone is a concept from Alchemy. Carbon is the key to transmutation. The formative forces that are locked up with carbon extend to the nucleus of atomic form. Carbon forms the hardest crystals on earth. It is the master of all forms. In our culture, it has a mythological power, but on a

deeper level, the basis of our spiritual incarnation, in the physical, is carbon. Spirit is the prime mover in terms of alchemical philosophy. In that way, if you can link up with carbon, then transmutation is definitely possible.

Graeme: Is transmutation involved in biodynamics, where apparently minuscule inputs can create major changes, or is this a result of biological stimulation?

Hugh: There is a real need for some hard research into transmutation. The chemists and their financial backers need to make a serious effort to determine what's going on here. It's not that difficult to investigate inexplicable changes in nutrient ratios, for example. The problem is that the human brain becomes a variable in the research. A classic example of this phenomenon relates to the findings in Utah, where the first desktop fusion process was developed. This researcher saturated platinum with hydrogen and brought about nuclear fusion at tabletop temperatures. Some other researchers were able to duplicate this experiment, and this generated tremendous excitement. Others were never able to replicate the results, and a controversy developed. One of the things going on here is that the most highly patterned energy sources in our environment are our thoughts. What we expect tends to be what occurs. The cynically sceptical couldn't replicate the deck-top process, while the people who were open to seeing it happen, were able to successfully repeat the research. We need to research the human mind. We need to hook up people to biofeedback and study how thoughts can influence various processes.

Graeme: Biofeedback machines are becoming popular in Europe, to create a meditation-like state of relaxation in a very short time-frame.

Hugh: Yes, they can take you straight into Theta. Some of the clairvoyant capacities, like remote viewing, are only possible in Theta. I'd like to put together the leading researchers in psychology and physics and see what we come up with.

Graeme: Yes, it would be interesting. Returning to your approach in agriculture, I'm afraid that I tend to lean towards a more materialistic approach. If you identify a mineral shortage, for example, then you correct it. If you have 0.5 ppm of zinc when you need 5 ppm in a particular soil, it seems a little like pulling rabbits from a hat to trust that you can cover that shortage with biodynamic preparations that don't contain zinc.

Hugh: It is completely valid to approach deficits from a materialistic standpoint. I'm not invalidating your approach. I'm just saying that, when we see mineral imbalances, we look deeper to find out why we have the imbalance. I like to find the cause behind the cause behind the cause, then I can address the root cause with pattern energy, by adjusting the transcendental dynamic patterns.

Graeme: But often the cause is simply physical. Boron may have leached from a sandy soil in the tropics. Minerals may be depleted from growing crop after crop after crop on the same soil and they need to be replaced. Are you suggesting that you can address these problems by just managing the energetics?

Hugh: Well, actually you can, but it takes a good deal of skill and understanding, and these qualities are not abundant in the world today. There are rare intuitive skills involved. There are other ways apart from the buy and apply approach. Certain plants, for example, can change the mineral balance of the soil. Hemp, for instance, is noted for unlocking potash. There may be several reasons for this. It could be the mix of root

exudates produced by the plant and the type of bacteria hemp feeds in the soil. It may involve internal activities within the hemp plant. It may be that hemp influences the clay and humic colloids and exchanges some of the minerals in the outer shells around the clay particles with some of the minerals around the inner shells. It may even be transmutative, but whatever the reason, if you grow hemp, the next season a soil test will reveal more potassium. Buckwheat will provide a similar demonstrable increase in phosphorus. Different plants perform different roles and we can use this information to our advantage.

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Graeme: I agree that we should look beyond the blind correction of deficiencies. In fact, in some rare cases it can seem like pouring profit into a bottomless pit, because simply adding the missing mineral doesn’t solve the shortage.

Hugh: I’ve seen this happen on my own farm, when I had an imbalance of energy, which was driving nutrients downward into the soil. Boron and copper leached the worst, but potassium and magnesium also leached. In this case, I added the minerals and they disappeared. I added twice what was needed and that disappeared. I added three times the requirement, and there were still no gains on the soil test! When I went to the root cause and corrected that energy imbalance, the minerals were retained. Boron was the slowest to recover.

Graeme: Yes, boron will leach in the best of conditions.

Hugh: Boron is one of these things where the crop won’t fill out unless you’ve got it.

Graeme: Yes, we really try to encourage leaf analyses in all crops before flowering, to ascertain boron levels. It can make a tremendous difference to yield. I remember visiting a very good farmer in Western Australia and checking out his corn crop. He complained that the cobs had not filled completely for several seasons, and he suspected poor pollination. A closer examination suggested that a boron shortage was the more likely cause. This grower had lost at least 10% of his yield for several seasons, for the sake of a \$2 boron foliar before flowering and, of course, a leaf test to diagnose the problem. He had applied some boron at pre-plant, but the constant irrigation had leached it before it was really needed.

Hugh: Leaf testing and foliar correction is certainly valuable. You may have the nutrients in the soil, but you may not be getting it in the foliage and vice versa. You may not appear to have adequate nutrition in the soil, and yet it is there in the foliage. Leaf testing is also really useful, because it can tell you what the pattern energy is doing. The patterns of activity have a lot to do with whether or not nutrients show up in the leaf. Some of these patterns of activity may relate to the species of mycorrhizae and other species of symbiotic organisms in the root-zone.

Graeme: Well, we have certainly noted a huge difference in the capacity of plants to uptake calcium, and this appears to be related to poor fungal activity in the soil.

Hugh: Yes, those fungi are closely related to the patterns of activity - they are a major player. If you've got a handle on what the patterns of activity are or what happens in their absence, then you get to where you can just about look at the crop and know what's happening in the soil. I would really like to see people learn agriculture from the viewpoint of these different tests. Soil test and leaf test results should be seen in connection with the activity of different microorganisms and mycorrhizal fungi, so that you would know about those patterns of activity. You would see the crumb structure of the soil in terms of mineral and microbial balance. You would see a whole range of connections.

Graeme: Yes, and these are often connections that weren't really understood until recently. It is microbial analysis which has tied these things together. People were doing an Albrecht soil test and minerally balancing their soils. Then they would do a LaMotte test and find that they had no biologically available calcium or phosphorus. They would test brix and find low levels, and often leaf analysis would show poor calcium and boron uptake. When these people do a soil-life audit, they usually find they have no fungi present. Suddenly it all falls into place.

Hugh: Yes, see, that's one of the things about biodynamics, and a lot of biodynamic growers haven't appreciated this fully. When you use horn manure, you have got this whole fractal layering - it's like one level of complexity on top of another level of complexity in the pattern energy of that preparation. You take that BD 500 preparation and sprinkle out just a handful per acre, mixed with water, and it affects that whole range of patterns. It brings about the chemical and it brings about the fungal. You can do it piecemeal or you can do it from the point of providing a complex pattern energy like BD 500 or BD 501, and this makes it a lot easier.

Graeme: But if you ignore the other parts of the jigsaw, your BD preparations will not necessarily do the job. I've seen them fail on several occasions.

Hugh: Yes, I agree. You often see elitists who put out their BD 500 but don't understand the processes at work. These growers may fail. They may torpedo themselves by neglecting other parts of the picture.

Graeme: Tunnel vision is very rarely effective in any enterprise.

Hugh: Yes, there is a perfect example here in America in BD circles. A debate rages between people like Greg Willis, who I mentioned earlier, and the Demeter Association. This association suggests that BD preps should be used once a year. Greg Willis is saying, *"To hell with that! You've got to put it out as many times as is necessary to get it really working. If that's once, that's fine, but if it's twenty times, you have to do it twenty times! Why wait around for twenty years to achieve results?"*

Graeme: Are you currently certified with Demeter?

Hugh: Demeter allow the use of field broadcasters, to broadcast BD preps, but they are not permitted as a replacement for the physical application of the preps. At this point, I don't qualify for Demeter certification, because I just use my broadcasters. In all honesty, I am achieving a quality that is beyond anything I've seen come out of Demeter.

Graeme: I've tasted some of your produce, and there is no doubt about the quality. Could we use the BD preps in our conventional, albeit biologically oriented programs, and still achieve results?

Hugh: You most certainly could. We've seen this with our field broadcasters. People, who would never have used BD 500, may use it with the broadcaster and achieve results. Often they are still using chemicals as well.

“A debate rages between people like Greg Willis, who I mentioned earlier, and the Demeter Association. This association suggests that BD preps should be used once a year. Greg Willis is saying, “To hell with that! You’ve got to put it out as many times as is necessary to get it really working. If that’s once, that’s fine, but if it’s twenty times, you have to do it twenty times! Why wait around for twenty years to achieve results?””

Graeme: How would conventional growers access the preps? Are they only available to biodynamic growers?

Hugh: Not in this country. I've been selling BD preps all week at my stall. Most of them were made by the Josephine Porter Institute. I've never known this institute to withhold sales from anyone at any time. It may be different in Australia. I have never known the question to be asked in America.

Graeme: A question about the horn silica - BD 501. If we demystify or simplify its role - is it essentially magnifying the effect of sunlight via its quartz crystal structure and improving photosynthesis as a result?

Hugh: Yes, that is an accurate, simplified description.

Graeme: There is a growing interest in the mineral role of soluble silica in Australia at present. Does the 501 offer any mineral benefits?

Hugh: No, there is a separate BD formula based on the horsetail plant, which contains soluble silica.

Graeme: There are several preparations based on potassium silicate, now available in Australia. They appear to offer quite an anti-fungal benefit.

Hugh: The horsetail decoction works the same way. The plants really harden up after you spray it on.

Graeme: I know, it's quite amazing to see the difference in our trial plots. Queensland cane farmers are excited about some of their results using silica, particularly in relation to higher sugar levels.

Hugh: Well, one of the things that's going on here is, that when you strengthen the cell structure, the cell is not going to leak away as much energy at night. That's where sugars fail to build up. Levels build up during the day from photosynthesis but decline at night from this leakage. Soluble silica can help lock in the sugars more effectively.

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Graeme: Just one more question [It's 3 am]. I'd better let you get some sleep. If Steiner was alive today, do you think he would have made any major changes to his system?

Hugh: Well, I really believe that he would have placed a lot more emphasis on horn clay and its role in the system. I'm sure he intended to elaborate on agriculture in later papers, but he died before he was able to clarify the situation.

Graeme: Thanks for your time. I've really enjoyed speaking with you. I'll continue to enjoy your Sanet postings on the Internet.

Hugh: It's been a real pleasure. I'll see you next time I'm in Australia.

DR DAN SKOW

Interview recorded December 1998



Dr Dan Skow was a veterinarian with a passion for soil science when he sought out the brilliant soil consultant and human health practitioner, **Dr Carey Reams**. At that stage of his career, Reams had become something of a fringe-dwelling loner, but **Dan Skow** listened and learned. In fact, for the following decade Dr Skow became Reams' sole confidante, and he collected and stored a huge amount of taped and written information. **Dan Skow** has since become the leading exponent of the Reams approach to biological agriculture. He is the author of one of the leading works in eco-farming - 'Mainline Farming for Century 21', and he has helped to train other leading consultants, like **Dr Arden Andersen** and **Dr Phil Wheeler**. In 2001, Dr Dan Skow received an Acres USA Lifetime Achievement Award for his work in agriculture. In this interview, he reveals some fascinating new insights into the dynamics of energy agriculture.

Graeme: In the foreword to your book, there was a dedication to Carey Reams, with a comment that his approach would sweep the nation by Century 21. Are you happy with the progress to date?

Dan: Well, I guess it could have been faster, but this is partly due to the fact that I have divided my energy between agronomy, my agricultural company and my veterinary practice.

Graeme: I wasn't aware that you were still a practicing vet.

Dan: Yes, very much so. I have a practice which includes eight other vets and twenty-five staff members in Fairmont, Minnesota. It is difficult to do justice to both passions, but in terms of progress, I've trained over two thousand people in seminars. Many of these are consultants, and I assume that they continue to spread the word, but there really is no way of knowing just how widespread this philosophy has become. I've sold over one thousand copies of tapes of my courses, and these are used in many small groups around the country.

Graeme: Reams-based consultants, like Dr Phil Wheeler and Dr Arden Andersen, have both visited Australia a couple of times in the past year, and they have been received very enthusiastically. The word is definitely still spreading.

Dan: Yes, they are both doing good work. Tools like the refractometer are almost mainstream concepts now. Most people in agriculture in the US now know about brix levels, and a lot of them are aware of conductivity meters for crop monitoring and measuring electrical flow. When I first started, none of these concepts were ever talked about or used. The main change is that we have introduced science to agriculture. We have a way to check crops and soils in a methodical way, which can be duplicated. Peo-

ple never understood the principles involved in bringing about a quality crop, or why one crop has insects and the other doesn't have insects, for example.

Graeme: Yes, this is a significant thing just in itself. Yesterday you talked about latecomers assuming credit without acknowledging the shoulders they stand upon - what do you feel about this?

Dan: I guess it gives a clue about the general integrity of these people. It helps me zero in on where they are really at. There's truth, and there's not truth. If they behave like this, then they will also be deceptive in other areas. It means 'Beware!' in my opinion.

“Tools like the refractometer are almost mainstream concepts now. Most people in agriculture in the US now know about brix levels, and a lot of them are aware of conductivity meters for crop monitoring and measuring electrical flow. When I first started, none of these concepts were ever talked about or used. The main change is that we have introduced science to agriculture. We have a way to check crops and soils in a methodical way, which can be duplicated.”

Graeme: Actually, talking about Carey Reams - I recently wrote an article about him, but I had great difficulty sourcing background info. I actually had to contact Phil Wheeler and Arden Andersen for some sketchy background details. You spent more time with Dr Reams than anybody - Was this lack of information based on the fact that he never wrote or published a great deal?

Dan: Yes, you're right. Anything that he did write I have on my files. There's a paper about pH and energy that he wrote in his younger years, and a booklet called 'The Farmer Wants To Know', which I have collated and distributed. Apart from this, there were five or six other small articles, including a couple based on the nematode plague in Florida citrus.

Graeme: What was his approach for nematode control, just out of interest?

Dan: Well, many fertilising practices have contributed to a fall in carbon levels in the soil and an associated lack of water-holding capacity. When this happens, there is a salts buildup and this is when the nematodes come in. The nematode gets into the root when the salt concentration on the outside of the root is greater than on the inside. You get a dehydration and the bark on the roots splits, and this allows the nematodes entry. In a healthy soil, with a higher carbon content and better water-holding capacity, you don't get a salts buildup - the salts are more dilute. It is necessary to have some salts for crop production, just from the standpoint of carrying current through the soil, and you need mineral salts for nutrition, but an excess causes root damage, and the nematode can get in. Now, there are all kinds of nematodes present in a healthy soil, and many are less invasive than others. Their numbers vary with different management practices, but a healthy soil also contains certain microorganisms that are helpful in keeping nematodes under control.

Graeme: Yes, the carbon connection is critical here, because these beneficial bacteria need a minimum organic carbon content to proliferate. The carbon decline is a dual-edged sword here - increasing the sodium levels to magnify the likelihood of nematode problems and reducing the potential for bio-control at the same time.

Dan: Actually, the Japanese have produced a great video called 'Life in the Soil', which uses an electronic microscope to demonstrate microbes controlling nematodes either by consuming them or simply outnumbering them on the root surface and reducing nematode numbers through competition for food.

Graeme: Returning to Carey Reams for a minute - it strikes me that the biggest problem in popularising his concepts relates to his unfortunate choice of terminology. He gave existing terminology different meanings, which confuses newcomers and alienates academics. What do you think?

Dan: Well, yes, cations and anions have an opposite meaning in the Reams approach. In his courses on human nutrition he talked of Alpha, Beta and Delta cells. An Alpha cell was healthy, a Beta cell was borderline, and a Delta cell was a cancer cell. This is certainly confusing terminology, considering the accepted meanings of these terms. Before he died, we talked about this problem a lot. I have been challenged many times on this, and we agreed that, in classes, we should always clarify that this is 'by definition'. I continue to remind students that these concepts and ideas are 'by definition' and can only be understood in this context. This approach has helped to overcome a difficult situation.

Graeme: Was there any particular facet of his work that Dr Reams himself considered to be more important than any other?

Dan: Well, he introduced the concept of electricity and electromagnetic fields to soil science. Plants or animals function off electromagnetic fields. You balance soils from an electromagnetic perspective. Basically, you have so much positive charge and so much negative charge, and when you get one of them out of balance, you have sickness or disruption in the growth of plants.

Graeme: Do you see a connection between Phil Callahan's paramagnetism and Reams's concept of electromagnetic energy?

Dan: Yes, definitely. We are probably looking at a terminology issue again. You are dealing with electromagnetic fields in both approaches. The strength of the field and how you define it, is the question. There is no doubt about the validity of the paramagnetism concept - crops simply grow better in a paramagnetic environment. It's such a new area, there is so much that we still don't know.

Graeme: One more question about Dr Reams - he was a religious man, originally affected by a healing miracle that saved his life and inspired much of his later work. What religion did he subscribe to?

Dan: Well, essentially he was a Christian. He didn't have time for particular denominations, cults or sects. The point he often made is that most religions have a man they can point to and a tomb they can point to where this person was buried but, when you talk about Christianity, there is an empty tomb, and that's the difference he was pretty adamant about.

Graeme: I believe that Charles Walters from Acres USA has been a tremendous force in sustainable agriculture. His contribution is almost immeasurable. What role did he play in the regeneration of interest in the Reams approach?

Dan: Well, there are several things - Chuck has made an enormous contribution to the field in general, but in this case the most important thing was probably related to the development of the brix chart for different crops. Chuck came up to one of our seminars and did several interviews with Dr Reams, and that's when we developed the brix chart. The information for this chart came from Dr Reams's exceptional powers of observation. He was always looking and asking questions to determine why one crop varied from another. He told me that part of his insight came from his years working as a consultant for Bayer - the German chemical company that developed Aspirin. He was apparently involved in mineral analysis and lab work with this company - particularly with colloidal minerals. This is when he discovered soft rock phosphate and the properties of that material. Chuck Walters helped us crystallise these years of experience into a practical, diagnostic chart for brix analysis. This is one of Chuck's strengths - he has sourced and published a lot of this valuable information, which would have been lost or abandoned without him.

Graeme: It was particularly important in this case, when Carey Reams didn't write and so little of his work or knowledge had been preserved.

Dan: When I started working with Dr Reams, he was basically considered a quack by many people. His lack of written data was compounded by the fact that his speaking voice was very difficult to understand.

Graeme: It must have been very difficult to impart details of a complex system when both written and verbal communication skills were limited?

Dan: Yes, even in the recorded lectures and conversations it's extremely difficult to sort out the words. I've listened to some of his original cassette tapes in my library hundreds of times, and I'll still find statements and information there that I swore I've never heard before. One of my most important recent findings related to brix readings and their meanings. Normally, when you have a brix reading of twelve, for example, then this level is sufficient to keep insects out of crops, but for years I've had people contact me who tell me that they have got their brix to twelve, but the insects are just as aggressive as ever. It was ten years after working in the field and struggling with this discrepancy that, while reviewing the tapes, I found a section where Dr Reams stated that there were exceptions to the rule. Somehow I had missed this information earlier. When you use a refractometer, you are actually measuring the concentration of the dissolved solids in the sap. Electromagnetic energy is radiating out of that sap. If you have a short-chain polysaccharide and a short-chain dipeptide, you can still get a dissolved solids reading of twelve, but it won't radiate the energy required to deter insect pests. You need to have long-chain sugars and long-chain amino acids to radiate sufficient energy at brix twelve to do the job.

Graeme: What conditions favour the development of short-chain vs. long-chain sugars and amino acids?

Dan: Simplistic, acid-based fertility materials are the main contributors to the short-chain problem. They often don't allow the plant and the system to make long chains. The problem is not confined to the plant. Simplistic products like potassium

chloride break bonding down into short chains to the point where you get down to simple sugars, single sugar molecules or single amino acids in the soil. When this happens, the soil loses its electromagnetic cohesion - its structure. Processes happen much faster than normal. The soil becomes more susceptible to wind and water erosion - it becomes more compacted with poor aeration. Magnesium tends to build up, because it doesn't go through its proper cycle, and it then becomes difficult to hold nitrogen in the system. When the primary structure of the plant is based on short chains of sugars and short chains of amino acids, you have weakened plants that attract insects because of the energy radiating from them. Kirlian photography can confirm this particular phenomenon.

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Graeme: Well, how do we differentiate between two readings of twelve? How do we determine the potential influence of short chains in the composition of the dissolved solids?

Dan: Well, therein lies the dilemma - How do we define and identify the length of molecular chains in a plant? When we talk amino acid chains, we are talking about stringing together 150,000 to 200,000 molecules in a single chain, but how do we know how many of these chains are required to radiate enough energy to keep insects out? I don't know that answer. I can only explain the theory. It makes perfect logical sense to me from an electrical sense. The longer the chain of amino acids, the more energy there is, and the longer the chain of polysaccharides, the greater the energy. There is also a physical resistance capacity associated with long sugar chains. For example, if you get long enough chains of polysaccharides, you finally get to the point where you have what we call lignins, and they have a woody, hard, stiff structure, which makes it very difficult for the insect's proboscis to penetrate tissues. Simple sugars and amino acids cannot provide this protective barrier. Materials like soft rock phosphate and more complex fertilisers like kelp, fish and humic acids can help create the long chains we are seeking.

Graeme: Arden Andersen talks about another variable that can affect brix readings. He describes a phenomenon called 'false brix', where dissolved solids become trapped in the leaf and don't translocate to the roots, due to some sort of blockage.

Dan: Yes, that's correct. If you are ever at a loss to explain this particular phenomenon to your clients, then I suggest you acquire a copy of a video produced by Dr James Ott. It's called 'The Spectrum of Light'. He uses an electronic microscope to follow the flow of sap within the plant. By changing nutrients and light conditions, you can actually watch the sap just plug up. It's just like the molecules are flowing freely, and

then they jam and can't go anywhere. Often that area of the leaf will then start to decay and die, because of the interruption in oxygen and nutrient flow - We call that a disease.

Graeme: So you could theoretically have nutrients locked into an area and provide a false brix level due to the extra concentration?

Dan: Yes, that's correct. If there are significantly different readings within the plant, or if brix levels don't increase during the day, there is a likelihood that a blockage is the cause.

Graeme: 'Mainline Farming' was first published almost a decade ago. Have you made any significant adjustments in your approach during that time?

Dan: This is one of the dilemmas that I face. What's new? There isn't anything new. The same rules apply. I guess I have to learn about repackaging old concepts.

Graeme: You could produce a new book reiterating the general principles, but highlighting each concept with anecdotal evidence...

Dan: Yes, I could write another one verifying the base principles with case histories, but the approach remains as sound as the day it was written. It's just that in our society you are expected to come up with something new every year, even if you are just recycling.

Graeme: I disagree, there are several subjects that we have discussed today, which are not in your book.

Dan: Actually, the one thing that's not in that book is the issue I've just explained to you. The critical issue of the lengths of the chains. You are actually the first person I've sat down and talked to about it. This is something new I've learned since the last book.

Graeme: I feel that there are some other base principles that need more explanation and clarification. The concept of energy measurement (ergs) using conductivity meters, has some grey areas, for example: Phil Wheeler mentioned that, when dealing with small crops, the accepted conductivity range of 200 - 600 is actually significantly higher. He mentioned requirements as high as 1500.

Dan: Okay, this is another situation similar to the brix reading problem. There are a lot of variables in the ERGS reading. For example, the lower the carbon (humus) content of the soil and the shorter the protein and polysaccharide chains, the higher the conductivity (ERGS) required to grow a crop.

Graeme: Well, that's something else that wasn't in the book. I reckon you have another book inside there just waiting to come out.

Dan: Well, maybe. The longer the chains, the lower the ERGS required to produce a crop, and this of course increases your efficiency tremendously. We are using far more fertiliser than we should need to grow a crop because of what we have done to the soil. If you look at a highly successful operation, like the Lübkes in Austria and their composting approach, you will get some conception of what long chains can do. My partner Wendell and myself are amongst the few consultants who understand the benefits of this type of energy management.

Graeme: Do you ever intend writing a follow-up to Mainline Farming?

Dan: It's difficult - a new book would involve complete commitment. I still have many close clients in my veterinary business - it would be very hard to just walk away. Then there is the travel and motel rooms associated with promoting a book. It's fun for awhile, but it rapidly wears thin. On the other hand, there is important work to be done in agriculture.

Graeme: Charles Walters co-wrote your last book. How did this relationship work?

Dan: Well, essentially Chuck took one of my seminars which we both thought had gone well, and he translated it on paper - smoothed it out and presented me with the manuscript for any corrections. I thoroughly reviewed it, and twelve months later it was published.

Graeme: I'm surprised, with your animal health background, that you haven't moved into animal nutrition.

Dan: Oh, we have! We have our own brand of feed products, but it is packaged and presented very much along conventional lines. There is no mention of the technology behind the product design. It's easier just to go along with the system and avoid conflict.

Graeme: I guess we are lucky in Australia that we do not have such strong conformity pressures. It is actually beneficial for our company to highlight the advanced biological technology involved in our product development. We celebrate the difference from conventional products as a promotional tool.

Dan: I think you are definitely ahead of the US in this respect.

Graeme: I'm very enthusiastic about the potential of using brix and other measurements to rate and quality-grade food for the benefits of both consumers and growers. Consumers would benefit because they would know they were getting high-quality food with better taste and extended shelf-life, while growers who produced the best quality could be rewarded accordingly. The Japanese have already begun to grade food using brix readings. Do you know anything about developments in this field?

Dan: Well, actually Dr Reams wrote a paper on the measurement of produce, and it would be worth clarifying this at this stage. If you use a combination of brix and sap pH, you get a far better guideline. If you have a brix reading of twelve with an acid pH reading, the taste can be sour, but that same brix reading of twelve with a more alkaline pH will produce much sweeter produce. You can also include a measurement of sap conductivity to give a more complete picture. You can use this combination of brix, sap pH and sap conductivity and manipulate or control response with fertility programs or with the timing of picking. At the end of the day, though, you can't meet a minimum critical level unless there are adequate available phosphates in the system to bring that about.

Graeme: Yes, but it's only a combination of education and the right phosphate source which will help produce the desired response.

Dan: Yes, I believe that with today's technology and, if you have the right people and the right money, you can grow crops to meet specs. I have no doubt in my mind about it. When people understand the basic rules, it is not difficult. One rule I always hit hard in class is that "*all elements go into the plant in the phosphate form*". Now, I'm sure

that the academics could prove that elements can enter the plant in the non-phosphate form, but there's a catch to that. Most people don't know that. Elements need to be carried into the plant by phosphate to ensure a healthy cell. The health of the cell is the key point here. If we can make people really understand this fact, then current technology like lasers, infrared, or whatever, can be utilised to create significant change in a short time. Fruit and produce entering the human food chain could easily be monitored. It would revolutionalise the whole concept of food distribution and nutrition, but the other thing which would be phenomenal is that, once you achieved better shelf-life, better quality and mineral density, you could virtually revolutionalise society. Health issues, mental health problems, violence, etc could all be addressed with improved nutrition in our food. There are influential people with money who are now realising that 'something is not going right', and the stage is set for meaningful change.

Graeme: Yes, a recent TIME Magazine cover story referred to the rise in alternative health and nutrition. The magazine reported that the percentage of the health dollar spent on natural health and supplements actually exceeded the money spent on traditional medicine and drugs for the first time ever.

Dan: The same thing is beginning to happen in agriculture, but it is not easily measurable. I call it the underground. The problem is that most of the change isn't trackable.

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Graeme: There is a remarkable change happening in contemporary agriculture. For example, our company, Nutri-Tech Solutions, is quite probably the fastest growing Ag company in Australia at present. We provide a logical, scientific and analytical approach, which is designed to build fertility and production profitability, but marketing and promotion are still essential. The message must be screamed from the mountain top. In this context I'm really disappointed with the mainstream promotion of this Acres USA conference. There are probably fifteen or more published authors addressing this conference. We are talking sustainable, non-toxic food production, and this is a central issue in society as we approach the new millennium. Degenerative disease is running rampant, and people are seeking answers. The leading proponents of the only real solution are gathered together here in Minneapolis, but there is absolutely no press coverage! Where are the newspapers? Where are the television cameras? It seems that a 'them and us' siege mentality reigns in this country. If you have a message that must be delivered to society, then what is the point of keeping it to yourself? There is no real gain in preaching to the converted. It also becomes a self-fulfilling prophecy if you see yourself as a closed group. This simply isn't the reality at present, but you will create a relatively insignificant, exclusive clique, if this is what you believe and promote. The aim of eco-agriculture is to increase the quality of the food which sustains us all. If we

accept this premise, then we shouldn't be directing our efforts at the 2% of organic adherents. It is the other 98% which can create real change. Often it's as simple as a phone call to generate media interest, but no one appears to have done it here for some reason.

Dan: I don't know the reason here. I don't have an answer for it. I just don't know, but I can tell you that Acres USA have had considerable problems in the past from the powers that be. I agree that this may no longer be the case, but a bitter legacy remains, and it may take some time to overcome these prejudices.

Graeme: There is a whole new mood happening, and those who can ride the wave and those who can satisfy the needs will change agriculture, but I'm digressing here, so let's get back to the interview. There seem to be considerable gains in combining humic acid with urea to dramatically extend the release pattern of this unstable nitrogen source. The urea bonds to humic acid to the point that some labs can no longer identify the urea when it is combined with liquid humates. In fact, they often identify the nitrogen as organic nitrogen.

Dan: Are you aware of the chemistry of humates? One of the reasons that humates have never really been developed in conventional science is because they haven't figured out a way to measure humates for activity so that they can standardise it. Humates are what we call an oscillating catalyst, and the bonding sites are so huge on a molecule of humates once it's in solution that, when you send it to a lab, it's not measurable. There are other variables, like temperature and sunlight, which further complicate the situation. It's very difficult to effectively standardise a liquid humate and come out with any kind of conclusion. This is a problem with biological agriculture in general. For example, if you try to split a water molecule, it takes a humungous amount of energy to get the oxygen and hydrogen separated. However, in the right circumstances, an enzyme can do it in split seconds. It's a whole different ball game.

Graeme: I guess there will always be problems with trying to quantify a living system, and, if the scientific method demands repeatable, accurate measurement, then biological farming will often fail to qualify.

Dan: Yes, conventional, academic science utilises Pope's postulates, where you have to have a certain methodical step-way. Biological science doesn't always work within these rules. Returning to the use of humates - when you add humates to NPK, you are effectively creating a synthetic organic. You are creating an electromagnetic field. You can actually achieve this simply by adding simple sugars to NPK products, but the difference is that the chains in a humate molecule are tremendously long. These long chains will help to build a higher electromagnetic sap, a sap capable of increasing insect resistance, as we discussed earlier. The bottom line is that humates are the ideal material to include with nitrogen or other fertilisers, because they include the long chains, which are essential to withstand insect pressure.

Graeme: I'd like to change tack a little. Phil Callahan talks about the importance of carbon to magnify paramagnetic energy. You speak about carbon increasing electromagnetism. Are you talking about the same phenomenon here?

Dan: When you blend organic carbon with paramagnetic rock dust, you're adding a water-holding capacity to the rock dust, and you are, in effect, creating an electromagnetic field. It is really no different to adding humates to urea. Returning to this concept

- When you do this, you can pre-program your nitrogen life for the crop cycle. The longer the chain in the carbon source, the longer the nitrogen will last. The nitrogen mixed with humates becomes slow-release and improves your efficiency tremendously. Liquid fish can also be used for this purpose, and it also offers rare earth minerals and several other benefits. It has to be saltwater fish, though.

Graeme: A couple of last questions - what is your opinion of no-till farming?

“... when you add humates to NPK, you are effectively creating a synthetic organic. You are creating an electromagnetic field. You can actually achieve this simply by adding simple sugars to NPK products, but the difference is that the chains in a humate molecule are tremendously long. These long chains will help to build a higher electromagnetic sap, a sap capable of increasing insect resistance, as we discussed earlier.”

Dan: Long-term, I think, no-till farming is pretty dangerous. Sooner or later you're going to need to work in your crop residue. In some areas, if you leave the crop residues on the surface, in hot conditions you will oxidise the carbon and you are left with ash. Here you get a salts buildup, and over time you also get stratification of the elements in the soil, and nutrient deficiencies begin to develop. Even if you work in the residue into the top couple of inches, it's more acceptable.

Graeme: The other problem is the fact that no-till requires massive blanket herbiciding, and the soil-life damage associated with this practice cannot be justified.

Dan: Yes, the ecological damage here is scary. Cornell University have researched the impact herbiciding has on the algae in the soil. Algae are single-celled plants which are destroyed by herbicides. Algae produce sugars through photosynthesis, as all plants do. These sugars are the food source for the bacteria and fungi in the soil. When you wipe out the algae, there is no energy source for the rest of the system.

Graeme: What are your feelings about the use of microbial inocula?

Dan: Well, we use them, but you must always remember that there are three basic requirements for microbes - you have to have air, you've got to have water and you have to have some sort of food source. There are many soils where one or all of these three elements are lacking. There is no point in adding microbes until you have corrected these problems, because they won't survive for long. Every single microbial species has an environment in which they function best.

Graeme: Is there much gain in using sugar sources in the soil, other than sugar or molasses? I know some consultants prefer dextrose or fructose in some soils, particularly when electronic scanners are used to determine requirements.

Dan: I've had clients who like to use dextrose, but I haven't really seen much evidence that suggests that they work any better than sugar or molasses. When it comes to scanners, it must always be remembered that the mind has a very strange way of being very biased. Scanners are notoriously unreliable because of this fact. The bottom line

with sugars is that they all do the same thing - they stimulate microorganisms, and they extend the life of NPK fertilisers.

Graeme: Thank you for your time, Dan. It's been most illuminating.

Dan: I've enjoyed speaking with you.

PROF PHIL CALLAHAN

Interview recorded December 1998



*In his book, 'Tuning into Nature', demonstrated that insects respond to infrared emissions from plants. Minerally unbalanced or sick plants produce a completely different emission. Insects home in on the sick and weak and complete their task as nature's garbage collectors. **Prof Philip Callahan, PhD**, the author of seventeen books and over 150 published papers, is widely regarded as a leading light in sustainable agriculture. His breakthrough work with insects and infrared radiation is a milestone in the understanding of the link between nutrition and pest pressure. Phil Callahan's development of the PCSM device for measuring paramagnetism has effectively lifted his findings out of the realms of abstract theory, and various companies have begun serious work with the concept. **Prof Callahan's** more recent research and discoveries in relation to paramagnetism are only just beginning to achieve widespread acceptance. Paramagnetism in agriculture is a powerful growth force that enhances root development and stimulates the multiplication of microorganisms. **Prof Phil Callahan** is an extraordinary scientist because he has the capacity to bring together the threads of many disciplines and piece together a new picture. I trust you will enjoy his fascinating story.*

Graeme: In the forward to your book on paramagnetism, your editor, Fred Walters, stated that you consider your work in this field to be the most important of your life. Are you happy with the impact of your findings in regard to agriculture?

Phil: Yes, I'm very happy. There are numerous farmers who attend these Acres USA conferences who have tried the concept successfully. Also, in your country some of the big corporations are now working with paramagnetism and plant growth. The book really got things started, because competent people can sit down and read the book and then go out and find out for themselves.

Graeme: The reason I asked if you were happy with the progress relates to what I consider to be snail's pace progress with your other major discovery. For the sake of readers not familiar with your work, I'm referring to your discovery that plants emit infrared radiation, which magnifies scent molecules. Insects use their antennae to detect the source of these molecules. Healthy plants emit a different signal than unhealthy plants, and insects are more attracted to the nutritionally deficient plants. This incredibly important finding has largely been ignored by entomologists, but the military were quick to see its significance. In fact, the heat-seeking missile was developed as a result of your work. How do you feel about this?

Phil: I'm satisfied with my paramagnetic work, but you have to differentiate between my infrared insect work. We are still working on projects, which will mean that eventually we will be able to generate frequencies that will attract insects. My interest in paramagnetism began with a study of sacred places. I visited these sites all over the

world - Catholic, Buddhist, Moslem - even Australian Aboriginal sites. I noticed that the plant growth is always better at these places and they always seemed to involve rocks. Further investigation revealed that these rocks were highly paramagnetic. The point is that this force was already there. I didn't discover it. It is there to be harvested. The archaeologists would call this 'gathering'. Good farming is not synthetic; it must involve working with nature rather than synthetic poisons. Paramagnetic materials are there to be harvested. Good farming is 'gathering'. In terms of the electromagnetic work - what I did there was to look at the insect's antennae, because I was experienced in radio technology. I spent the war in Ireland at a top secret radio station. The system I worked with was not a solid state system that you turn it on and it keeps working. It was a vacuum tube system, and it worked for 24 hours a day for two years to keep the coastal command planes finding their way home. I had to keep this system in there at all times. If I made a mistake there might be 300 dead pilots. I was tied to that station, but I learnt a lot about radio. Eventually I looked at the insects antennae system and said, "*Well, it waddles like a duck, it looks like a duck and it quacks like a duck - it well may be a duck*". So I started experimenting. A simple \$2 experiment put me on the right track. I took a corn plant and used a box to diffuse the scent from the plant. Beside the box I placed a piece of hairy cloth (which is hairy, like corn silk) and shone a blue light on it. Out of 2,000 eggs laid by the corn worm moth, 1990 were laid on the piece of hairy cloth instead of the corn plant. From this simple experiment I realised that the energy from the light was combining with the energy from the scent and raising the power of the scent far higher than what it was at the plant or point of origin. I realised that scent was involved and that scent was really acting as an oscillator. It's all common sense. If scent is an oscillator, then you start looking for the frequency. The infrared part of the spectrum was the obvious choice. The problem with gaining acceptance of these new concepts relates to the fact that entomologists are tied to 100 years of olfaction theory, which does not cover the concepts of scent and frequency. With paramagnetism you simply need to apply a highly paramagnetic crusher dust to see the results. Farmers are practical scientists - if it works, they do it. With the infrared work it involved disturbing the status quo, and that's a lot harder task.

Graeme: It's also easier with paramagnetism, because you've developed your PCSM [Philip Callahan Soil Meter]. When growers see the direct relationship between productive capacity and the reading on the meter, then the whole concept has been lifted out of the realms of abstract theory. It virtually can't be denied.

Phil: Actually, the entomologists could repeat some of my simple experiments and they would see what is undeniable, but they don't want to because they have a mind set against it - a paradigm it's called. There is no paradigm against paramagnetism, because no one ever heard of it before.

Graeme: I understand that your latest research suggests that paramagnetic materials are a source of subterranean light to increase root growth. Can you explain this phenomenon?

Phil: Yes, paramagnetic force is light from rocks for the roots. The rock is actually a transceiver collecting magnetism from the cosmos and throwing it back out to the roots. If you take a paramagnetic rock and put it into Dr [Fritz] Popp's lab in Germany and measure it with his instruments which count photons one at a time, you'll find that a highly paramagnetic rock puts out 2,000 to 4,000 photons. If you put that rock with

some compost, if you treat it organically, it goes from 2,000 to 4,000 photons to 400,000 photons. Now you are generating a light for roots. Roots are wave-guides, just like the antennae on insects. If you clean off the roots and shine a light on them, they'll wave guide just like a fibre optic. Dr Popp has a \$100,000 instrument to measure light in the form of photons. I can demonstrate the phenomenon with a \$200 instrument called a pinhole camera. You just drill a hole in the lens cap and tape a rock to the camera in total darkness. In three weeks you can develop a film that will show lights with every colour in the rainbow. There are so few photons coming off, you have to leave it there for three weeks to get it, but the film is sensitive to light, and if you leave it there long enough, you'll get a picture. This is irrefutable proof that paramagnetic rock generates light. Remember that plant roots are there for three months minimum, so they get plenty of light.

Graeme: That's fascinating stuff, but it's only a recent finding. Was this how you always theorised it was working?

Phil: Well, in this case I knew it worked, but I had to find the mechanism of how it worked. Some of my experimental work suggests huge increases in plant performance. For example, I took rye grown in sandy soils with a paramagnetic level of 60 and fed those soils with paramagnetic rock. The rye, before treatment, had 10 to 15 nitrogen nodules on the roots, but after treatment the number increased to 200 nodules. It suggests that the bacteria in the soil can't convert minerals into a plant-available form without this paramagnetic force. They will never utilise all that fertiliser they're dumping on them without the paramagnetic force. This force is to roots what light is to chlorophyll. If you don't have light, then chlorophyll can't work. If you don't have paramagnetic force, then the roots can't work.

“You just drill a hole in the lens cap and tape a rock to the camera in total darkness. In three weeks you can develop a film that will show lights with every colour in the rainbow. There are so few photons coming off, you have to leave it there for three weeks to get it, but the film is sensitive to light, and if you leave it there long enough, you'll get a picture. This is irrefutable proof that paramagnetic rock generates light. Remember that plant roots are there for three months minimum, so they get plenty of light.”

Graeme: Well, we've had a recent experience which confirms exactly what you are saying. I'm not sure if you are aware of our company, Nutri-Tech Solutions. We specialise in fertility analysis and personal prescription blends, utilising a combination of Albrecht soil balancing principles and biological activation techniques. We have recently begun importing your PCSMs to further expand our coverage. Our approach has been remarkably successful, to the point that we are now the fastest growing Ag company in our country. Recently we had a rare failure. A couple growing lychees in North Queensland had experienced three years without fruit and they turned to us for help. A soil analysis revealed deficiencies in almost everything. We produced a prescription blend covering all deficits at quite a cost to people in their position. Unfortunately we still didn't get a crop that season. We were really scratching our heads at this

stage, so we shouted them another soil test to see if we could diagnose anything. Their soil sample arrived at the office the same day as the first shipment of your meters. We decided to test the soil for paramagnetism. That soil measured minus twenty on the meter! Paramagnetic energy was the limiting factor here, and, as you said, all the fertiliser in the world couldn't correct the problem.

Phil: Well, none of this stuff is going to work without some of this paramagnetic energy. It can't work without light.

Graeme: This really is an amazing discovery. It's so important for those with non-volcanic soils.

Phil: I'll tell you, Graeme, and I'm not saying this because of me - I don't even care if they give me credit for it - I'm trying to save the family farm. This is, in my opinion, the biggest agricultural discovery in the last century, but I didn't discover paramagnetism - I discovered the use of it. That's the difference.

Graeme: Nevertheless, I believe that in fifty years time, when we evaluate the central figures in Twentieth Century agriculture, your name will be there, and so will Charles Walters' name [the founder of Acres USA].

Phil: Absolutely. It had better be. Without him I wouldn't be here. You're talking about getting the message out. I could have written 1,600 articles and fifty books, but without his newspaper it would mean nothing.

Graeme: It's not just you. Albrecht's work would have been forgotten. Carey Reams, Arden Andersen, Dan Skow, Phil Wheeler and many others would have been voices in the wilderness.

Phil: Chuck Walters deserves all of the thanks. I'm just having fun. Chuck is a remarkable man, but he has to suffer enormous stress in the process. I don't really care - I survived in the war in situations where my life was on the line. I just laughed at them. They really don't know what to do then. You're supposed to be afraid. The IRA or the Protestants; I was situated in the hot spot of all Ireland - an American radio technician - an alien. It is equivalent to taking an Israeli soldier in uniform and pulling him into the middle of a Palestinian village. That was my situation in World War II, but I somehow survived.

Graeme: How old were you when you were positioned in Ireland?

Phil: I was eighteen years old, in charge of a \$100,000 radio station, 24 hours per day, totally by myself. It was a huge responsibility. They wouldn't do that today.

Graeme: You speak as though you were in enemy territory - surely Ireland was an ally?

Phil: At present, there are an average of two terrorist incidents per month in Ireland. When I was there, there were 147 incidents in a three-month period. There were numerous infiltration attempts by the Germans during that period. A stranger can't walk through the Irish countryside unknown. Not a single soldier ever made it through. If they had, I wouldn't be here now!

Graeme: I can understand your casual approach to life, having survived something like that at such a young age. I'd like to ask you a few questions about the mechanics of

paramagnetism for my own benefit and for the readers. Is there any relationship between paramagnetism and brix levels?

Phil: A recent article in Acres USA cited research where there was a six-point difference between low and high-paramagnetic soils. It's not the complete answer, but it certainly plays a role.

Graeme: In your book you suggest that compost, microorganisms and paramagnetism are the principal ingredients in sustainable agriculture. We use a lot more inputs than that and, from experience, I feel that this analysis is too simplistic. Calcium, potassium, phosphorus and trace elements are often still necessary inputs.

Phil: I'm not anti-chemical. Like Arden Andersen and Phil Wheeler, I believe that muriate of potash is indefensible, but the point I am making is that, if you don't have paramagnetic energy in your soil, then the fertilisers you are applying are simply not being utilised. The family farm is at risk because money is being wasted. If you need nitrogen, then use the best source for your soil, but don't use anhydrous ammonia. I'll tell you something about this product. Research has been cited, suggesting that earthworm counts can increase following an application of anhydrous. Now, earthworms are considered the epitome of high fertility. The fact here is that ammonia attracts insects, and it also attracts earthworms. Dead roots out-gas ammonia, and earthworms track this emission, because dead organic matter is what they feed on. You really have to understand the bigger picture when analysing anything. The tendency toward rigid, narrow-minded disciplines, considering just a little part of the picture, is dangerous. A holistic approach is essential.

Graeme: We offer a free service to growers, measuring local crusher dust to determine the fertilising potential of these materials. Basalt is the predominant paramagnetic material in Australia. There is a huge variation between samples, with a variation between 100 and 3,000 CGS on the meter. Why is there such a variation? What exactly is it that determines levels of paramagnetism?

Phil: This is pure speculation. I'm not a volcanologist, but there appears to be a relationship between the amount of magma in an eruption and the paramagnetic level of the rock erupted. Magma is from down low - many small eruptions simply don't contain this deep material. Heat is the key ingredient - even simple composting can lift paramagnetic levels. Compost alone can lift a soil from 30 to 70 CGS.

Graeme: We've increased paramagnetic readings in the soil by up to 700%, simply by correcting the calcium/magnesium ratio and lifting oxygen levels in the soil.

Phil: Oxygen is the key here. It is the most highly paramagnetic gas. When magma has erupted, it rains down and it picks up oxygen. There is a link here between the heat and oxidation.

Graeme: There is one interesting phenomenon I would like to discuss - We do some work in an area in Queensland, called Blackbutt. I've seen your references to optimal and high paramagnetic levels, but this particular area reads far higher than any of the soils you mention. Paramagnetic levels range from 3,000 to 10,000 CGS. The interesting thing is that, even at these elevated levels, there is still a difference in yield between soils measuring 3,000 and those measuring 10,000. Even more interesting, soils mea-

suring 7,000 were still showing a visible benefit from the application of basalt crusher dust which measured just 2,000 - Can you explain this?

Phil: Here you are looking at remineralising benefits - it may be cobalt or iron. Phil Wheeler suggests that nickel is often the missing link. Whatever the case, the response from the crusher dust isn't coming from paramagnetism here. Paramagnetism stimulates bacteria to increase the bioavailability of micro- and macro-nutrients but, if you don't have those nutrients present, you won't get the desired results. You could theoretically have a soil measuring 15,000 CGS, but without calcium it would not produce.

Graeme: How reliable is paramagnetism as a plant growth stimulant? Can any grower source a good crusher dust, apply it and expect to see results, assuming that his existing soil levels are low?

Phil: No, definitely not. Soil life is the thing - paramagnetism works with compost. There may be hundreds of organic growers out there doubling their yields, but, when you apply the same material to a dead, chemically farmed soil, it won't work. If you don't have a minimum level of organic matter, paramagnetism doesn't work. I've even trialled it at home. Both of my turnip plots have had paramagnetic material added, but one has also had compost. There is no comparison between the growth - compost is the key.

Graeme: That's interesting. I had no idea that the link was so strong. Is there a one-on-one relationship between increasing organic matter levels and response from paramagnetic materials?

Phil: It's pretty complicated, and we haven't yet done the research to be able to be that precise. There's another ten years of work here, and I can't do it all.

Graeme: One of your strengths has been your capacity to bring together the threads of many different disciplines to offer a more holistic explanation. This is in direct contrast to the reductionism of modern science. Has this broad-stroke approach proved a handicap in terms of mainstream credibility?

Phil: The generalist approach is not for anyone who wants to win a Nobel Prize. Chuck Walters gave me a prize last year, a little glass plaque, and I said "*This is my Nobel Prize.*" It wouldn't mean a hill of beans to me to win the Nobel Prize. I mean, the guy who invented DDT got the Nobel Prize. Credit is rarely given where it is due. My favourite example is the Nineteenth century scientific genius, John Tyndall. Tyndall actually discovered penicillin eighty years before Sir Alexander Fleming. He discovered that scent molecules absorb infrared radiation. He actually said that this is the way olfaction works. Tyndall also discovered paramagnetism, so both of the things I'm working on today were discovered in 1850. This is so often the case in science, but there is so much dishonesty in this industry. Egos cover the truth and credit is not given where it is due. I actually discovered these things myself, but then found later that Tyndall had found it before I did.

Graeme: One more question about measuring paramagnetism with your meters - How do you differentiate between ferromagnetism and paramagnetism, when both affect the meter reading?

Phil: Yes, that is a problem. Obviously the ideal is a material with low iron levels and a high paramagnetic reading.

Graeme: We work with a scoria / crushed lava product, called Nutri-Score Crushed Lava, which has a reading of over 3,000 but it only has 7 ppm of iron. We often combine it with other materials that have water-holding capacity, like soft rock phosphate and humates and then pump a microbial inoculum into the blend. When the scoria fines are part of the blend, the microbe count jumps from 1 billion per gram to 2.5 billion per gram.

“My favourite example is the Nineteenth century scientific genius, John Tyndall. Tyndall actually discovered penicillin eighty years before Sir Alexander Fleming. He discovered that scent molecules absorb infrared radiation. He actually said that this is the way olfaction works. Tyndall also discovered paramagnetism, so both of the things I’m working on today were discovered in 1850.”

Phil: That’s right. It works every time, but in the soil you have to remember that you still need all of the chemicals in the right balance. You will still need nutrition to benefit from paramagnetism. It’s part of a bigger picture. Science is supposed to study nature. When you see something happen, you experiment with it, then you try to engineer it. This is when the math’s comes in, but it should come in after the experiments, not before. Thousands of researchers sitting around with computers theorising. That’s not the way science is supposed to work.

Graeme: One other thing we’ve noticed is that paramagnetic levels are usually higher on elevated ground. Even in the Queensland case, where levels varied between 3,000 and 10,000, the higher readings were found at an altitude of just four to five hundred feet [approx 120 to 150 metres]. What is the explanation of this?

Phil: Yes. When the volcano erupts, the magma comes up from the bottom. It forms droplets and is charged up with oxygen. When it drops back down, more of it will land near the top of the cone. The wind gets hold of it and spreads it more thinly elsewhere. The weaker stuff will always be at the bottom.

Graeme: You make a statement about the purpose of weeds in your book. You suggest that weeds are present when nutrients are missing and that they serve the function of nutrient recycling, bringing up nutrients from down deep and often actually increasing paramagnetic levels.

Phil: Yes, that’s correct. They are a deficiency signpost, and they do recycle. The increased paramagnetism is to do with the extra minerals and the extra oxygen allowed into the soil when weeds help condition the soil.

Graeme: But when you weigh up the nutrient and moisture competition related to having weeds in your crop, do you still consider that we can live with them?

Phil: Often we can. There are many times when we overestimate the competition caused by weeds. We also have to look at the alternative, which is herbicide. All herbicides kill microorganisms. Weed killers are far worse than insecticides in this regard.

Graeme: You have mentioned the negative aspects of herbicides. How does no-till farming rate with you in this regard? They are some of the biggest herbicide users.

Phil: Well, I must agree. Herbicides ruin photon. All herbicides kill microorganisms. Some of them are more destructive than others. Atroazine is probably the worst, but Roundup is also a killer.

Graeme: That's interesting, considering the fact that Roundup is always promoted as biodegradable.

Phil: It may biodegrade eventually, but it's never specified how long this may take. The fact is that residues remain for many months. Earthworms don't like the stuff. Darwin himself stated that anything that will kill a plant will also affect earthworms. As I said, herbicides are far worse than insecticides.

Graeme: We've been promoting the concept of using humic acid with herbicides to tie up residues and reduce ongoing damage. Are you familiar with this idea?

Phil: Yes, it's definitely a good concept. I think Arden and Phil Wheeler are promoting similar ideas. Phil Wheeler is a brilliant young physicist and a great teacher but he tells me he has to really take it easy when he is talking about paramagnetism, because it is such a strange idea that it tends to alienate people.

Graeme: I disagree with Phil on that score. I agree that Phil is a highly credible communicator, but his work with radionics has far more alienating potential than the concept of paramagnetism. Your PCSM takes the witchcraft out of the picture. This meter is one hundred percent reliable. If you have a good, highly productive soil, it will always produce a high score on the meter. Conversely, if you have a problem area, then there will always be a much lower reading. By contrast, it is a fairly hard sell to tell a conventional grower that he can post a polaroid photo of his crop to the other side of the world and his problems will be diagnosed. It may be true, but it is definitely more of a fringe-dwelling concept than paramagnetism. Paramagnetism is now provable using your meter. I feel that it's been completely removed from the mystical realm.

Phil: Yes, it's good, solid physics. Even electrical engineers take one look at this meter and say, "*God, that's it!*" With radionics there is one main problem: When you start trying to make a human being an antenna, you've got troubles because you can't tune a human being. One might measure 200,000 ohms resistance, and another measures 500,000. When you're trying to match an antenna to a transmitter, this is a big problem. A scanner is essentially an impedance box, except in that case you have a stable antenna and a stable transmitter. Scanners are incredibly operator-dependent. Selling one of these things to me would be like selling me a violin and wanting me to play 'Danny Boy' on it. I don't have a musical ear. Some people are very sensitive to radionics - dowsers, for example - but the majority of people cannot reliably operate a scanner, and that is the major problem with this technology.

Graeme: Is there any hope of developing a reliable scanner, which is not dependent on the human antenna?

Phil: Yes, there is, and I'm working on a prototype at the moment. It's a remarkably simple idea, which should cost a fraction of the current cost for scanners when I've perfected it.

Graeme: You certainly managed to reduce the cost of paramagnetic meters by several hundred percent with your PCSM. What was the history of the development of that meter?

Phil: Well, I knew what I wanted, but I wasn't capable of wiring it up. I had to bring in an electrical engineer, the head of an electrical engineering department, called Ed O'Brien.

Graeme: Where did Bob Pike fit into the picture?

Phil: Well, Ed and I developed a prototype, but there were a lot of bugs. Bob sorted out the problems and then began marketing the meters. We wouldn't be anywhere without Bob - Bob is an incredible character. Don't anyone ever tell me the younger generation is no good. Bob Pike is the younger generation. He is passionate and dedicated, and I owe him a great deal.

Graeme: Returning to paramagnetism in agriculture. We always push the paramount importance of calcium in the fertility equation. What is the relationship between paramagnetic response and calcium levels?

Phil: Well, calcium is the most important nutrient, and you won't get a good response from paramagnetic rock dusts if you have ignored your calcium. Nutrients in general won't be available if you don't have enough calcium. Paramagnetism is not a substitute for nutrition. It is something extra.

Graeme: One more question about living with weeds', because they are a major problem on both biological and conventional farms. You suggest that there is an optimum weed population. What is that optimum and how is it achieved?

Phil: Well, I think what should happen with weeds was best illustrated by Phil Wheeler in his address today. He said, "*I fertilise for the plants and not the weeds.*" If you have weeds growing as high as your corn, then you have not been fertilising correctly. If the crop is thriving with the right inputs, it will always outperform the weeds.

"Well, calcium is the most important nutrient, and you won't get a good response from paramagnetic rock dusts if you have ignored your calcium. Nutrients in general won't be available if you don't have enough calcium. Paramagnetism is not a substitute for nutrition. It is something extra."

Graeme: There seems to be a tendency in eco-agriculture to compare some of the concepts to the ancient Chinese philosophy of Yin and Yang. Arden Andersen likens growth energies vs. reproductive energies to the Yin-Yang concept, and you make similar suggestions for paramagnetism and diamagnetism. Is there common ground between these ideas?

Phil: Absolutely. I once photocopied many sections from fifteen volumes I borrowed from the USDA Library, which covered the link between ancient Chinese philosophy, science and religion. The old dowsers used to look for the right place to build a house. They were dowsing places that were highly paramagnetic. Actually, while I was in Australia last time, I was talking about Ayers Rock with an Aboriginal. I mentioned that it was a sacred place, but he informed me that the rock was actually a meeting place because it could be seen for miles around. The actual sacred place is thirty miles from there. I can't remember the name of the area. When I got to Ayers Rock, I mea-

sured it and it only measured 30 or 40. When I went to their sacred place, it measured 5000!

Graeme: You certainly have a great love for travel and adventure. Has age tempered this passion at all?

Phil: People have a strange idea about age. Five years ago, at seventy, I decided to find a place where nobody had ever been, so I found 25,000 square miles on the Amazon, which the Peruvians would never enter. It was controlled by a headhunting tribe with a vicious reputation. The Peruvian Government rented me an army plane - I guess they wanted to see what would happen. I flew in with a friend of mine. The pilot dropped us off, and I said, "*Don't forget to pick us up in three weeks.*" I walked in and found the headhunting tribe and lived with them for three weeks. There was no problem. The key is to go in smiling. If you go in unarmed and not speaking their language with a big smile on your face they are fascinated. It's like bringing them a new TV. Pretty soon they're calling you Uncle. We were almost killed in the plane going in. Motor vehicles and aeroplanes are far more dangerous than most of my adventures. Almost every member of my family has had serious car accidents - I've had two. The whole family has recently been involved nursing my wife, who is just recovering from being hit by a truck. It was her second serious accident. No, it was a great experience with the headhunters, I might write a book about it some day.

Graeme: You have published many books. Are you working on anything at present?

Phil: Yes, actually I consider it pretty important. I'm doing a handbook on paramagnetism. The first part will explain what volcanoes do; the second part will describe erosion - good erosion - where paramagnetic earth goes down to the rivers. Then I'll explain why you need it in the soil. Part two will contain simple experiments with earthworms' nitrogen nodules on roots, different chemicals. It will be a simple handbook which should clarify paramagnetism for many farmers.

Graeme: Are you familiar with the American researcher Bruce Tainio? He has pioneered the concept of monitoring the pH of leaf sap as a guide to plant health and nutrient requirements.

Phil: No, I haven't heard of his work.

Graeme: Well, apparently he has also been researching paramagnetism. I hear that he has been crushing highly paramagnetic material with a ball roller to reduce it to the finest powder. This powder, when applied in tiny applications, has increased microorganism counts by over 300%. This brings me to my next question. How important is particle size when applying paramagnetic materials to the soil?

Phil: Well from a practical standpoint, dust is hard to work with. In the lab it may be relevant, but in the field we've had better results with coarser material.

Graeme: In our case we would usually mix the dust with other materials to avoid this problem.

Phil: Well, if you're mixing fine dust with compost, I think you would be better off. Whatever you do it's best that the material be disced in, otherwise there is the possibility of encouraging shallow roots.

Graeme: We've also found a difference in readings between wet and dry soils.

Phil: Yes, that would be right. Water is diamagnetic. I'll tell you something important about water and paramagnetism. Rainfall records show that in the American Mid-west they have had twelve inches of rainfall every year for the past 100 years. There were never droughts prior to World War II, but now they are commonplace. They are still getting the same water - what's changed? Average paramagnetic levels in those soils were 300 to 400 fifty to sixty years ago, now they are always below 100. The results I've just received from the Australian company Boral, who are working with these concepts, confirm the reason. Boral has found that paramagnetic materials increase water-holding capacity by 50%. The point is that the paramagnetic force can and will erode over time. Modern farming techniques speed that erosion. It's not a new phenomenon. It's just sped up a lot. I've been working in Phoenix, Arizona looking at tabletop basin farming. How did the Indians have farms on top of the mesa in twelve inches of rainfall with no way to irrigate at all? One mesa I found was suitable for irrigation, because there were twelve springs on top but all the rest of them had no springs. One archaeologist suggested that they must have carried water up the mountaintop, but this was simply not feasible. They had to depend on the rain. I have a photo of a mesa, which was actually taken by Charles Lindbergh. You can see in this photo exactly where the Indians had farmed. I went to the mesa and under the adobe, where it had never been farmed, the paramagnetic levels were 800 or 900, but where it had been farmed the levels were down to 50 or 60. Basically, the Midwestern farmers had eroded away their paramagnetic force in a fifty-year period, while the Indians had taken 300 to 400 years to achieve the same depletion. The point I'm making is that these soils can easily be re-energised. It may only last ten or twelve years in our irrigated farms, but it is relatively inexpensive, and it can make a huge difference to production. The Indians abandoned their land when the energy had fallen below 100, as they it was longer viable. We don't need to do that.

Graeme: Yes, we have found that, in orchard situations where growers use under-tree sprinklers, the paramagnetic reading is often half that of the inter-row area or the area just outside the sprinkler line. I wasn't aware that the energy could be eroded like this.

Phil: Yes, that's what's happening, but it's more than that because, during the rain period, the tree collects water and then drips, and this dripping action will erode paramagnetism. I measured Stone Mountain in Georgia, which is white granite - the top of the granite, which is exposed to the elements, measured 30 or 40, but the bottom, where it is sheltered, measured 2000. The force weathers over time.

Graeme: Do you do much in the way of seminars or talks here in the US?

Phil: No, there is far more interest in these concepts in other countries. I only ever speak at Acres USA Conferences these days. When I was in Australia last, I gave eighteen talks. While I was in Japan recently, I had thirty-five invitations to talk. I had actually been invited over there as the first Westerner to open one of their sacred buildings. Apparently tree growth on many of their sacred sites had slowed to a halt. They read my book on paramagnetism and applied some volcanic ash to some of the trees. The trees sprang to life, and they rewarded me with this honour. The people my wife and I were introduced to at the ceremony included the Japanese Royals, but we weren't even aware of it at the time.

Graeme: It's amazing, after all your work, that you still have a credibility problem in the US.

Phil: Well, it's seventeen books and 150 or so published scientific articles later, but I've never been approached by a single American company to commercialise any of my projects. Mainstream academics are constantly trying to discredit me. A colleague was recently involved in an argument about my ideas with the head of an entomology department. The guy was completely closed. Finally my friend said, "*Well, what if he's right?*" The department head said, "*That would be real bad.*" Obviously, if I'm right, then there are a whole lot of people who have been wrong for a long time.

Graeme: Yes, I guess it would force them to confront their entire belief systems.

Phil: Yes, that fellow was right - it would be bad for them. I think I will receive due credit eventually - in fact, I know I will, but probably after my death, but at least it will keep my grandchildren from starving. Historians usually manage to straighten things out.

Graeme: Have figures for likely increases in paramagnetism levels been determined yet? For example, if you had a soil measuring 100 CGS and you put on 5 tonnes of crusher dust measuring 2000 per hectare, do you have any idea of the end gain?

Phil: No, we have been talking about that just recently. It's a new concept and we really are at the pioneering stage. No one has done this kind of work yet but I'm sure it won't be too far off. I mean, optimum levels may vary for different plants. There is a huge amount of research needed.

Graeme: I would suspect that there is a perfect soil that grows everything perfectly. In our case that soil would have a pH of 6.3, the perfect calcium to magnesium ratio, over 5% organic matter, balanced cations, balanced anions and a functioning biology. In that perfect soil I would like to see a paramagnetic reading exceeding 500.

"A colleague was recently involved in an argument about my ideas with the head of an entomology department. The guy was completely closed. Finally my friend said, "Well, what if he's right?" The department head said, "That would be real bad." Obviously, if I'm right, then there are a whole lot of people who have been wrong for a long time."

Phil: I would tend to agree with you. Balance is everything. I just wish there was some funding to find out more about these things.

Graeme: It will have to come from private enterprise. When there's a profit to be made, the funds will come from everywhere. There is no great conspiracy surrounding chemical companies. They are merely chasing a profit, and chemicals have been what growers were chasing. When demand changes focus, these same guys will sell organics. Our goal is to speed up that change.

Phil: That change is already happening in human health, where the big companies are now trying to grab a piece of the growing market for minerals and supplements.

Graeme: Yes, the reason that the demand for supplements and natural medicines has grown is because people have discovered that a lot of them work better than their drugs. My dad was crippled with arthritis a few years ago. The painkillers he was prescribed aggravated his stomach lining, and he was hospitalised for a bleeding ulcer when he had never had an ulcer before the drugs. I heard about celery seed extract from one of my clients. He started taking Celery 7000 and persisted for the six-week kick-in time, and he now has complete control over his arthritis. If he drops the celery extract for more than a few weeks, it returns, but having to take one tablet a day of a natural substance indefinitely is a small price to pay for a pain-free life.

Phil: Well, I cured my boy's arthritis with paramagnetism. I cured my own lung cancer with this force. Lower back pain is easy to cure with it.

Graeme: Tell me about it - I've suffered lower back pain for years!

Phil: Well, my book 'Ancient Histories, Modern Visions' covers this a little. One chapter is about how to make a shatnez. Shatnez is an old Hebrew word. I found out from the Rabbis that the high priests used to wear this piece of cloth called a shatnez. The high priest would wrap this cloth around himself. The high priest was a doctor and he had to spend time helping the lepers. He had to have a good immune system to survive. I figured that maybe this garment is part of a healing system. The Irish take the halter of a donkey, which is drenched in sweat. They wrap this around arthritic joints, with great results. The cloth the priests used was woven with wool one way and linen the other way. The American pioneers used to call the same cloth Linsy-Woolsy. The Hebrews call it shatnez. It is arguably the best cloth ever invented. It retains moisture really well, but it also dries really quickly. If you wet it, it stays damp forever, but if you want it dry and put it in the sun, it dries in a hurry. It makes a good cloth and it's great for soaking up sweat. I made a vest of this material and I soaked it in seawater to mimic sweat. I found out that you don't necessarily even need Linsy-Woolsy. My wife made me a vest out of a burlap sack. I soaked it in seawater and wrapped it in plastic cling wrap to retain the moisture. I used to wear this damp vest over a T-shirt to keep the plastic away from my body. When I was diagnosed with lung cancer, it was the cornerstone of my own treatment regime. I spent five years evaluating the damage done with herbicides and pesticides, and I'm sure there was a link to the cancer. Anyway, I also took garlic every day and ate a tablespoon of highly paramagnetic dirt each day. The tumour shrank and I cured myself. I also made one of these vests for my wife for her arthritis. Her persistent lower back pain disappeared in a week and a half. Then she put it on her shoulder, which had arthritis, and it was also cured. So far I've cured fifteen people with arthritis with this one vest. The last chapter of the book describes how to make this vest. There are two chapters planned in the next book. One is about the pattern for this cloth and how to make it, and the second one is about how to do it cheaper with a piece of burlap.

Graeme: Another agricultural question. If you had to short-list the four major benefits of paramagnetism, what would they be?

Phil: Well, as I mentioned, water retention is a big one. Microbial stimulation is another. Improved nutrient utilisation is a major factor, but the provision of a light energy source is very important. When I was working with Dr Popp on this one, he was very surprised. He had been getting coherent radiation from seeds and I had been getting it from insects, but he didn't think it would happen in rocks. When he measured the 2000

photons that came out of rocks, not only did his photon counter show that it was coherent, but it also had a memory! In other words, it lasted something like twenty or thirty minutes, sort of like a fluorescent light bulb dying down. God takes care of you. When I got to Germany, there were meetings going on everywhere at the university. Dr Popp couldn't find a graduate student to help with the research. There were two Russian scientists working there who could speak English. I don't use a computer - all my work is done with a pencil and paper but, to speed things up, you really have to have a computer. These Russian guys dropped everything and helped me with the computer side of things. They were absolutely flabbergasted. When they saw the coherent radiation with a memory coming out of a paramagnetic rock, they were just jumping up and down like a couple of kids. It was at this time that I started coughing. I thought it was a cold, but when I got home to Florida, it got worse. At first they thought it was tuberculosis, but then I was told I had lung cancer.

Graeme: How did you feel about the diagnosis?

Phil: To be honest, I really didn't worry about it. You are going to die sometime and I have no fear of the prospect. I wanted to test my own treatment, and it worked for me. A damp burlap vest, soaked in seawater and wrapped in plastic, a teaspoon of garlic and a tablespoon of paramagnetic rock did the trick.

Graeme: Does your wife mind that your years of retirement remain so busy?

Phil: Well, sometimes she does, but there are treats for her. I'm sure she would be happy to come with me to Australia when you next invite me. Now, that's a gentle hint! She loves Australia just like I do.

Graeme: Well, we'd love to have you. Part of the Nutri-Tech game plan is to bring out leading consultants for seminar series, but we have grown so rapidly, there never seems to be any breathing space to do some of these things. Who knows what the next year will bring? Thanks for your time - I've had a great afternoon.

Phil: It's been a pleasure. I hope to see you in Australia sometime soon.

DR PHIL WHEELER

Interview recorded December 1998



Dr Phil Wheeler is an energy consultant. He was trained in the Reams school following a conventional PhD in biophysics. During the past two decades, he has become a crop and soil consultant of international renown. It is a rare treat to sit in one of his seminars and hear a master consultant describe, in hard science terminology, subtle energy techniques, including radionics and field broadcasting to died-in-the-wool conventional farmers. It is a mark of this man's credibility that he has been one of the few presenters who has been successful in this daunting endeavour. Dr Wheeler and Ron Ward, the co-author of the successful publication, 'The Non-Toxic Farming Hand Book', were principals of a progressive US company called 'Transnational Agronomy'. The publication was derived from the operations manual for the company's consultants and has progressed to one of the leading practical information publications in this genre. Both authors were involved in this interview.

Graeme: Congratulations on the new book. It's an excellent and much-needed reference manual. How did it come about? Ron, I understand that you originated the manual concept in an attempt to record Dr Wheeler's Philosophy in an accessible, practical fashion.

Ron: Yes, the book was originally an attempt to do two things. Firstly, I needed to grasp an understanding of this approach for myself, and writing down and collating these concepts certainly helped. Secondly, I felt that, if I was initially struggling to comprehend Phil's approach myself, then our farmers would definitely need some help. You must remember that during the writing of this book, Dan Skow's book had not been written, and Arden Andersen's books were not written, so ...

Graeme: You mean your current book was written prior to those books? That's quite amazing. I'd assumed that some idea-sharing was inevitably happening with several books covering the same subject. It's quite an achievement to be the first cab off the rank.

Ron: Yes, I updated it each year, and we self-published the original manuscript, which was only supplied to Transnational seminar clients. We've fully updated the new version for general publication with Acres USA.

Graeme: It was a little disconcerting for me personally to hear that Transnational Agronomy had folded, particularly considering the fact that our company, Nutri-Tech Solutions, has a similar operating philosophy and product range. Do you consider you were ahead of your time, or were there other problems?

Ron: Yes, we were a little ahead of our time, but we also tended to suffer from the fact that growers, who were being pushed harder and harder financially, were less

likely to risk something different. From what you've told me of your company, we did not have such a complete approach. I understand that you guys take care of balance and mineralisation before you use microbial additives or foliars. We worked mainly through agents, and we often had mixed results when the soil biology wasn't present. We often tended to tackle just part of the problem, and I consider that was a failing.

Graeme: Yes, complete programs definitely offer the most reliable results. I'm wondering about your use of the electronic scanner as a monitoring instrument. When I interviewed Dan Skow, he said that many consultants had become closet scanner users, because they didn't wish to alienate growers with this controversial technology. Phil - I know that you are one of the few consultants that openly embrace the technology. Do you consider it has the potential to become a liability from a credibility point of view?

Phil: I don't ever push radionics technology on my clients. It is what it is. Growers are usually only interested in a program which works, and they often don't care how this is achieved. I know that several consultants use scanners behind the scenes. I'm neither open or closed about the issue - I just use it. I advertise it as a testing method, and don't hide it in any way. It just happens that Louisa, my spouse, is a very good scanner operator. She understands agriculture, and together we find that the scanner is a valuable tool in matching up programs that work.

Graeme: Despite the fact that these tools are user-dependent, you're completely confident about your results?

Phil: Yes, but not so confident that I'm not going to look at a CEC test or a LaMotte test to verify findings. I'm not foolish - I'm not going to go out there and blow foo-foo dust and find out later that he had 10 pounds per acre of nitrogen to grow corn, when that crop sucks up 100 pounds.

Ron: When I first started with Phil out in Pennsylvania, radionics was being promoted as a saviour of farming. A lot of farmers who were about to lose their farms bought this equipment, only to find out that it didn't live up to expectations. In my opinion, there's definitely a problem with this technology, because it's so user-dependent. Good operators can achieve excellent results, but while we may be concerned with the condition of the soil, the physical condition of the scanner operator also appears to play an important role in determining success. Polluted operators often produce polluted results.

Graeme: It is certainly a fascinating concept, but I wouldn't be prepared to gamble on becoming involved for that exact reason.

Ron: Yes, this technology can be fascinating, even in the human health arena. I was once diagnosed with the scanner with having a parasite problem. The operator broadcast an anti-parasite signal from a different city, and the following morning I found a tape-worm in my poo. Stories like this are common, and they suggest intriguing potential.

Graeme: During recent interviews, I've noticed an interesting contrast between the approaches of a couple of your consultant colleagues, NealNPKsey and Dr Arden Andersen. While Neal is quite conservative, and obviously concerned about stepping on toes, Dr Andersen is blatantly confrontational and uninhibited in his analysis of the

failings of conventional agriculture. You also appear pretty forthright in your opinions. Do you cop much mainstream flak?

Phil: Over the years, since what we've been doing has always been way ahead of the standard university system, we always caught flak, because we were saying things that made the university look like they were wrong. Now we have several universities, like Texas and Michigan, who are trying to do the right thing, but there's still a backlog of people and ideas that are still mired in the NPK simplistic field of toxic, rescue chemistry, etc. There's no clear indication that these people comprehend that all diseases, conditions, insects, etc are 'nutritional energy based'. Many of these researchers are, in a sense, reinventing the wheel, repeating the research the Russians have already done, so that they can have their own name on it. In typical institutional style, they want to be seen as the principal suppliers of information but, in most cases, they are playing catch-up. Back to the flak question, though - I'd say we have it pretty easy in comparison to anyone practising alternative medicine in the US.

Graeme: Yes, I suspect Arden Andersen will feel a little more pressure now that he's involved in the medical arena. Another question - Phil, I know that you're a friend and colleague of Dr Phil Callahan, who's very excited about the agricultural potential of his work in paramagnetism. Do you share his enthusiasm?

Phil: Yes, I do. I think that the first wave of organics was the biological, and the second wave, which is upon us now, is concerned with the biophysical. I was associated with John Hamaker and his work on rock dust. John attributed the whole fertilising response of rock dust to the re-mineralising capacity of these materials. Now it appears that paramagnetism may be playing the major role with these rockmineral fertilisers. However, it should always be remembered, as Phil Callahan has pointed out, you don't necessarily need volcanic rock dust to build paramagnetism. A good soil nutrition program will often have the same effect, because it will build oxygen levels in the soil. Oxygen is a highly paramagnetic gas.

Graeme: The PCSMs [Phil Callahan's Soil Meters] can be a highly accurate indicator of soil health and fertility. Have you had much experience with them?

"I was associated with John Hamaker and his work on rock dust. John attributed the whole fertilising response of rock dust to the re-mineralising capacity of these materials. Now it appears that paramagnetism may be playing the major role with these rockmineral fertilisers."

Phil: We are really only just beginning to experiment, but one problem we've encountered relates to the effect of ferromagnetism on readings. High iRon levels can contaminate paramagnetic readings. This is a perfect example of the value of scanner technology, because we can use the radionic resonance capacity to determine the value of any given rock dust in a particular soil.

Graeme: The Carey Reams concept of the 'likes attracting likes' is used in your approach to stimulate calcium release. Some of the calcium applications involved border on the homeopathic. The idea of putting out a few litres of calcium with molasses and

Vitamin B₁₂ obviously has more appeal in broadacre, from a cost perspective, than having to adhere to a Neal Kinsey-type recommendation involving four tonnes of lime per hectare. However, does this approach have a proven track record?

Phil: I look at some of the recommendations made using the Albrecht system in broadacre, and I think this is ridiculous. It's going to take twenty years. The fact is that we can use homoeopathic, biodynamic-style methods to make minerals more available by using the energy concept, combined with small mineral applications.

Graeme: But there's very little margin for error in broadacre. Is this approach always reliable?

Phil: Assuming we get adequate rain and sunshine, our system works. It strikes me that, in most cases in conventional agriculture, we fertilise without having any idea of what it really is that the soil needs, and you have no idea if it becomes active after you put it out. That's when you're really taking a chance. In our system, we're either on-farm monitoring every two weeks, or we teach the grower to monitor crop and soil performance. We're monitoring electrical conductivity - we know how the ions are flowing. If the crop's running low on energy, our growers know immediately.

Ron: The idea of using two gallons of liquid calcium [approx twenty litres per hectare] coupled with some molasses to kick free additional calcium in the soil works really well, but we've found that timing is critical here. You really need to get on to your field and apply this mix right after planting, or during planting if possible. What we found is that if you wait for a week, the effect is definitely minimised.

Graeme: Does your in-crop monitoring include more conventional monitoring, like leaf analysis?

Phil: Sure, I use it all the time. In horticulture, I like to see how a program is going. Often a cross-section of blocks will be tested in this fashion rather than every paddock. I like the security of these numbers - I can say *"Hey, look, you don't have the boron out here, and you're asking me to get you a good crop. Let's be reasonable here - if you won't put on a boron foliar, I won't be responsible for the crop performing below par."*

"In our system, we're either on-farm monitoring every two weeks, or we teach the grower to monitor crop and soil performance. We're monitoring electrical conductivity - we know how the ions are flowing. If the crop's running low on energy, our growers know immediately."

Graeme: Apple cider vinegar is used in your system to create a reproductive response. This has obvious potential financially for growers chasing early maturity. What amounts of this material do you normally use?

Phil: Well, we might use one or two quarts as a foliar, or ten to twelve quarts in the soil.

Graeme: Is phosphoric acid an option in the soil to create the acid response necessary to generate a fruiting response?

Phil: No. Phosphoric acid will tie up real quick in the soil, grabbing some calcium and forming tricalcium phosphate. Single superphosphate is a better choice in the soil. This product creates a real acid response, which works well when manipulating fruiting energies. Phosphoric acid is a good option, but for foliar only.

Graeme: I understand that your on-farm consulting and analysis work, while you were in Australia, revealed a need for sugar in many soils. Is sugar better than molasses for microbial stimulation, and how much do you use?

Phil: There are many forms of sugar, and most Australian soils, I found, have a shortage of dextrose. Several soils showed a response to a combination of dextrose and molasses. These soils required about eight kilograms of dextrose per hectare.

Graeme: There is ongoing debate about the use of muriate of potash [potassium chloride] versus sulfate of potash [potassium sulfate]. With sulfate of potash costing 45% more than muriate, there is a need for some hard facts to convince many growers to switch over. Do you have these hard facts?

Phil: Okay, we can argue all day about muriate leaching or percentages of chloride and chlorine or whatever, but the fact is, I know of no consultant who has been able to achieve good LaMotte test numbers for calcium and phosphorus until they removed muriate from the farm. This is all the evidence I need, because good LaMotte numbers are simply essential for healthy crops.

Graeme: I've wondered if you've played around with any of the natural growth hormones like cytokinins, *Yucca shidigera* or triacontanol, and what you thought about the use of these materials.

Phil: Certainly. I'm very much in favour of their use. I believe yucca extracts are extremely bio-enhancing, and I personally represent a cytokinin product called Nitro-Zyme, and I can tell you that these products work. I've been to lectures on triacontanol, but I've yet to use the stuff.

Graeme: Are you familiar with the use of magnets to improve water quality?

“Okay, we can argue all day about muriate leaching or percentages of chloride and chlorine or whatever, but the fact is, I know of no consultant who has been able to achieve good LaMotte test numbers for calcium and phosphorus until they removed muriate from the farm.”

Phil: Yes, I believe magnets have a role to play, but radio frequency can also be used to treat water. I understand that the farming results have been tremendous with this technique, especially where you have sodium problems. It actually ionises the sodium to where it will keep on going right through the soil, and not build up and cause problems.

Graeme: That sounds interesting - I'll check it out. We've developed a system involving the best from all worlds, including parts of the philosophies of Albrecht, Reams and Callahan, amongst others. In general, do you consider that the Reams paradigm alone is sufficient to handle all situations?

Phil: Like you, I operate from several paradigms, but the central influence is derived from Carey Reams.

Ron: I feel that a combination is best. Reams people, for example, are always concerned about putting on more calcium, but it wasn't until I went to a Neal Kinsey seminar that I recognised the special relationship between calcium and magnesium. As Neal pointed out, every time you put on calcium, you're going to displace some magnesium on the colloid. It seems to me that this phenomenon is not always considered in the Reams approach. Neal also differentiated between the amount of magnesium needed in lighter soils. The calcium to magnesium ratio is much closer in sandy soils than the 7 to 1 ratio in the Reams approach.

Graeme: Yes, we use the Kinsey / Albrecht balancing approach in our soil therapy programs, and it has been successful, particularly when the benefits are magnified by activating the biology. Digressing for a moment - Ron, I understand you promoted a soil-conditioning product during your Transnational Agronomy days, called ammonium lauryl sulfate. We're developing something similar at present. What was your opinion of that product?

Ron: Well, it certainly works, and that product was an ongoing seller for us. I remember Neal Kinsey saying that he used to tell people they were wasting their money on the soil conditioner. You could only break up hard-pans with soil-balancing techniques. But when he looked more closely, he found some very good results.

Graeme: Yes, Neal talked about demonstrations where you couldn't push a probe two inches into the soil before treatment, and immediately after that, a probe could push down eighteen inches. Arden Andersen is also enthusiastic about this soil conditioner.

Ron: Yes, but in heavy soils we found that you need more than a single application. Often it took several applications to do the job.

Graeme: Phil, are you aware of the potential of combining urea with humic acid to extend nitrogen life and prevent leaching?

Phil: We haven't really done this on a large scale, but obviously it would work. That's what humates are all about - holding nutrients in the root zone.

Graeme: Phil, your lecturing style is dynamic and no-nonsense, and you present as a highly credible ag-scientist. You certainly handle academic detractors with ease. Has your scientific background helped in this regard?

Phil: I have enough of a science background to recognise when things match in the science area. Most people might look at biology, but biology is really based on chemistry, and chemistry is really based on physics. So when you're talking about plants, animals and people, you're talking biophysics, and most people don't have the foggiest idea of how living things work from a biophysics standpoint. Since I conceptually understand that, when things I work with match these realities, then I have the deepest conviction that they are the right thing. That's the way things are as far as I'm concerned. The other thing is that I believe the proof is always in the pudding - it's either working in the field, or it isn't. By working, I don't mean it is producing 200 bushels of plastic, empty corn. I'm talking about producing a healthy crop of reasonable volume, with food value - that's the proof.

Graeme: One of Nutri-Tech's biggest-selling products is a crop-specific liquid fertiliser range, which combines the best of organics with conventional NPK. Do you have an opinion about these types of fusion fertilisers in comparison to straight organics?

Phil: Yes. The majority of my work is in what I call 'transitional agriculture', where farmers are trying to reduce chemicals and improve their farming. These kinds of products can play an important role in these situations. There is also the potential for a synergistic reaction between conventional and organic ingredients. The bottom line is that we are trying to produce better-quality food, and these products can help do this.

Graeme: Where did your Dr Dirt name come from?

Phil: Well, I had always been dubbed Dr Dirt locally, and when I went to set up my site, I found that there were already 24 other Dr Dirts. I became Dr Dirt No. 25.

Graeme: We have had good results releasing nutrients through biological activation, but potassium is the hard one. It is very difficult to release significant amounts of potassium even though we know it is there in large amounts, in tied-up form.

Phil: It could be that Australian soils have a different mineral complex where potassium is held more tightly. In the US, potassium is often an unwanted excess. The trick is to find the right microbe to release some of the potassium reserves. This is where the scanner can be very valuable - it can be a rapid way to determine the right direction to go.

Graeme: A major component in your approach is the use of the refractometer to measure brix levels. In theory, if brix levels are over twelve, there will be an inherent pest resistance. After many years in the field, can you offer unqualified support for this concept?

Phil: No, I can't offer unqualified support, because there are some cases where this is not true. Remember, brix is dissolved solids - dissolved solids can also be acid components rather than sugar components. If you have a plant with a false brix, it's still going to get insects. If you have a plant with a true brix of twelve or thirteen, you can sometimes have conditions involving other factors which may be disrupting things. Maybe the amino acids are disrupting things, even though they shouldn't be. I don't know, but it's always possible, and I never trust brix readings totally. You have to observe other indicators to make sure you're on track. However, the refractometer remains one of the simplest and most effective monitoring tools available, and all growers should use one.

Graeme: Well, that just about wraps it up. I'd like to thank you both for your time. I wish you every success with your book.

Phil: Nice talking to you. I'll be in touch via email.

Ron: Thank you, and I hope your company continues to do well.

DR ARDEN ANDERSEN

Interview recorded December 1998



*Dr Arden Andersen juggles a variety of professions with consummate ease. His contrasting roles include those of medical practitioner, Air Force surgeon, agricultural consultant, lecturer and published author. His apprenticeship involved an intimate association with three of the legends of sustainable agriculture. He worked with **Dr Carey Reams** for several years, he was a research assistant with **Dr Dan Skow** and he was a student and field researcher with **Dr Philip Callahan**. The growing interest in energy agriculture in Australia can be partially attributed to his regular visits and seminars. Originally heralding from a dairy farm, he has retained a capacity to communicate with farmers and he has influenced many conventional growers to venture forth into the brave, new world of biological agriculture. In his new profession of 'medical agronomy', Arden Andersen is perfectly positioned to become the pre-eminent specialist in the all-important soil health-human health nexus in the decades to come.*

Graeme: There is a tremendous interest in sustainable agriculture in Australia at present. Is this growing interest apparent in American agriculture?

Arden: There are definitely more and more farmers looking for alternatives, looking at sustainable agriculture, biological agriculture or whatever you want to call it, but, at the same time, the government agencies are finally admitting to problems that we were talking about fifteen to twenty years ago. For example, fifteen years ago, the State Departments of Agriculture denied the possibility of herbicide-resistant weeds or insecticide-resistant insects but today they are finally admitting to these problems. Farmers are hearing these admissions and realising that they must look at other options. The better managers have often realised these problems in advance of everyone else, and I guess that is why they are better managers - they are always looking at ways to improve their business.

Graeme: Here it has become very much a farmer-driven phenomenon. There is very little direction coming from the various State Ag Departments. It is usually growers themselves deciding that it is time for a change, and I wondered if this initiative was present in your country.

Arden: There is no doubt that it is a grass-roots movement. The information is not coming from the top down - it is coming from the bottom up. Industry is often forced to change because of grower demand. However, from my experience in Australia, I would have to say that there is a difference in intensity here. It seems like Australian farmers are more aggressively searching for answers.

Graeme: I've recently interviewed Neal Kinsey, and there's no doubt that Neal takes the middle ground. He is obviously concerned not to shake the boat. In contrast, you speak your mind. You have had more of a confrontationalist approach than anyone has

in the eco-agriculture field. Have you had any problems from governments or multinationals?

Arden: I must say that I have had no problems. I really believe that the conspiracy theory issue simply relates to the way business is structured. Most of the big businesses are public companies with one expectation - maximum profit. These companies have a mandate to achieve this goal at all costs. Any threat to all-important profits will provoke a serious attempt to circumvent that threat. I just don't see any evidence that there is a conspiracy at the top that is intelligently planning stopping this. I'm not sure I want to give them that much credit. I think it's more the tail wagging the dog, so to speak. From my own personal perspective, I have to live with what I talk about. I have to speak the truth. I don't try to be a confrontationalist, but the people I deal with accept my honest opinion.

Graeme: You are closely involved with the medical establishment. Are there problems associated with talking about alternative systems in that domain?

Arden: There are far more problems in the medical field than in the agricultural field. There is a tremendous amount of fear in medicine. Disease is a multi-billion-dollar industry, and there's a lot of fear about the gravy train drying up. Realistically this fear may be quite justified. If a cancer cure were discovered tomorrow, you would have many, many unhappy people. There would be many hundreds of thousands of jobs lost. It then becomes an economic issue of survival. It has nothing to do with conspiracy theories. It has everything to do with day-to-day paying your bills, supporting your family and meeting your mortgage. The answer is not that simple. There is an overriding motivation to maintain the status quo. There is really no difference in current sentiments from those 2000 or 5000 years ago. Remember, Copernicus was killed for suggesting that the sun is the centre of our solar system. Throughout history every true scientific discovery or rediscovery has been met with staunch opposition from the establishment. Today we do economic and political assassinations rather than physical assassinations of pioneers, but it is made very difficult for them to survive. However, the exciting thing that is happening now relates to a 'people-push', a grass-roots drive for change, and we are not looking at a peasant uprising. Recent research shows that interest in alternative medicine is coming from well-educated, successful people. They are not people swaying with the tide. They are investigating for themselves and taking the personal responsibility. It is the same breed of farmer who is looking at alternative agriculture.

Graeme: I agree. Our company's growth has been built upon the written word. We have no salesmen cold-calling on farmers. When we began with our 3000-word infomercials, we were told we were wasting our time and money as farmers would never bother with this much information. Well, we proved that there is a great thirst for information about alternatives out there, and the foresight and intelligence of many of our clients confirm the American findings.

Arden: Yes, we find it is usually the well-educated, well-read, successful farmer who is looking for ways to improve things. These people are in the position they are because they have always been forward-thinkers. It is a continuation of their open-minded approach, which has created their success. But, returning to the conspiracy theory, I think it is dangerous if we get too paranoid about possible consequences

rather than working at the grass-roots level and simply doing our job in helping other people. I think that what goes around, comes around.

Graeme: When talking to Neal Kinsey, I asked him about the differences between the Reams and Albrecht approaches, about the similarities and differences between the two major philosophers in eco-agriculture. What is your opinion about the common ground and conflicts between the two approaches?

“There are far more problems in the medical field than in the agricultural field. There is a tremendous amount of fear in medicine. Disease is a multi-billion-dollar industry, and there’s a lot of fear about the gravy train drying up.”

Arden: There are some differences, but if we go back and look at Albrecht’s huge body of research, we see that the central concept relates to the premise that disease is directly related to soil health. Albrecht and Charles Northern, a couple of decades before him, highlighted this problem. Northern was a gastroenterologist who showed that digestive diseases are directly related to the food that the person ate, which was directly related to the health of the soil. He actually made the first medical / agricultural connection. Albrecht took the animal model and showed that many animal diseases were related to the trace mineral content in the soil and subsequently to the stock food. This approach is essentially identical to the Reams approach, where disease at the animal and human level is traced back to soil health, particularly nutritional balance. Achieving that essential balance is where the differences come in, but these differences are not a problem. There are many roads that lead to Rome, and the ultimate goal is still the same.

Graeme: A major difference between these approaches lies in the diagnostic tools used to determine nutritional requirements. The soil tests, for example, are very different. The Albrecht approach utilises the Brookside-type base saturation test, while the Reams school uses the LaMotte test. How do these soil tests contrast and compare?

Arden: Well, the Albrecht system is looking for arbitrary numbers in the soil. There is a given list of percentages of various different nutrients required for soil balance. This is an excellent system which can provide valuable information, and Albrecht and Kinsey have been undeniably successful using these techniques. However, I feel that we take it a bit broader than that. The Reams test is unique in its capacity to reflect and describe actual conditions in the field. It is possible to have all the numbers right on the Albrecht test, but still suffer a range of problems. This is where our test comes into its own. The Reams test involves the LaMotte test format, using Morgan extraction solution. The extraction solution contains weak organic acids, which closely mimic the acids plants release through their roots to dissolve nutrients and increase their availability. The Albrecht test is like a mining assay providing information about the amount of each element in the soil. The Reams test measures the biological availability of these elements.

Graeme: I can certainly see the validity of this sort of test. Nutri-Tech uses the Albrecht-based Brookside tests. We balance the soil using the numbers game, but we also include a variety of biological stimulants and microbial products in all programs

to ensure this biological activity. We don't specifically test for it, but we always work to achieve this anyway.

Arden: Well, it's true that we can't have a good biological system without considering minerals. Microorganisms have to have the mineral balance in order to survive. At the same time, we often find that, just because we have achieved the percent base saturations required by the Brookside test, it does not mean that we have that system activated. So we take the next step. We measure biological availability with a Reams test, and then we make decisions about how to achieve biological availability. I have to decide - am I going to use a chemical catalyst, a biological catalyst or a combination of the two to make the nutrients available to the plant? For example, using liquid calcium with Vitamin B₁₂ and sugar is primarily a chemical catalyst to make calcium available, but introducing a microbial or enzyme-based material is a biological catalyst. We find that in certain situations one is more appropriate than the other. Anyway, I agree that it is best to use a combination of the Albrecht and Reams tests to get the full picture.

Graeme: My other reservation about the Reams test relates to the fact that, if it is used alone, there is no cross-reference possible. Good growers monitor their test results over the years. It is possible to correlate Brookside tests with previous test data, but the Reams test is a whole new ballgame. It's like casting the grower adrift in an ocean of uncertainty. It's too much of a total change, even for the best forward-thinkers.

Arden: It is indeed a different ballpark. There is no correlation between the Reams test and any other test, because you are dealing with different extraction methods, but if you have all the ideal Brookside ratios and you don't have a good crop out there, then how do you explain that? The Reams test will explain these problems. Carey Reams spent years correlating various ratios in the test data with actual conditions in the field. The Reams test will reflect what kind of weed you will see in the field, what kind of soil compaction and tilth you will see, and what kind of brix readings you will see in the crop. It is possible to have varying brix readings, even with perfect ratios based on the Albrecht system. The Reams test will explain that variation. As I said, the combination of both tests gives the clearer picture. We need to know and adjust the nutrient bases before activating the biological system.

Graeme: We support a lot of the Reams concepts, and we have very much fused the two approaches, but there are some features of your approach that we have avoided. Our most important concern relates to the use of electronic scanners to monitor compatibility and energy levels of fertilisers. This equipment appears to have huge potential, but the big question mark is the human error component. What is your opinion?

Arden: That is a very good question, and I'm often asked about this. Well, I do a lot of lab stuff in medicine, and it must be said that even the clinical tests, supposedly involving no human involvement, do involve human involvement. Because, who programmed the computer, who sets and calibrates the computer that runs the test, etc? You can take blood and send it to two different laboratories and come back with two different results. The key to scanner effectiveness is the common sense of the operator, and the operator must also have a basic understanding of the basic principles of soil science. The better this understanding and common sense the operator has, the more effective they are with a scanner, and the information provided is no less reliable than that from other testing techniques.

Graeme: This scanner technology has been promoted by yourself, Dan Skow and others for ten to fifteen years. Nicola Tesla came up with the original concept a century ago. Has the concept gained more popular acceptance in recent years, or does it remain a fringe option?

Arden: In my personal realm, interest continues to increase because of my classes, etc. The technology is used extensively in England in natural health and is right up there with homeopathy and acupuncture in that country. In the States it is used predominantly in agriculture. Essentially the scanner is a problem-solver. Most problems can be solved using existing technology, but a scanner with a good operator can solve the really difficult problems. A scanner is not a substitute for good education, good planning or common sense - it is simply another tool. When used properly, it can increase your problem-solving arsenal.

Graeme: I'd like to ask your opinion about the quality of organic produce and the fertility management skills of organic vs. conventional growers. Nutri-Tech has several thousand clients with only a small percentage of organic growers, but in all honesty I would have to say that the best growers producing the best produce are not organic. The best of them are those who are increasing organic inputs to improve quality and increase sustainability. Organic produce is often inferior - the spotty, second-rate produce is obviously nutritionally deficient, and it is clear that there is a lot more to being a good grower than animal manure and idealism.

“The growers who are already very good growers, very good managers and do a good job of fertilisation are the farmers who are moving in the biological direction, and they do an excellent job of producing high-quality, biological products. This may be a bitter pill to swallow for the organic people, but it is a fact.”

Arden: Graeme, I fully agree with you. I've found exactly the same sort of thing. It is a fact that some of the best and unfortunately some of the worst produce on the market today has an organic label on it. There are some organic growers who understand nutritional requirements, but unfortunately most of them are strictly following a philosophical procedure, and this procedure says you can't use this list of materials, you may only use this specified list, and, by doing so, you automatically have a better crop. Well, that's not true. Nutrition is the key to quality produce, and it doesn't matter whether you use approved organic materials or some of the unapproved chemical materials. Nutrition remains the key. The chemical residue question is obviously relevant here, but even this can be a dubious guarantee. There was a study done by the US Geological Survey in 1984. It was in 'The Land' magazine in Minnesota, and they found that the rainwater falling in New York State contained pesticides and herbicides that were applied in Nebraska and the Dakotas - 1500 miles from the original spray site the rain is dropping those same toxic chemicals. How can anything be truly organic? The critical requirement for low-toxic food is not necessarily rigidly enforced exclusions. The higher the nutritional values, the healthier the soil and the plant, the less the residue, regardless of the initial application of pesticide, because the biological system is able to detoxify it, and the plants do not pick it up. This fact really throws a monkey wrench in this whole procedural system. The bottom line is - why do we eat food? We eat food for

the sustenance it contains. Our body doesn't care what procedure that food went through to get to us. The body needs good nutrient value to ensure it can derive sufficient energy from that food. Whatever works to achieve improved food value is valid and should be adopted. My finding is exactly the same as yours, Graeme. The growers who are already very good growers, very good managers and do a good job of fertilisation are the farmers who are moving in the biological direction, and they do an excellent job of producing high-quality, biological products. This may be a bitter pill to swallow for the organic people, but it is a fact.

Graeme: Our motivation for involvement in sustainable agriculture basically relates to a desire to try to improve the food quality of produce, but the prevailing popular philosophy in human nutrition involves the correction of deficits with supplements. There is currently a huge use of these nutritional supplements in Australia and elsewhere. In your experience, is it possible to substitute good human nutrition with bottles of multi-vitamins, minerals and high-tech antioxidants? Can you counteract the junk food with these additives or are you dreaming?

Arden: I think you're dreaming. Supplements are just that. They need to be added on top of a good diet. The space program revealed the shortfalls of this idea. It was found that the astronauts couldn't survive on pills. They came back to earth with muscle loss and bone loss. We simply can't do well without natural food. We see it with patients in my clinic. We can come up with an excellent nutritional supplement program including IV nutrition, herbs, vitamins and various mineral supplements, but supplements are never as good as what nature can put in there in a foodstuff. We need it in that biologically active form for two reasons: One - because of the biochemistry, and two - because of the biophysics - the energetics that we are deriving from that system. We simply can never get that energy package from a pill. Unfortunately, because of our food chain no longer containing the nutrition that it should, we need to augment that shortfall. Supplements are not a panacea, and they should not substitute good food. There is another problem looming, which is related to supplements. Because of the increased demand and public awareness of herbs and other supplements, our native supplies of many of these supplements have run out, and so we now have commercial production using conventional agriculture. These herbs are now deficient in basic nutrition like the majority of our food, and consequently their value is greatly decreased. Using chemical principles to grow Ginseng or Echinacea is not a good idea. These medicines no longer work the way they are supposed to. Homeopathic physicians and herbalists have major problems, because of this increasing nutritional deficiency in the materials with which they work.

Graeme: We have had tremendous results with humates and humic acid, and I'm aware that it is possible to use too much of a good thing with these materials. What are the negatives associated with overuse?

Arden: There are two problems here. I agree that humates can provide an invaluable boost to fertility, but, if overused, they are capable of tying up valuable nutrients. Humates have the capacity of binding pesticides and toxic chemicals in the soil. It's a bit like the use of activated carbon for human health. If you were to drink a poison, the initial therapy would be to give you activated carbon, and humates perform a similar function in the soil. However, it is possible to over-apply this material and 'lock up' nutrition as a result. It's like anything that is over-applied. Calcium is very valuable,

but what happens when you apply too much? A little is good, sometimes more is good, but a lot can be disastrous.

Graeme: Well, what are the appropriate applications of these materials?

“...but supplements are never as good as what nature can put in there in a foodstuff. We need it in that biologically active form for two reasons: One - because of the biochemistry, and two - because of the biophysics - the energetics that we are deriving from that system. We simply can never get that energy package from a pill.”

Arden: Well, there is obviously a variation between requirements for different soil types. In some soils dry humates can be applied at up to a ton per acre [approx 2.5 tonnes per hectare]. It must be remembered these are a slow-release source of humic acids. If the release pattern is magnified with biologicals, then the maximum allowable application is reduced accordingly. Humic acids, on the other hand, are much more available. We find that we can achieve great results with up to 10 to 15 litres per hectare per season. However, if we go beyond 25 litres per hectare per season, then we start seeing decreased yields. We start seeing nutrients going out of solution. They begin to become tied up. We also start to see a decrease in our biology in the soil, because a little is good, but a lot can be disastrous. It's like using sugar or molasses in the soil. It can be a very productive additive, but it can be easily overdone.

Graeme: How much is too much molasses? We use molasses in many of our programs at around 10 litres per acre.

Arden: We also use about 10 litres of molasses per acre, but, if we start using 20 to 30 litres per acre [approx 50 to 70 litres per hectare], we are in the danger zone. 80 litres per acre, for example, can be disastrous. We start getting decreased biology and even fermentation, and the associated production of alcohols, which are not good. We start precipitating calcium when we get alcohol and we can start the process of sterilisation. As far as sugars go, we are looking at 9 kg per season per acre. When we cross this threshold, we start seeing a reversal in our benefits.

Graeme: Is there any difference between white sugar and raw sugar?

Arden: As a rule it doesn't seem to make much of a difference. It makes more of a difference, in some cases, whether you are using sugar or molasses. If you have a high iron content, you should be careful of molasses because of its iron content. There are some biological products that shouldn't be mixed with molasses because of the risk of unwanted fermentation. There are others that thrive in the presence of molasses. Sucrose is the primary carbohydrate in both sugar and molasses, but the difference is that there are other minerals present in molasses.

Graeme: I guess this whole issue of use and overuse of good materials is also relevant in relation to the use of crusher dust. You are no doubt familiar with the use of this rock dust material for remineralisation and paramagnetic benefits. We have growers who apply several tonnes per acre every year - Is this a potential problem?

Arden: There are really only two negatives about putting on large amounts of crusher dust. One relates to the possibility of unbalanced mineral content in the crusher dust. Iron can be a problem, and there is even the potential for heavy-metal contamination in some of these materials. The second negative relates simply to the cost of large applications. However, from a biological perspective, the more fertile the soil is, the higher the magnetic susceptibility. It must be made clear that this doesn't guarantee that the higher the magnetic susceptibility, the more fertile the soil, because it depends totally on what makes up that magnetic susceptibility. For example, you don't want a ferromagnetic situation; you want the influence to be paramagnetic. High iron can introduce ferromagnetism to the picture.

Graeme: That is a question I need answered. Does one exclude the other? If you have a very high paramagnetic reading on a Phil Callahan Soil Meter [PCSM] and you find, on further analysis, that the material contains 7% iron, how do you differentiate paramagnetism from ferromagnetism and analyse likely benefits?

Arden: Yes, the differentiation is difficult, and of course you don't want iron toxicity in the soil. Paramagnetism is lower on the scale as far as magnetic susceptibility goes. It's a range - you start at zero - below zero is diamagnetic and above zero is initially paramagnetic - and then, once you get over a threshold, you are now ferromagnetic. It's simply a degree of magnetic susceptibility - paramagnetic being the lower degree, and it is this low-level paramagnetic energy which is so closely related to soil fertility.

Graeme: Is there a one-on-one relationship - the more crusher dust you apply, the higher you will lift your soil paramagnetism?

Arden: Yes, there is a direct relationship here. The more you put on, the higher your overall score is going to be. There is an obvious dilution effect related to whether you spread it on top or work it into the whole six inches of aerobic zone. If you can influence that zone, the benefits will be greatest. If we can increase soil CGS (units of measurement on the Callahan meter) by 100, we get direct benefits - both with microbes and crop production, particularly root growth.

Graeme: Is there a relationship between overall mineral balance and that paramagnetic effect?

Arden: Whatever soil you have - if you increase the magnetic susceptibility, you get better efficiency of whatever you have there. There are benefits for poorly balanced soils, but obviously, if you couple magnetic susceptibility improvements with nutritional balance in the soil, you maximise the best of both worlds.

Graeme: Paramagnetism can be a difficult concept to grasp for growers. Could you provide a simple explanation of this phenomenon?

Arden: Well, when you increase paramagnetism, you are essentially setting up an antenna to receive magnetic energy. It is energy that grows living things. Magnetic susceptibility is basically the ability of a substance to collect electromagnetic energy, particularly radio waves in the atmosphere. Radio waves are very important for driving plant growth and microbial growth. When you increase a soil's magnetic susceptibility, you increase its capacity to harness these radio waves.

Graeme: Thanks. That should help clarify the concept. One of the major differences between your approach and the Albrecht approach, as represented by Neal Kinsey, re-

lates to the size and cost of treatment programs required to correct problems. At a recent Kinsey seminar, it was hard not to miss the despair of some of the broadacre growers present, as Neal talked about 700 kg of ammonium sulfate per hectare and expensive trace element applications required to reach minimum levels. Your approach doesn't involve the numbers game to this extent, and you seem confident that you can lift production in any soil cost-effectively, regardless of its condition. What are your comments regarding these contrasts?

Arden: We believe that it is possible to increase the efficiency of whatever you have. I agree with Neil regarding the importance of having sufficient calcium in the soil to ensure a good foliar response, but if the calcium correction is not feasible, then we look at other options like the concept of providing a localised supply. We might dribble pelletised lime down beside the seed with a little carbon attached to set up a local, available calcium source. We might hit it a little later with a calcium foliar, and we now are starting to achieve that all-important calcium base. This base alone will give you a higher magnetic susceptibility, and you will benefit accordingly. I've seen many soils completely out of balance, which have significantly increased yield simply by adding some paramagnetic rock down beside the seed.

Graeme: There is another conflict here between the two approaches. Neal Kinsey is adamant that broadcasting is the most effective fertilising approach as opposed to banding beside the seed. He believes that broadcasting encourages better root growth and ensures a better ultimate response.

Arden: Well, he's absolutely correct, long-term, but the bottom line with many of the farmers we work with is that if you set that demand upon them, we don't get anything done. If we can at least get a foot in the door with inexpensive banding, then farmers see the results, and they begin to see the potential for improvement. Maybe they will be able to afford to broadcast after these improvements. We simply have to work with whatever parameter we are given. It is undeniably better to broadcast, but what happens when we can't afford the luxury?

Graeme: The Reams approach has a strong emphasis on the importance of phosphate, particularly in relation to its importance in plant sugar production. Carey Reams was a strong advocate of the use of soft rock phosphate to build phosphate levels to increase brix levels. Has this emphasis changed at all during the past few decades?

Arden: The fact is that, if we have problems with insecticides, diseases and weeds, then we have an imbalance in that soil, regardless of what the conventional soil test figures might be telling us. Carey Reams showed that insect and disease problems are related to the brix level of plants. He also showed that weeds are evidence of nutritional imbalance - often involving calcium and phosphate deficits or potassium excesses. Soft rock phosphate, because of its colloidal nature, is a very available source of both calcium and phosphate. When we look at the importance of phosphate in plant sugar production, we must go back to basic photosynthesis, the Krebs cycle and the citric acid cycle, which is in all living microorganisms. Phosphate is a key component of that - particularly in the form of ADP and ATP. If you don't have an adequate amount of phosphate available, you will not have sugar production, and consequently you won't have sugar combustion for energy and plant growth. Yes, phosphate remains a primary emphasis in this system, and soft rock phosphate is undeniably the best source of this

element. However, it must be remembered that it is the microorganisms which determine phosphate availability.

Graeme: We use a variety of microbial inocula as part of a balanced program, but there is a tendency for unscrupulous operators to oversell these materials...

Arden: I agree with you, Graeme. You have to provide nutritional balance for a biological system to operate. The question that should be asked is: *“How come these beneficial organisms are not active in the soil now?”* The reason is because the environment is not conducive for them. When you take these microbial products and add them to the soil - it's like taking a human being and placing them on the moon without a spacesuit. The reason we are not there now is because the environment is not suitable and the soil is no different. We have to provide good nutrition in the soil for microbes to function well. Simply adding a microbial product guarantees us nothing. It is possible to build a good biological system without a microbial inoculation, simply by the use of fish, seaweed, humic acid, composts and sugar. However, inoculants tend to speed up the process. They can give a jump-start.

“The fact is that, if we have problems with insecticides, diseases and weeds, then we have an imbalance in that soil, regardless of what the conventional soil test figures might be telling us.”

Graeme: The likelihood of good biological response is conditional on pre-existing organic humus levels in the soil. We design all programs with a view to building these humus levels. Can you offer any new insights into this carbon-building process?

Arden: Yes, I think there is one aspect that is often overlooked here. It should always be remembered that the quality of your nutrition determines the quality of the fodder that you have to reincorporate into the soil and turn into organic carbon. In many of our conventional soil systems the crop residues comprise an extremely high lignin fibre and very low carbohydrate or free sugar. Lignin takes a lot of energy to break down, and the humus production is limited by this problem.

Graeme: Yes, it's much the same with compost production. Your compost will only be as good as the ingredients it contains. The home gardener's lawn clipping compost is a prime example. If they were to add rock phosphate, humic acid, animal manure and molasses to the clippings, their end compost would be far more productive.

Arden: Yes you tend to reap what you sow. The microbes work more effectively with good nutrition, and you end up with a case of the whole being greater than the sum of the parts.

Graeme: I'd like to take the opportunity to ask a series of questions that may be of help with some of the problem soils we deal with regularly. Firstly, high-calcium soils - soils with 80%+ base saturation of calcium and the associated lockups. Is the foliar option the only way to ensure adequate trace element availability for the crop?

Arden: Foliars are an effective way to get the system to go, but I often like to try to get things in the soil, if I can, to get it balanced. I might look at humic acids, carbohydrates like sugar and maybe Vitamin B₁₂ to get things available. That's when the Reams test comes into play. We may appear to have a calcium overload, but how much

is available? I've seen sour grass weeds growing in calcite soils, which tells me that we still have, functionally speaking, a calcium deficiency in that soil. I need to do something to get the calcium working in that system. I may use liquid calcium as a catalyst on the soil for rapid activation. I may use ammonium sulfate. This material often works very effectively when we have a high base saturation in order to get some calcium available and to generate some microbial activity. There are many factors determining a plan of action. What is the CEC? Do we have 80% calcium in a sand or clay soil? Are we in an arid or tropical environment? The reason I ask this is because, if we don't have water control in a high-calcium soil, then dehydration is going to be an issue. If I try to do too much at once in this situation, I may produce too much crop for what my late season water supply can handle. So, now I have too much water demand and I dehydrate my whole crop, my biological system falls in the sink and nothing works for me. Each situation must be evaluated independently.

Graeme: What is your opinion of the use of natural hormones to manipulate plant growth?

“You have to provide nutritional balance for a biological system to operate. The question that should be asked is: “How come these beneficial organisms are not active in the soil now?” The reason is because the environment is not conducive for them. When you take these microbial products and add them to the soil - it's like taking a human being and placing them on the moon without a spacesuit.”

Arden: Yes. I did a research project on gibberellic acid and growth hormones in general at the University of Arizona. I find that, if I understand the energetics of nutrition, I can get the same out of nutrition as I can from hormones. A good example - A colleague of mine, Jep Gates, works in the cotton industry, where they use a hormone called Pix, in order to slow down the growth of cotton and to get it to set bolls. We can get the exact same thing happening with the use of nutrition. In plant growth there is the Yin (female) or acid energy, and there is also the Yang (male) or alkaline energy. Do you want to set fruit or do you want to get growth? If we want fruit and we have established a good calcium base, either locally or regionally, then I can apply an acid-based foliar and I can set fruit with that. There is a common problem with orchards and grapes, where we have one good year followed by a poor year. This is a nutritional problem.

Graeme: The season can play a big role. We work with a lot of tropical fruit in North Queensland, and this past season there has virtually been no winter. Some growers have had mixed results in manipulating fruiting response in these conditions. Can you offer any advice?

Arden: In an extreme situation like this it means that you need a little more power. A single foliar is simply not powerful enough to get that system to switch. It is also important that, if you use hormones, you run the risk of causing an energy switch without the nutrition to support it. A good base saturation of calcium is the critical factor here. If you have this prerequisite, then you do both a foliar application and a ground application. You come in with something like superphosphate on the ground, which creates

a powerful acidic reaction. I might even use ammonium sulfate or a combination of these. Then I come back with a foliar spray of vinegar, phosphoric acid, some household ammonia, seaweed, fish, maybe a little sugar and maybe a deficient trace element. Amongst these basic ingredients, vinegar should be apple-cider vinegar, the carbon (sugar) is in there to buffer it, so I don't burn the leaves. I may include humic acid, if I can get it to mix (we always do a jar test first). Seaweed in general works better on the leaf and fish better in the soil. I had a 100-acre walnut plantation in California, which had produced so badly that the farmer was going to rip them out. It was a species that became notoriously unproductive after fifteen years - these were eighteen-year-old trees. I said, "*Well, just give us a year, and we will see what we can do.*" We had to hit that with three heavy foliar sprays in order to kick it over to fruiting. He had been yielding only $\frac{1}{4}$ of a tonne per acre. The first year he had between $\frac{1}{2}$ and $\frac{3}{4}$ of a tonne, the second year he got over a tonne, and the third year he had 2 tonnes - so much for the waxing and waning of years. And not only did he eventually increase yield by 800%, but he got a premium, because the nuts were of superior quality. We had already prepared the nutritional base, but we still had to hit with a foliar once a week for three weeks in order to get the system to switch.

Graeme: What is the reason for your use of household ammonia in your foliar recipes? Why not use ammonium sulfate or any other ammonia source?

Arden: You have to be very careful with ammonia when you are putting it out on the crop. If you put too much out there on the crop, and your brix reading isn't high enough, Phil Callahan has shown that ammonia is the most effective radiation pump to call in the insects. You just need a little ammonia, so you are just kind of teasing it out there. We always prefer to use ammonium sulfate in the soil to encourage microbes and to get the calcium working, and we use a very diluted ammonia in the foliar recipes. This usually seems to work best. Remember that you also need to include a carbon with ammonia, so you don't lose it. We use sugar rather than molasses, and it also buffers against leaf burn.

Graeme: Is that one of the reasons that seaweed works so well in broadacre foliar sprays, where four litres of product in forty litres of water is a dangerous dilution rate, but if you add seaweed, you don't get burning? Is it the complex sugars in the seaweed providing this buffer?

Arden: I think so, yes. Plus you are providing hormones and other broad-spectrum nutrition, so that the plant is better equipped to handle the stress.

Graeme: I'd like to ask you for your evaluation of the reliability of monitoring brix levels and associated plant health using refractometers. How solid is the high brix / pest resistance connection? Does a good brix of 12+ automatically confer pest resistance?

Arden: You must always take environmental factors into consideration when using a refractometer. For a start, the 12-brix reading must come from the weakest part of the plant. You also have to consider the dehydration issue. Dehydrated plants have concentrated sugar in the leaf, and you will always get a higher reading. You must always correlate brix readings with field observation. If I have a brix reading of 20 and I have pest problems, then that is obviously an aberrant brix reading. When we have factored in all conditions, a true 12 does not have insect problems. Let's take sweet corn as an

example. You may take a reading of the ear and you may have 24 brix, yet the corn borers are running rampant. What you will find with that sweet corn is that, if you take a reading of the stem or the main roots, you will have a brix reading of 4 or 5. What's happening is that nature is moving all of the carbohydrates into the ear in an attempt to reproduce the species, so it's a fictitious level in the cob. The other influence at work here can be genetic manipulation and breeding, where free sugars are forced into the fruit without the plant having the opportunity to utilise these sugars to keep the whole plant healthy. So, again you look at the weakest point of the plant - you don't measure the fruit. Another source of false brix is what we call vascular plugging, where there is no sugar transport out of the leaves. It just sits there, but it's not healthy. It's just like constipation in humans. You could say you're full, but you haven't had a bowel movement in a week. If we take these things into consideration, then the refractometer is a very valuable tool to monitor plant health. Remember though that all tests should be used within a context as to what you are going to do about it. You may need to correct a deficit or you may need to catalyse availability with a biological, but you make that decision based on a variety of observations, and refractometer readings are one of those. Even conventional analysis should be considered within a context like this. It is common, for example, using conventional leaf analysis, that you will be told that your nitrate is low. However, your crop may be doing fine - it's putting on fruit, the fruit is growing and you don't have an insect problem. One sure way to get insect problems in this system is to add nitrate nitrogen when it is not needed, because then you lower your brix reading, you get more water in the plant and the insects move in. No test data should be used in isolation. If the field evidence contradicts the test results, then more evaluation is needed before taking action. For all deficiencies you must always evaluate whether it is a quantitative or qualitative deficiency.

Graeme: I was wondering about your experience with weeds. Weeds are often called a signpost to nutritional deficiencies. Do you have concrete evidence of this nutritional link?

“You must always take environmental factors into consideration when using a refractometer. For a start, the 12-brix reading must come from the weakest part of the plant. You also have to consider the dehydration issue. Dehydrated plants have concentrated sugar in the leaf, and you will always get a higher reading. You must always correlate brix readings with field observation. If I have a brix reading of 20 and I have pest problems, then that is obviously an aberrant brix reading. When we have factored in all conditions, a true 12 does not have insect problems.”

Arden: Absolutely and without question. Three to five years into a program weed problems begin to significantly diminish. Sour grass weeds are indicative of a functional or qualitative calcium problem. It may be quantitative, too, but it is a functional calcium problem. Broad-leaf weeds are a functional phosphate and potash issue, and succulent weeds (the viney things on the ground) are a carbohydrate issue. Another interesting thing is that, when balance improves and brix readings go up, then the brix in

the weeds goes down. The insects go from eating the crop to eating the weeds. Again, if you're not out in the field looking at these things, you won't see them.

Graeme: Are you familiar with a balancing philosophy popularised by a New Zealand consultant, Peter Lester, which has an emphasis on the importance of manganese? His clients put on high manganese applications, and many claim results.

Arden: Yes, I am familiar with this approach, Graeme, but I suspect that they are misreading their results. It goes back to energy. Anytime we are using a metal we must remember that a metal is a very strong conductor. You can apply metals when you may not necessarily need them, and they are a tremendous conductor. You can instigate large amounts of energy release in the system. You think - "*I put manganese on and I got this great response*" - but it need not necessarily be the case - The strong metal conductor gave energy release, which in turn gave the crop response.

Graeme: Energy release and nutrient release are obviously two sides of the same coin, but there are some questions I'd like to ask about the phenomenon of nutrient release in general. We have had good results releasing tied up nutrients by biologically activating the system, but the hardest element to release has been potash. Even though there can be huge amounts of this element locked up in heavy soils, we rarely see good nutrient release gains reflected in subsequent soil tests. Can you throw any light on this problem?

Arden: You must remember that the crop will consume a lot of potash, compared to phosphate, where some is consumed, but a lot of it is cycled. Crops use large amounts of potash and calcium. You may be successfully releasing potash, but it is being used to produce the crop. With the Reams test we find that potash availability is directly related to our calcium availability. This is a functional and qualitative issue. It has nothing to do with conventional soil test numbers - it has to do with bioavailability. When we make calcium biologically available, then it seems to be easier to get our potash functionally available.

Graeme: While we are talking potash, what are your feelings about the use of muriate of potash vs. sulfate of potash?

Arden: The only time we would consider muriate is if the soil needed chlorine. Chlorine is actually required at about 10 ppm, but you will appreciate the fact that very few soils today have a chlorine shortage. In conjunction with Dan Skow, Phil Wheeler and several other organisations, we are farming several million acres with this eco-agriculture, biological approach, and we are doing this successfully without using muriate of potash. Muriate is destructive to beneficial organisms, and it also affects active carbons (basically all salts tend to do this). It is really a poor energy producer. Many conventional programs have inadvertently replaced calcium with potash, and quality suffers as a result. Muriate is a strong salt that increases conductivity, and it can produce growth, but it is not sustainable. It sterilises the soil, and sulfate of potash is a far better material in this regard. We really have to get our calcium base moving, and then remove muriate of potash from the program immediately, or, in some situations, we may need to take it a little more slowly.

Graeme: I would like to know your opinion regarding the relative benefits of conventional v's organic systems. Do you prefer either, or would you rather have a combination of both? In my opinion, a functional hybrid works better.

Arden: I think you're absolutely right. Our concept of biological farming is the best of both worlds. The conventional system has learned to manage business on the farm very well. They are very efficient managers. The organic system acknowledges the need for biological balance with non-toxic inputs. Unfortunately they may not be doing a very good job achieving this balance, but at least they understand the imperative. We combine these two systems. We use good commercial fertilisers - if used correctly in a biological system, they do the job very well, and the ultimate goal of course is producing nutritionally rich food. However you achieve this goal is valid. Biological farming should be both economically and ecologically sustainable - we have to have both. Farming may be a great way of life, but only if you are profitable enough to pay your bills.

Graeme: There seems to be a genuine spiritual component to your work. Carey Reams was a profoundly religious man. Dan Skow appears to be of a similar ilk, and one of the chapters in your book is titled 'The Divine Blueprint'. How important are your personal beliefs in your work?

Arden: Well, I think it's a legitimate question. I think it has to do with the question "*What are you doing your work for?*" As a physician, my concern is the link between human health and soil health. Farmers have an incredibly important role to play as food producers. I have often heard farmers tell me that they don't eat what they commercially produce. They keep a separate plot, which doesn't get all the poisons, and that is what they feed their families. To me this idea embodies an unforgivable lack of respect for your fellow man. The ludicrous thing is that even this selfish attempt to protect your own family from poison is often pointless, because your children will eventually marry outside of the family and that polluted food you produced and sold may well have fed your future daughter or son-in-law. As a farmer, anything I do affects my neighbours and future generations. I see, as a physician, that the food that people eat determines their health. The integrity of the farmer determines the integrity of that food chain. Those farmers who acknowledge that connection seem to find the answers to their problems. They are motivated by a compassion for their fellow man and a compassion for the soil, because they want their children and grandchildren to have the opportunity to farm. These are the big success stories in eco-agriculture. They are the ones producing the best quality food. It doesn't matter what religion you subscribe to. The basis of all religions is that you take your fellow man into account and you treat your fellow man how you would like to be treated yourself. We are not an island unto ourselves. Whatever we do affects our fellow human beings, and, if we understand that, our decision making process is different. We should still make profit - we were meant to be profitable - and it is a lot more rewarding, however, achieving profitability sustainably.

Graeme: Finally, I'd like to ask you about your reasons for becoming a Doctor of Medicine after years as a leading agricultural consultant. Why did you decide to move in this particular direction?

Arden: Well, for many years I had been interested in going to medical school. Carey Reams encouraged the idea, and Phil Callahan also encouraged me to do that. Most of the earlier researchers I really respected, like Charles Northern, for example, had combined agriculture and medicine. They made that direct connection between soil health and human health. I also noticed how many farmers were ill from pesticide use - whether it be more and more birth defects, lung diseases like asthma, environmental

sensitivities, chronic fatigue, etc, etc, and they had nowhere to go. There was no one really pushing the connection between their farming practices and their health. So I decided to take the plunge and go to medical school. Now, when I speak about soil health,

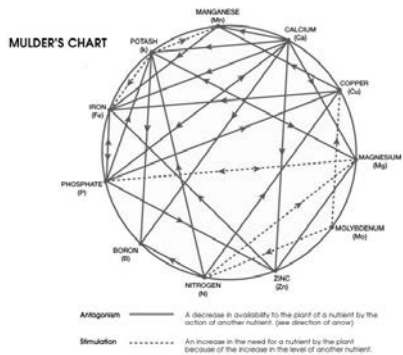
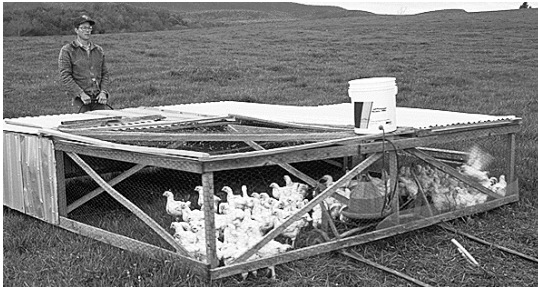
“Farmers have an incredibly important role to play as food producers. I have often heard farmers tell me that they don’t eat what they commercially produce. They keep a separate plot, which doesn’t get all the poisons, and that is what they feed their families. To me this idea embodies an unforgivable lack of respect for your fellow man. ”

I can make the connection between what you, the farmer, is applying to your soil and what you, the patient, comes to me with symptom-wise. I can now offer a wider understanding of the importance of biological farming. Not only do you need to be profitable, but you also need to be healthy to enjoy that profit. Many of my patients are farmers, and I relate very closely to these people. The laws of nature apply to all living things. The human body and the soil are closely linked. The digestive system is the closest parallel. My increasing understanding of each system adds to my ability to make these analogies to farmers. I now feel better equipped to help make a real difference through my medical practice and through my teaching of the principles of biological agriculture.

Graeme: Thank you for time. I’ve really enjoyed talking with you.

Arden: I’ve really enjoyed Australia, and I’m looking forward to returning.

ANIMAL & SOIL HEALTH



GARY ZIMMER

Interview recorded December 1999



American author / farmer / consultant, **Gary Zimmer**, has a vision to 'change agriculture' and he is the kind of highly motivated 'doer' destined to achieve this goal. His book, 'The Biological Farmer', is an exceptional practical guide for the prospective eco-farmer. Gary is President of **Midwestern Bio-Ag**, the most successful US company involved in sustainable agriculture. He has trained and nurtured over sixty competent consultants fanning the Midwest and beyond, and he has established the Bio-Ag Learning Center with an associated trial farm where his legendary field days draw large crowds. Gary is a trained Brookside consultant with a masters degree in dairy nutrition. His consulting services have grown from a dairy base to now encompass most areas of agriculture and horticulture. He believes that large-scale change in agriculture can best be achieved by encouraging conventional farmers to visit successful biological farms, and he promotes his 'seeing-is-believing' approach at field days around the country. It is a considerable achievement to develop an entire approach, to possess the practical skills to take the theory to the paddock and to have the verbal skills to communicate your findings to your fellow farmers. In Gary there is the inspirational passion of the zealot. He is in love with farming and he strives to ignite - to spark that excitement in all he meets.

Graeme: Congratulations on 'The Biological Farmer' - it was an impressive effort. What was your major motivation for writing the book?

Gary: Well, it started out, about ten years ago, as a training manual for our consultants in our business of biological farming. We have a large number of consultants and they needed training. It was a notebook that kept growing until farmers started asking about it. We don't have any secrets, so I started giving out the manuals and building on the information. Two or three years ago, Acres USA approached me and suggested that I do a book. Dr Harold Willis was working with the company at the time and he also encouraged me, so I started knocking away at the book. It was one of those things I couldn't escape from after I had started, but now its done.

Graeme: I understand that you struggled for some time with the title because you have aversions to the terms organic or sustainable. Does the 'biological' tag pretty much wrap up what you are trying to achieve?

Gary: Certainly, but I guess I could have called it 'The Chemical, the Physical and the Biological', because these are the three things we are trying to influence within our approach. However, if the popular soil balance approach has a weak link, it is the lack of focus on soil biology. Often people don't grasp the importance of understanding, feeding and taking care of the living soil. Part of this is understanding what we don't

know about it. Let's be a little humble about it and say, "*Well, this is Mother Nature, lets use some common sense and treat it like a living thing.*"

Graeme: You're the president and founder of Midwestern Bio-Ag, a sustainable fertiliser consulting firm, but the main focus of your approach has been on the power of demonstration. Talk is cheap - farmers like to see a system at work. Tell me about your plans to extend this concept on a much larger scale.

Gary: Well, we started off as dairy nutrition people, but we wanted to build nutrition from the soil up. Our company grew from the success that we had in the dairy industry. People used to say, "*What are your goals?*" Well, my goal was to change agriculture, and I started with university research and trial plots. Pretty soon I realised that you can research and prove pretty much anything that you want, but people just take it with a grain of salt. If we are going to change agriculture, it's got to be with the success of the farms we work with. That's why I introduced the concept of a model biological farm, where I can bring in the farmers to see for themselves. Farmers believe what they see. If they can go to a farmer who is doing well, he's happy with what he's doing, and he's having fun, then it catches on. If you mark a map of America with pins representing those involved in biological agriculture, you'll see that the pins are in clusters. Well, we need to expand those clusters. Farmers have to change their thinking first before embarking in this area, and it can be difficult for them. I'd like to ease that transition - make it more comfortable for them by giving them access to guys that have already done it. It's hard to take risks these days, but growers can feel more relaxed about a change when they see the results for themselves.

Graeme: You mentioned, in your address last night, the idea of publishing a list of one hundred model farms in Acres USA to encourage this 'see-and-believe' concept.

Gary: Yes, I had talked to Chuck Walters about this concept a couple of years ago. I have all kinds of farmers that are willing to share their farms and their information. They're proud of it - there's pleasure in what they are doing! Farming isn't only about money. It's about feeling good about how you are farming!

Graeme: It's interesting that it can also work the other way. Money can motivate the change. I found it fascinating listening to Klaas and Mary-Howell Martens yesterday. They came to organics when a breakup between brothers reduced their family holding from 1000 acres to 500 acres, and this smaller area was insufficient to sustain themselves and their three children. He was the largest chemical user in his area in New York State and quite proud of the fact. They researched how they could survive financially on 500 acres and decided that the higher organic premiums were the answer. It was only after they changed systems that they recognised the other benefits. Now that the life has returned to their soil, they have realised - "*Hey, there's something good happening here!*" Now they're passionate converts, out spreading the word.

Gary: I missed their talk. I guess it can work that the money drives them into it and then they discover the satisfaction. I'm a strong believer in the importance of maintaining the family farm concept, but we do work with corporate farmers who are principally governed by profit. We have the farm manager and agronomist from a 30,000-acre potato farm here today. Since working with us they have taken \$50 an acre off their chemical bill, they have cut their fertiliser bill in half, they have taken their nitrogen usage down from 240 units of N to 140 units. They're growing their brassicas

and green manure crops and doing well. There is not necessarily an ideology behind their move towards biological farming - it can be simple economics.

Graeme: Getting back to your list of model farms concept, is it up and running yet?

Gary: No, not yet. I have a bunch of signs all made up, but ideally I'd like to involve other similar companies in the project. Unfortunately there is competitiveness in this industry, which can be a problem. I just talked to a guy yesterday from one of the other biological companies and he confessed that he was unhappy with our growth because we might threaten his business. It's a huge market out there and more can be achieved working together.

Graeme: We've had the same problem in Australia as we've expanded. It was always assumed that our problems would come from the chemical farming industry as they began to perceive us as a threat. Instead, any strife we have had has come from within the industry. Petty jealousy can only be destructive.

Gary: Yes, sometimes we need to pool resources. I would like to see two hundred model farms representing every company strung out across the country, and I'll be working to achieve this.

Graeme: Do you envisage that the new book will open doors and promote an extension of your sphere of influence beyond the USA?

Gary: Well, during the last year, whenever I've been asked why I'm writing the book, I say its because I want to travel to Australia and New Zealand and this book may get me there. My idea of travel is not tall buildings. I like to get amongst the farmers. I've been to Europe and I had difficulties with the language. It's hard to make a connection there, but Australia and New Zealand are a different story. I've always been fascinated by those countries. We've even got a somewhat similar language [laughs].

Graeme: Well, we will certainly do our best to get you out there within the next twelve months. How successful has Midwestern Bio-Ag been? Are you beginning to see the same tidal wave of interest we are experiencing in Australia?

Gary: We've been in business for fifteen years now. We started with two hundred dairy farmers, but now we are involved in most areas of agriculture. At present, we are trying to control growth with more quality and better trained consultants. The business has been very successful. We have distribution centres in several states, but the biggest problem is finding good quality consultants. It's our biggest limiting factor. I won't go into a new state without a really good consultant to spearhead the expansion. We have recently started our intern system, in the hope of addressing this shortage of trained staff.

Graeme: What is your intern system?

Gary: Well, for the past three years we've been taking in young guys and they work on the farms or in the company with a minimal pay, but we invest time in thorough training. They may be students or just anyone who has a real interest in learning about this type of farming. It's just a minor way we bring people on board.

Graeme: Your infectious enthusiasm and passion are a timely antidote for the gloom-merchant atmosphere that prevails in times of low commodity prices, particularly when we desperately need to fire up a young generation on the land. I understand

that your son works with you on your demonstration farm. Have you found that your philosophy appeals to the young potential farmers?

Gary: Yes, often the children of the farmers we work with develop a strong desire to become involved. Not because Dad said they had to, but because they are excited about it. I tried to encourage my own son to go on to college, but he only wanted to farm. He started at thirteen and bought his first farm at sixteen. He is shouldering a large debt for a twenty-one-year-old, but he's making money and he loves what he is doing. I always say that he is the son my father always wanted. I was always concerned with education, questioning learning, but he just gets out there and does it.

Graeme: I appreciated your quotes from Louis Bromfield's books during your lecture. He really had an understanding of the art and craft of being a good farmer. His twenty-point list of the attributes of a good farmer should be laminated and hung in every farmhouse. What prompted you to return to his forty-year old texts for inspiration?

Gary: Well, I guess you are familiar with Malabar farms - Louis Bromfield's own property, which he opened as a model farm for biological farming in the fifties. As a Brookside consultant some twenty years ago, I stopped and visited the Farmers Estate Park in Ohio, which was formerly Malabar Farms. Four years ago I was approached by a gentleman to get involved in a project to re-establish Malabar Farms as a model for biological agriculture. He wanted me to make a presentation to the Board of Directors. Well, I always like to research everything before making a decision. I do my homework. I want to see where it's been and what it's done. I drove back to Ohio, toured the Estate Park and read every book I could get my hands on. I got so excited as I read, I kept saying "*Hey, those are my ideas, how did you get them?*" Of course I was two years old when he wrote them. Concepts like using hydrated lime, balancing with all of the trace minerals - including cobalt, molybdenum, using soil conditioners, green manure crops, chisel ploughs. They even had a Rotovator to shallow-incorporate residues - the same sort of things we are doing, except we have better tools today. I've since read all of his books and I love his style. 'Return to Pleasant Valley' is a wonderful book. One term of his I really love - he used to talk about 'sparking' farmers. This refers to when the farmer makes the transition from the pure product, business, money, sales side of things to the emotional side - here the interest, the enthusiasm, the excitement flies like sparks. When the farmer gets 'sparked' you can't stop him. They are so hungry for information. I'll give you a copy of 'Return to Pleasant Valley' before I leave. I'm sure you'll enjoy it.

Graeme: I'm sure I will. There is nothing more rewarding than being part of a grower's discovery of that 'spark'. I interviewed Charles Walters yesterday, and I mentioned Gene Poirot, who was also an early pioneer of the biological approach. There is one quote of Gene's which seems particularly relevant to your work. He used to say that farming with nature should nurture the soul of man. What do you feel about this concept? You look like a guy whose soul is in pretty good shape.

Gary: There is no question about it for me. I farm partly to keep my sanity, to reduce stress. That feeling on the land, being out there, being part of it - there is nothing that compares. I always say that the farmer on his tractor with his headphones on, listening to rock music, really hasn't figured out what this is all about yet [laughs].

Graeme: Yes, and I am often amazed at how different it has become for many farmers. I share your reverence for nature and I wonder about the souls of farmers spending their summer in a tractor cab surrounded by a haze of herbicide day after day!

Gary: Yes, what sort of nurturing feeling can you have when you're out there poisoning something daily?

“One term of his I really love - he used to talk about ‘sparking’ farmers. This refers to when the farmer makes the transition from the pure product, business, money, sales side of things to the emotional side - here the interest, the enthusiasm, the excitement flies like sparks. When the farmer gets ‘sparked’ you cant stop him. They are so hungry for information. I’ll give you a copy of ‘Return to Pleasant Valley’ before I leave. I’m sure you’ll enjoy it.”

Graeme: And poisoning yourself, it's an undeniable health risk. How can you possibly feel good about what you are doing?

Gary: You put on the mask, then the rubber gloves, hop in the insulated cab and turn on the rock music - you're not farming at that level, you're in a factory job! That's why the kids are leaving the farm. That's why farmers talk stress, frustration and big business. It happened when they lost the spark about what land and nature and nurturing is all about. Over here, the grazing people are about the only ones who have retained the feeling on a large scale. They walk the pastures, they observe. Mother Nature teaches you everything you want to know, but you've gotta look.

Graeme: I see that you prefer the standard CEC test to the LaMotte test. We also use a combination of refractometers, sap pH and conductivity meters and Horiba ion meters to monitor the crop. What other monitoring tools do you use?

Gary: In general we rely on CEC tests and tissue tests. In dairy we monitor fertilisers based on feed test results. I've looked at the LaMotte test, but it has problems in that it really only offers a snapshot of what is happening at that precise moment. You really need to test each week and our farmers just don't have the time. I'm not saying it doesn't have merit, but it doesn't fit us well.

Graeme: You favour using natural, slow-release fertilisers, particularly rock phosphate. Do you use bio-activation to speed things up, or phosphate starters to allow for the kick-in time?

Gary: I like to balance the soluble with the slow release. I divide programs into two categories - soil correction and crop fertilising. For soil correction I prefer slow-release rock phosphate, compost, humus, green manure crops, etc. We balance the trace minerals, correct the pH and correct the calcium / magnesium ratio. When we use fertilisers in the row, I call them the solubles. These feed the plant, they are not fertilisers. We might use MAP or ammonium sulfate for this purpose.

Graeme: You don't use scanners in your program, like Phil Wheeler or Arden Andersen?

Gary: No I don't. I considered them when I was introduced to them at an Acres conference fifteen years ago, and some of my colleagues got into them. However, as a company we are not really trying to attract the guys who think that far outside the box - the fringe dwellers. There is no way that we would be working on 30,000-acre farms involved in intensive horticulture if we walked onto the place with a scanner.

“What sort of nurturing feeling can you have when you're out there poisoning something daily?”... “You put on the mask, then the rubber gloves, hop in the insulated cab and turn on the rock music - you're not farming at that level, you're in a factory job! That's why the kids are leaving the farm. That's why farmers talk stress, frustration and big business. It happened when they lost the spark about what land and nature and nurturing is all about.”

Graeme: I agree completely. It's a credibility thing. It's often just too much of a jump for growers to embrace this approach. There are other options that don't alienate.

Gary: We try to focus on the basics. Ninety percent of growers still don't have a grip on these basics. Like the example I pointed out yesterday - that guy had farmed twenty-five years and had never done calcium! We often need to get to page one first. I've watched guys with scanners really go off the deep end. They begin to think of themselves as gods. I'm really not comfortable with that.

Graeme: You are keen on feeding the soil with cover crops and green manure crops. Do you use microbial inoculants to speed up the breakdown of green crops when they are ploughed in, or extra nitrogen to ensure a suitable carbon / nitrogen ratio?

Gary: Well, the nitrogen option is not available for my own farm because I'm certified organic. Like I always say to farmers, *“You've got to earn the right to not use nitrogen, you've got to earn the right not to use herbicides and insecticides. You have to earn the right to go organic.”* I balance carbon and nitrogen with legumes and green manure and inter-seeding. If the growers are not organic, we might use a little ammonium sulfate. As far as inoculants go, we add them to our composts, and the compost is, in effect, an inoculant. When we have a minerally balanced, biologically active soil, I've proven that we don't benefit from other inoculants. We already have the system firing. Of course it is a different story in a less fertile soil.

Graeme: You have a strong emphasis on the importance of correct tillage techniques, apparently fostered by tillage guru Don Schriefer. Can you offer a typical tillage program?

Gary: Well, once again, we are looking at common sense where we always consider microbial comfort. The life in the soil likes to be left alone. I figured out, a long time ago, that the fence post rots off near the top, not a foot deep down in that soil, and I'm not into tipping up that soil. Once again, we look at nature. In nature, soils are never bare. I remember years ago, talking to a really good farmer and asking him what kind of soil he had - he said, *“Well, I try to never let anyone see it. I want something protecting my soils all the time.”* Ideally there should always be a cover crop in, but sometimes there are trade-offs. For example, I have fields on my farm which are now

chiselled and dug for this fall. This is the first year I've done it. I feel like I'm sacrificing my biology because I want an early spring planting. Normally you should always have something green on the ground. With tillage, I've got my old Howard Rotovator. I'm a real believer in shallow incorporation of residues. A Rotovator is quite aggressive in chopping up. We only go two or three inches deep. Then, sometimes, we do run over with our sub-soilers. If I drag my big equipment, which we all farm with today, out there and pack those soils down, because I'm out there in less than ideal conditions, then I'm going to have to re-pick them back up and aerate them. However, I'm not a big fan of sub-soiling. This year we did some deeper chiselling with just a straight tyne, following a wet year last year. If I pack this soil, then it must be aerated. I've tried various deep tillage tools, but if I have earthworms and tonnes of life in there, then the job is done for me. I put tillage in the category of herbicides and pesticides - they are necessary evils. You're not out there to exercise your tractor. You'd better have a reason why you're doing it, and your job is always to work towards doing less.

"Like I always say to farmers, "You've got to earn the right to not use nitrogen, you've got to earn the right not to use herbicides and insecticides. You have to earn the right to go organic."

Graeme: Similarly, rotational sequence plays a big role in your programs and research. Can you offer any insights into ideal rotation practices?

Gary: Well, someone said at one of my field days that I talk about all these tight rotational practices, and yet on my own property I have areas with corn on corn for nine years straight. Well, what I'm trying to demonstrate here is that you can grow corn on corn for years without any nitrogen supplementation, without herbicides or insecticides. The key is a clover crop inter-seeded in my corn crop. If I just grew corn on corn and did it on bare soils and sprayed herbicides, how successful would I have been? A rotation is to break disease cycles and to give the soil-life a different food. The ideas of Dr Elaine Ingham are very relevant here. Corn on corn has never been very successful. Farmers have realised that, if corn follows soybeans or clover, then they always do better. The disease explanation of this difference was really not a good enough explanation for me. I needed a better answer. Elaine provided that answer. She said that it is really to do with the microbial populations in the soil. The woody materials, like corn stalks, promote a fungal population. Corn likes to grow in a bacteria-dominated soil, so corn on corn produces an undesirable fungus-dominated soil. When I inter-seed clover, I'm bringing back some bacteria. Rotation and this sort of inter-seeding is actually manipulating biology. Normally I do like tight rotations.

Graeme: You've been pioneering the concept that the performance of lime or gypsum is based on the solubility of the calcium content. This is something that is never measured in Australia. You've discovered that some Ag-limes have as little as two pounds of soluble calcium per ton, while gypsum might have 25 pounds. Your own product, Bio-Cal, has six times the soluble calcium content of gypsum. Can you tell me more about this concept of calcium solubility?

Gary: Over the years, I've always had questions and struggles understanding why relatively small amounts of calcium nitrate or soluble, chelated calcium can produce a

more immediate response than lime. I mean, twenty pounds of calcium as calcium nitrate can produce more response than a ton of limestone, which contains 600 pounds! I thought something's wrong here, and that's when we got into this issue of calcium solubility. Most labs don't test for this, but we found industrial labs that could test solubility. We have developed a product that has 150 pounds of soluble calcium per tonne. Burnt lime is part of that formula. I always point out that the first lime in this country was burnt lime. They couldn't grind it, so they burnt it. George Washington plastered the country with hydrated lime and gypsum and really kick-started agriculture with these materials. The value of these materials is amplified in alkaline soils, where the alkalinity is based on magnesium or another cation rather than calcium. Acidic soils can begin to release the calcium in ground limestone fairly rapidly, but in alkaline soils the lime just sits there. Soluble calcium is the answer here. If we put on 1000 pounds of our Bio-Cal, we are getting 75 pounds of soluble calcium, which is equivalent to 75 gallons [approx 300 litres] of calcium nitrate. There is simply no comparison between the relative cost of these two sources. The calcium nitrate is several hundred percent more expensive, before you begin to factor in the 6 to 8% sulfur, boron and trace elements in Bio-Cal.

“I put tillage in the category of herbicides and pesticides - they are necessary evils. You're not out there to exercise your tractor. You'd better have a reason why you're doing it, and your job is always to work towards doing less.”

Graeme: I understand that you use your trial farm to test out some of these concepts.

Gary: Yes, I've shown, for example, that, where I've put on a ton of lime an acre for the last five years and monitored with tissue tests, I've found that I'm not getting the kind of mineral uptake and response I want. I have a neutral pH, which still needs calcium. When I put the Bio-Cal on this block, I got an instant response. This is what we do with potatoes. When we put 1000 pounds of Bio-Cal on potatoes, we get a dramatic nutrient response. We are taking petiole tests on potatoes every week and we see a really rapid increase in mineral uptake. We find with alfalfa that we can increase the mineral content by 50%. You can't do that with Ag-lime. We are getting 50% increases in soybeans. It usually takes five years with gypsum, at one tonne per acre per year, to achieve this level of response.

Graeme: One of the few areas we differ relates to your favoured 1 to 1 iron to manganese ratio. We always prefer iron to be higher than manganese to ensure adequate iron uptake. Do you have research to support your 1 to 1 ratio?

Gary: No, but I feel good about it [laughs]. I think you might be talking soil lab variations here. I've seen other tests where you do need to have more iron than manganese. In our dairy work we are looking at phosphorus as a key element. We want phosphate uptake for sugars and energy and digestibility and plant health, etc. If I have high iron in my soils, usually from over-tillage, excessive use of caustic materials or too much nitrogen use, I'm not happy. On a dairy farm, I scream and holler if they buy a single pound of commercial nitrogen. If they buy nitrogen, I want to know why. They had better use their manures and alfalfa and rotation, because I don't want iron buildups.

Iron binds with phosphate within the plant. Maybe people who don't feed cattle don't notice this difference. You see, the phosphorus may be in the plant, but when you bind it to iron, it becomes unavailable. Iron has a triple-positive charge and phosphorus has a triple-negative charge, so they will bond very easily. If your feed is high in iron, then the cow is starved of phosphorus. We are fanatical about trying to get our iron down, just so we have better phosphate availability. In high iron soils I don't think our soil tests give an accurate idea of phosphate availability to the plant.

Graeme: You suggested in your seminar that, if we had had access to a test to measure biological activity and soil health years ago, we would never have accepted such obvious declines in fertility. Do you currently use any test within your company to monitor soil life?

Gary: I've spent a lot of money chasing this thing. I've used the Formazon test - the Soil Foodweb test, but the problem with these tests is similar to the problem with LaMotte tests - they only give a snapshot. As I showed on my soil tests in the seminar, manganese will float every month, based on the weather. I mean, when do we do a soil-life test? Before I put in my green manure crop, or two weeks after, or in July, when it's real dry? There are so many variables here that I finally realised that we were going to get misleading or false information, and because of this there was too much chance for clients to be misguided or discouraged. At this point in time the smell is still the best shot. Get down on your hands and knees, look at the soil, touch it, check for earthworms, smell it. There was some University last summer that analysed a range of soil-life tests. They finally concluded that smell is still the best guide.

Graeme: In your seminar, you proposed the inclusion of lime, phosphate and trace elements during the composting of manures. We've usually found that lime is unsuitable for this purpose, as it tends to increase the pH of the compost and reduce microbial activity. Have you had a different response?

Gary: No, we actually don't add lime to compost for that same reason. We have added gypsum before, but only late in the composting process. We often also add rock phosphate and trace elements to the compost.

Graeme: Oxygen is considered a principle ingredient in soil-life health. No-till farming is limited by the inherent inability to manage compaction and associated oxygen management in the soil. You have researched years of no-till farming. How do you rate this approach?

Gary: I don't personally see 'no-till' as a type of farming. Whether you decide to till or not depends on a variety of factors, but for some reason it got branded as a farming philosophy. 'No-till', as they call it, has some serious problems. I hear people say "*It gets better after five years,*" and I always say "*Why would you take yourselves through five years of bad times?*" Maybe you have to earn the right not to till. If you quit tilling a dying soil, you're going to have a bigger problem than you ever had. The tool called the 'Airway', which I think originated in New Zealand, is big news over here, particularly amongst the no-till farmers. Getting some air into these soils is critical. An Airway is probably the best investment a no-till farmer can buy.

Graeme: We always try to address calcium and boron together to magnify their synergy. I loved your quote - "Calcium is the trucker of all minerals and boron is the steering wheel". Is it your own?

Gary: I can't say where it came from. I doubt that I invented it, but I picked it up along the way somewhere.

Graeme: In your fertility programs, you prefer that a broadacre grower with limited funds does a little over the entire area, rather than providing a full program for selected areas. This is in direct contrast to Neal Kinsey's approach. Have you looked at comparative gains for both approaches?

Gary: Well, we are trying to chase the best bang for your buck, and this is best achieved by treating the whole farm. This is particularly important if you farm live-stock, because our goal is to get all the fields uniform. If there is diversity, then there will be nutritional problems with the animals. If you're struggling with cash flow, you need to have the whole farm working for you, even if it is only at three-quarter pace.

Graeme: Your results with soluble calcium on potatoes, where you achieved better phosphate increases than actually applying more phosphate, was fascinating. Have you seen similar results with other crops?

Gary: Alfalfa is actually what we began with, but the potato growers I work with did their own research. They are the closest thing to precision farmers I have ever seen. I've seen grid-testing precision, when, at the end of it all, they simply go out and throw on nitrogen and potassium. I can't see the precision in that. They just use the same old cheap salts. No, the potato farmers are real precision farmers. To me, precision is looking at more things and doing a better job of monitoring. The potato people take weekly petiole tests, and they deal with all the trace elements. They use Chilean nitrate and bat guano in their formulas. These are huge commercial farmers. They watch their salt indexes, they foliar-feed, they constantly monitor their crop. It was one of these companies with 5000 acres of potatoes, where one of their agronomists came back with a bunch of graphs, after trialing Bio-Cal, and said, "*I struggled for years to get what I just saw here, and I spent mega-dollars on phosphorus. You came along and quit the phosphorus and put on calcium, and I finally get the results I was after.*" This calcium-related phosphate uptake will not occur in soils with a poor history of phosphate fertilisation. Soils with low phosphate, which have been neglected, simply don't have the phosphate to kick loose. I did some university work to try to prove this phenomenon, but I failed. I failed because they gave me three years on a field that hadn't been fertilised at all for five years. The minerals were depleted, and the three-year trial was over by the time I got them back up there. Bio-Cal didn't give a response, because there was nothing to kick loose - the pot had been sucked dry. You go to a farmer who has put on fertiliser every year but is just not getting the response anymore, and you put on soluble calcium, and he says, "*Wow, what's going on here?*"

Graeme: One of your crop management practices involves planting on the basis of current weather conditions rather than pre-determined dates. You suggest that any condition less than ideal at planting time is unacceptable. Have you ever come unstuck with this approach and simply planted too late?

Gary: Well, we joke about that, we say "anything less than ideal at planting is not acceptable until June 1st, then all hell breaks loose". I spoke to someone yesterday who bragged that he planted his soybeans on May 4th and he got 34 bushels. Well, I planted on June 22nd and we averaged over 50. When I talked to this guy, he mentioned that he couldn't use his Rotovator because it kept clogging up. Well, it's impossible to clog a

Rotovator unless you've got mud. The guy had planted in mud to be early! With corn on our farm, I generally plant a shorter-day variety corn. I plant later, but I plant a higher population. Yield is kernels per acre, so, if I get smaller cobs, lets get more of them. My 89-day corn was planted the first week in June last year. If you compare 89-day corn with normal 105-day corn, grown in our area of Wisconsin, there is, on average, a four-bushel difference. I say, "*Per four bushels of corn I plant three weeks earlier - you've got to be kidding!*" I have the chance to extend my green manure crop when I plant later. This year, in one week, we doubled the amount of dry matter in that green manure crop. We took our nitrogen units from 110 up to 220. I doubled the amount of organic matter. I gained more by waiting a week and growing on 89-day corn any day than I would have if I'd planted a week earlier. I really believe that, if we can plant in ideal conditions where we can get everything perfect when we plant, I'll out-yield the early guys any day, anytime, any deal!

Graeme: You actively promote the reduction of herbicides and pesticides whenever possible. Are you aware of the benefits of adding humic acid to these chemicals to increase their uptake and reduce ongoing toxicity?

Gary: Yes, we are. Actually, the only liquid product we market at this stage is a humic acid. We have something called N-Booster, which is basically humic acid. Apart from its benefits with herbicide, humic acid and sugar can also buffer mid-season nitrogen foliar applications, where we would spray 28% nitrogen on corn and turn it brown. We would find that, when we add a quart of humic acid per acre with some sugar, there is no problem with burning. If a farmer has good weed control now, we say, once again, that you have to earn the right to use herbicides. If your soils are biologically active, loose and crumbly, you won't get anywhere near the weed germination. When we add humic acid to the herbicide of a farmer who is getting good weed control now, we will cut back his herbicide by 25% the first year. If he's not getting good weed control, then we say, "*What's going on, what's wrong here?*" It's time to investigate.

Graeme: The benefits of humic acid with herbicide go beyond the ability of humic acid to increase the permeability of plant membranes to promote increased uptake. It is the detoxifying capacity of humic acid that is important here. Elaine Ingham has confirmed that contact herbicides, like Roundup, for example, are only biodegradable if the soil is alive and well. In many soils the residues remain for months. Humic acids, with their cation exchange capacity (CEC) of 450, absorb the toxic residues in much the same as activated charcoal is used to rescue poison victims. The herbicides kill algae, which provide the energy source for the rest of the system. If you can take the toxic residues out of commission with humic acid, at least you restrict potential ongoing damage.

Gary: That's interesting. I wasn't aware of that. Actually, it was funny, on my own farm, when I started, I decided I had to do some herbiciding just for that first year, so I called a contractor in, because I hate these chemicals. I asked the guy if I could put something in his tank before he sprayed. He agreed and, as I was pouring, he started a tirade about all the crazy quacks in Iowa who were mixing humic acid with their herbicide. I never did tell him what I was pouring in [laughs]. After that first year I decided not to use herbicide. Basically I didn't want to put any yield limitations on my crop. Herbicides limit yield, simply because they always affect microbiology. There are

tonnes of guys researching herbicides. I wanted to be the guy who was researching farming without herbicides.

Graeme: Thanks for your time. I think we will try to get you to Australia in 2000, if you are interested.

Gary: There's nothing I'd like better.

Note: Gary Zimmer did come to Australia in August 2000, for the 'Two-Up Tour', covering fourteen venues in six states. We had a wonderful time and he has become a life-time friend. We will repeat the tour in March 2003, with Jerry Brunetti on board. This time, it's called 'The Three-Up Tour'.

JERRY BRUNETTI

Interview recorded December 1999



*The annual **Acres USA Conference** in Minneapolis always offers a feast of illuminating presentations, and it is difficult to ever select a standout performance. The leading US consultants and authors share speakers duties in two large lecture theatres for three days, from 9 am till 9 pm. At any given time there are two presentations from which to choose, and the depth of talent ensures that this choice is often agonising. At the 1999 conference*

*I was impressed by the integrity and shining intellect of **Jerry Brunetti**, founder and CEO of a thriving Ag supply company called **Agri-Dynamics**. Jerry is mid-way through writing a book on holistic livestock management, which will expand his central thesis that **“Disease is not the cause of the decline in animal productivity and health, but rather it is a manifestation of this decline.”** Armed with a degree in Animal Science from NCSU, **Jerry Brunetti** departed academics for several years of hands-on farm management before accepting a position as Dairy Director at the National Farmers Organisation. This position involved quality control and screening of antibiotic residues. It was during this period that he began to investigate alternatives to allopathic drugs. Agri-Dynamics was founded in 1979 to develop and market some of these alternatives. The Agri-Dynamics product range has gradually evolved to include an impressive range of preventative and therapeutic formulations, based on herbs, essential oils, enzymes, probiotics, chelated minerals, colloidal minerals, vitamins, colostrum, mannens, plasma, etc. The business has recently expanded into the equine and pet food industries. Jerry’s approach, however, is not limited to specific remedies. He is an accomplished educator who constantly emphasises the need to understand the similarities in the biological dynamics of the entire farm. Whether in the rumen of the cow, the rhizosphere in the soil or the digestion of organic waste, the microbial life involved should be seen as part of an integrated, complementary, holistic system.*

Graeme: Thanks for your time. Your lectures have been fascinating and very well attended. You are a wealth of information. I’m surprised that you haven’t written a book yet. Is anything planned?

Jerry: I have several installments written, some of which have been published in Acres USA. Maybe this time next year I’ll have one finished. Chuck Walters has been pushing me for some time.

Graeme: I think sometimes it’s better to force the process and put aside four hours a day for the book, regardless of other commitments.

Jerry: Okay - sounds easy! [laughs].

Graeme: Well, I keep telling myself it should be, but I can never manage to find those four hours. I was horrified to hear about the state of the dairy industry, where cows are now burnt out after just two years. Which factor is more responsible - greed or nutritional ignorance?

Jerry: I doubt that you can separate those two, but you must realise that greed relates to the vendors who profit from the dairymen, at least as much as it influences the dairymen themselves. The dairymen have been sold a lie that 'more is good'. A good example relates to corn silage meetings for dairy farmers. When corn seed companies host these meetings, it is understandable, but when the feed mills and the mineral supplement companies host these meetings, as they often do, then we should look a little deeper. The fact is that corn silage is so low in minerals, they know they are going to sell them some minerals, and the feed mills will also sell a lot of protein to compensate for this low protein silage. Everyone is trying to create a system where they can profit from the farmer, and meantime farmers have been taught that the only success route is to produce more milk. It's not the case. I was recently working with a Wisconsin herd of 1500, which had moved in from California. They were milking three times a day with bovine growth hormones and their milk production was 65 pounds per cow per day. We have Amish farmers milking twice a day without bovine growth hormones - using a predominantly forage ration, achieving that same 65 pounds per day. It's a myth, and it should be exposed.

Graeme: As always, nutrition is the solution, and you argue that grass grown on fertile soils is the ultimate productive food source for grazing animals. The protein, carbohydrates, enzymes, natural antibiotics, pigments, vitamins, and, of course, minerals are some of the benefits of a grass diet. I assume that your field research confirms obvious differences between grass-fed and grain-fed livestock?

Jerry: Oh, yes! It's self-evident. You see the difference starting with the manure, and you start seeing it with temperament of the cows and usually the milk production. The next step relates to the health problems in the herd. You see much better health, and you don't have to feed nearly as much concentrate. Your costs immediately reduce, simply because the milk production remains the same at less cost.

Graeme: One of the most damning statistics of current livestock production you quoted was the fact that less than 5% of cattle livers are redeemable after slaughter. The liver has essentially become a toxic waste-dump from nutritional mismanagement. Growers must surely be aware of problems of this magnitude. Are you finding them increasingly receptive to your approach?

Jerry: Not necessarily because they give a damn about the livers. More often, they are receptive because cull-cow prices are between \$1500 and \$2000.

Graeme: I'm not familiar with the term cull cow.

Jerry: A cull-cow is an animal that is no longer productive because she's either got lame feet, or reproductive failure, or chronic mastitis, or they won't eat or milk. They are all done. It's the livers that are gone. Cull-cows are valued at \$300 each. When they are butchered, there are less than five percent salvageable livers. To replace that cow, you must find at least another \$1500. One of the barometers I use to determine the success of a dairy operation relates to cull-cow sales. Usually the first question I ask is "How many bred heifers do you sell a year?"

Graeme: You certainly aren't keen on the use of urea in dairy pastures. Can you explain the problems associated with synthetic nitrogen fertilisers?

Jerry: Well, the best dairy farmers here no longer use nitrogen. They have recognised some problems. Number one is that you drive out your legumes with nitrogen. The government agronomists are still saying that you need to get your nitrogen on there in order to get enough lush grass. In reality the fields really need the other minerals like calcium and trace minerals. A Florida dairyman I spoke with today, milking eight hundred cows, described running into the same wall. The conventional wisdom in his state suggested that nitrogen and potash were the main requirements. He said he had a beautiful, lush stand of ryegrass, but the cows were just standing at the fence bawling for feed. It was so toxic that they wouldn't eat it. Urea is certainly widely recommended, but amongst our farmers we discourage it immediately, because we tell them that it's not only unnecessary, it's counterproductive. However, having said that, you must remember that you must earn the right not to use urea.

Graeme: In your seminar you mentioned bandaid solutions to compensate for problems associated with the overuse of nitrogen. You mentioned soluble sugars, soluble fibres and edible clays. You mentioned that bentonite was good, but only for short periods in severe cases. What other clays do you favour?

Jerry: We use some of the non-swelling montmorillonites and some of the humic shales that have montmorillonites. We use the new Mexican humates, because they contain some clay, good mineral levels and a lot of fulvic acid.

Graeme: Are you benefiting from the chelating capacity of the fulvic acid?

Jerry: Yes, we think so. One of the most obvious benefits with the fulvic-rich humates is that we get a lot more rumen activity. You can usually see the difference when you look at the manure. The manure odour decreases and manure quality increases. You almost could structure a degree in manurology [laughs]. But really, it is so important. We need to look at manure. Manure is part of what we are. It's part of our body which we are discarding, and it has a story to tell. Good cow manure, for example, should have 25% microorganisms by weight. The question is - does yours?

Graeme: [laughs]. I must admit, I haven't weighed it lately.

Jerry: [laughs]. I wish I hadn't said that! Of course I meant that you should always ask the question, "*Do your cattle produce quality manure?*"

Graeme: I understand that breeding problems are directly related to the overuse of nitrogen, because ammonia in the blood kills sperm cells. You mentioned that the normal blood / urea / nitrogen levels should be 0.02 to 0.03%. How often are these figures exceeded?

Jerry: Well, BUN [blood / urea / nitrogen] levels are not so much measured any more, because you have to pay a vet to do it. Now they use what's known as milk / urea / nitrogen (MUN), done by the Dairy Herd Improvement Association. Typically, you will see herds on fertilised pastures with high MUN. It's very common in the UK, where they have poorly mineralised soils with a grazing-based system, and they are using a lot of urea to try and get tonnage. Those grasses are loaded with non-protein nitrogen (NPN), which, when ingested by the cow, produces rumen ammonia, which becomes BUN and ends up in the udder of the cow and becomes MUN. I call this

'funny protein', as opposed to 'true protein'. The problem has been that the protein tests haven't, up until now, differentiated between these two types of nitrogen. The cheese factories have been paying on milk protein, regardless of what it comprises. Plant proteins are determined by a crude protein test, which is merely a measure of nitrogen. Nitrogen multiplied by 6.25 gives you crude protein. Well, milk protein is determined the same way, except they extract the nitrogen and multiply it by 6.38. Now the cheese factories have decided that they want 'true protein'. They finally want to get what they are paying for. True protein is really a measure of casein and other albumens that are in the milk. The buyers are beginning to insist on a test that measures this and excludes 'funny protein'.

Graeme: You suggest that whole grains were only ever intended as food for birds, as birds have a crop with associated predigesting capacity. Acidosis is the direct result of feeding whole grain to cattle. How could the enormous feedlot industry have possibly got it so wrong?

Jerry: Well, realistically, why should they care? They are making money from grain, but the industry doesn't admit to a problem. If you speak to a conventional nutritionist, he'll tell you that the feeding of grain is risky or that it's detrimental. The reason why the industry hasn't done anything about it is because it's presumed that energy cannot be provided by forages. Since it's presumed that making a lot of milk is in the best interest of every dairyman, then the only place you can get the energy from is grain. It's considered a necessary evil. But what we are saying is that energy for ruminants can come from forages. You won't get as much energy from forages as you will from grain, but you will get enough energy from forages to produce very economic levels of milk, and you will keep the longevity of the cow. This is the issue. We don't have longevity in the cows anymore, and this is a huge dent in the economics of the dairy industry. The health crisis in the dairy industry encompasses laminitis, reproductive failure, chronic mastitis, liver failure, ketosis, milk fever, retained placenta, etc.

Graeme: And - does sprouting reduce the grain problem?

Jerry: Yes sure, it certainly helps. It gets rid of the phytic acid, which is an enzyme inhibitor. Now, this is true for monogastric animals as much as it is for ruminants. Your compatriot, Bill Mollison, has graphically demonstrated this fact. He has shown that, when sprouted cereal grains are fed to starving children, they have tremendously more food value than unsprouted grain. In Ethiopia he was able to alleviate starvation in children by simply sprouting the limited grain supply available. You don't have the enzyme or absorption inhibitors, and you gain a rich lode of food enzymes that are released by the sprouting procedure. You see, grain is a seed, and as such it must protect itself from premature sprouting. It wants to sprout under ideal conditions, so it has enzyme inhibitors there to keep it from sprouting in a hostile environment. When you sprout grain, you release these enzyme inhibitors and you synthesize these enzymes. Higher life forms eating the sprouted grain now get the grain value, the added sprout value and the absence of inhibitors.

Graeme: Sounds like I'd better get the seed sprouter working again. I'd forgotten the benefits for human health. One of your bandaid solutions was vinegar. What process is at work here? How does adding an acid reduce acidity?

Jerry: Well, vinegar is acetic acid, and acetic acid is a volatile fatty acid that is produced in the fermentation of cellulose in the rumen. The rumen is a fermentation eco-system. You choose what you ferment and when you ferment cellulose, which is what forages contain, then you get volatile fatty acids, one of the most important of these being vinegar. When you put grain in the rumen, you also get fermentation, but you produce lactic acid. Lactic acid has ten times the acidity of acetic acid. The eco-system in the rumen, which requires a pH above 6.4, is destroyed by lactic acid. When those particular microorganisms have been removed, there is room for *Streptococcus bovis* and lactic acid organisms, which accelerate even more acid production. Then you start getting fungal organisms that start inhibiting that eco-system. The fermentation of cellulose starts to disappear, because those organisms that were fermenting cellulose are no longer able to live in this acidic environment. Also, the organisms that normally gobble up rumen ammonia, are disappearing. You can actually have a combination of blood alkalosis because of ammonia and rumen acidosis at the same time.

“... you will get enough energy from forages to produce very economic levels of milk, and you will keep the longevity of the cow. This is the issue. We don't have longevity in the cows anymore, and this is a huge dent in the economics of the dairy industry. The health crisis in the dairy industry encompasses laminitis, reproductive failure, chronic mastitis, liver failure, ketosis, milk fever, retained placenta, etc.”

Graeme: If you are going to use the vinegar bandaid to address these problems, is apple cider vinegar the better choice?

Jerry: Yes, it is, because it has got more minerals and vitamins and it also contains what they call ‘the mother’. ‘The mother’ is the microbial metabolites of good vinegar manufacturing. It is a bio-stimulant derived from the fermentation process, which the old-timers used to call the ‘the mother’.

Graeme: What a great name! The problem of moulds and mycotoxins is largely attributed to excess nitrogen, poor-quality feed and poor storage. Nitrogen excess rears its ugly head in several of these health problems. What level of nitrogen usage is accepted, or would you prefer that it was dropped entirely in favour of other high-protein supplements?

Jerry: Well, if you are on a grass-based system, you really don't need synthetic nitrogen, but this is only when everything else is right. As I said earlier, you have to earn the right to get there. If you don't have adequate minerals in the soil - trace elements, macro-nutrients and the balance of the cations - you're probably going to have to use some nitrogen, but not as much as they are typically telling you. If you are not an organic operation, we would probably be telling you to use something like ammonium sulfate, because it's temperature-sensitive, not water-sensitive, and you get some sulfur out of it. One of the companions to nitrogen should always be sulfur, because, if you have free nitrogen in the soil, which ultimately ends up in the crops, one of the best things to balance out nitrogen is sulfur. Utilization in the rumen goes way up when

there's sulfur along with free nitrogen in the ration. In a grass-based system, ultimately, the only applied nitrogen should come from animal manure.

Graeme: Some of the solution options for moulds and mycotoxins you covered in your lecture included feed-grade fungicides, some of which are as yet unproved. The list included gentian violet, capryllic acid, nystatin and ionic copper. What is your personal preference?

Jerry: Well, gentian violet is proven, but it is illegal to use in this country.

Graeme: I don't think that's the case in Australia, but I'd have to check.

Jerry: If they can use gentian violet for mould control in Australia, then they should go for it. It's terrific stuff. You must mix it in with the feed. I know that there are some US companies making gentian violet for export. It's used in South East Asia and in Indonesia and Malaysia in chicken operations. Very little is needed to control the mould organism.

Graeme: What sort of amounts?

Jerry: Well, they were using a gentian violet product which was less than 2%, and only adding one to three pounds per ton of grain.

Graeme: I hope you've got these figures right, because I've no doubt that there will be some readers who will want to trial this.

Jerry: Yes, those were the figures, but, if it will put your mind at rest, I know of one dairyman who used some gentian violet. He had a high somatic cell count, and he had quite a lot of mouldy silage. The hired hand made a mistake and threw fifty pounds in per ton. The only disaster he had as a result was that it turned his wife's laundry purple. The cows were fine. The somatic cell count dropped. Things got a whole lot better, because he was able to kill those moulds, not just in-vitro in the silage, but it also works in-vivo.

Graeme: It is interesting to see the similarity between human and animal health requirements, particularly with regard to the desired ratio between Omega-6 and Omega-3 fatty acids. Recently I interviewed Dr Joel Wallach in California. He is an ex-vet now specialising in human nutrition. How close is the link between animal and human health?

Jerry: They are very, very similar. The reason the importance of some of these essential fatty acids has not been highlighted is because the animals simply aren't around long enough to find out if they're going to end up with degenerative diseases like arthritis, etc - particularly beef and poultry. The issue here is that the fatty acid content of wild game is substantially different than that of domesticated animals. We have often ignored this requirement in the diet of our livestock.

Graeme: I understand that industrial hemp is a particularly good source of fatty acids...

Jerry: Yes, it is. It's probably even better than flaxseed, because it has some oleic acid and some of the palmitic acids in there.

Graeme: Once again, there are very low levels of these fatty acids in grain. Good grass is considered the primary source, but flaxseed, canola and soya oils are good sup-

plements. We have access to a high-quality, cost-effective source of Omega-3 oil in the form of orange roughy oil. Would this material have any potential as a feed supplement?

Jerry: Yes, it certainly would, so long as there is no rancidity. Fish oils are a lot more saturated than vegetable oils. There are some gains for cattle, but the biggest benefits would be with mono-gastric animals like pigs and poultry. When you are feeding oils to ruminants, you must still deal with the rumen problem. In effect, the eco-system of the rumen is susceptible to too much oil - any kind of oil. They're feeding animal fat to animals now, trying to get energy into them. They've hit a wall because grain is killing cows with acidosis - so they're mixing tallow with vegetable oil. However, there is a limit to how much oil a cow can take. You could fortify low-oil feeds for poultry and pigs with fish oil and then end up with egg yolks and pork with high Omega-3. The other nice thing about forage feeding is that, if they're eating good, mineralised grass, the rumen will produce another fatty acid called CLA - conjugated linoleic acid. This is only produced by fermentation in the rumen. Any animal that has a fermentation system will produce it. CLA is big news because it is the fatty acid with the highest carcinogenic impact. There's some research that came out of Cornell University and the University of Wisconsin, showing its anti-carcinogenic properties. You need very little of it to slow down cancer. It's found in both the milk and the meat.

Graeme: But is this anti-cancer benefit only present if you have good, mineralised grass?

Jerry: Yes, that's right. You will only have the fatty acids in the grass if you have good fertility in the soil.

Graeme: Joel Salatin claims that kelp is the ultimate health tonic for all livestock and poultry, and it should be included in all feed rations. What is your opinion of kelp as a feed supplement?

Jerry: It's terrific - It's one of the best. All of the minerals are protein-bound minerals. It's got a lot of mono and polysaccharides and a number of plant hormones which are probably useable by livestock. It's got so much in there. It's got over sixty trace minerals, fourteen amino acids - yes, I'm a big fan of kelp.

Graeme: The most common mineral deficiencies in your animal nutrition work appear to be low-calcium, excess potassium, nitrogen / sulfur imbalances and potassium / sodium imbalances. There is no coincidence that these are also major problems in soil nutrition. Trace mineral deficiencies listed included iodine, selenium, chromium, cobalt and vanadium. These are elements not normally tested in soil tests and not included in fertility programs. How important are they, and how do we overcome this problem?

Jerry: Well, for starters, these elements are extremely critical for animals. I am a strong proponent of using these trace minerals on the soil to get them into the crop. I don't know how many of these minerals are supportive of horticultural function. I suspect that they are, but at this stage I have no conclusive proof. However, even if they were not, I'd argue that, since most crops are grown for livestock or people, why wouldn't we supplement forages or grain so animals and people are getting them? Again, the availability of these minerals in plant-derived form is a whole lot better than taking expensive mineral supplements.

Graeme: Any idea about appropriate application levels?

Jerry: Well, selenium is only used in ounces per acre. I've read research about iodine applied as potassium iodine at 25 pounds per acre [approx 28 kg per hectare], and there were significant measurable gains in stock health as a result. I'm not sure about the others.

Graeme: We usually add cobalt sulfate to our prescription blends, and our research suggests that it's a worthwhile inclusion.

Jerry: That's a good idea. I don't know of anyone doing that here. How much are you putting on per acre?

Graeme: We allow for about 500 grams per hectare, which is around 200 grams per acre.

Jerry: Well done! I thought I was the only one using cobalt in the soil.

Graeme: You quoted some really high production and longevity figures from fifty years ago, where the main diet was pasture, kelp and molasses and far less grain. Sometimes it seems that we never learn by experience. There's little evidence to support better results using Bovine Growth Hormone, 'funny protein' and whole grain, particularly when animal health is factored into the equation. What's your personal opinion of Bovine Growth Hormone?

Jerry: Well, there are definitely concerns about health issues, but apart from this, there are a couple of other things. Number one: It doesn't seem to be any more economical than putting cows on grass where you have a good agronomic program and are producing high-quality forages. Cows can react badly to Bovine Growth Hormone. One of the reasons is that you are telling the cow to make milk when its body is saying, "It's time to slow down." You're automatically going against the grain. The second fact is this: The biggest concern in a cow, from a lactation perspective, is the first three months. In the first three months of lactation the cow will make 50% of her milk. So, in that first three months there is a tremendous workload on the beast - she produces 50% of her milk, she has to drop the calf, get bred back, not have ketosis, not have milk fever or a retained placenta. It seems to me that, if they paid more attention to the first trimester of lactation and solved the problems I've mentioned, then, from an economic point of view, there would be a lot better return on their money than worrying about trying to squeeze a dry sponge in the last trimester of lactation. That's the problem. Of course, the other issue is that we have absolutely no idea of what Bovine Growth Hormone does to people. I think the US is the only country that uses this hormone.

Graeme: There are concepts suggested for pasture nutrition that will have herbicide jockeys straining at their leashes. For example, you suggest that every pasture should contain thirty herbs, many of them weeds. Can you elaborate on this concept for us?

Jerry: Well, it's like I wrote in my last Acres USA article - If the weeds were interfering with more nutritious plants, then you would have an argument to get rid of them. But if the weeds are indeed more nutritionally valuable than the pasture plants you are trying to cultivate, then what's the problem leaving them there? There is a lot of evidence, historically and empirically, to suggest that the animals gain considerable benefit from a small percentage of weeds in a pasture. Animals do relish these herbs.

Graeme: How do you differentiate a weed from a herb?

Jerry: People who understand them and have reverence for them, call them herbs, while people who have disdain for them, call them weeds. In a monoculture system, like a cornfield or a wheatfield, there probably is no place for weeds. In a polyculture like pasture, if you can prove that the nutritional value of weeds, the medicinal value of weeds and the phyto-chemical value of weeds dramatically exceed these values in domesticated pasture species, then you have nothing to lose and everything to gain by leaving them there. It's not like they are going to take over in a polyculture system. In this system they are always going to be the minority of the eco-system. The other thing about these pasture weeds is that they are excellent accumulators of minerals, particularly hard-to-absorb trace minerals.

Graeme: You suggest that biodiversity begets diversity. Once you get the ball rolling, you create an entire eco-system that is vastly superior to the limitations of monoculture. Are there many working farms illustrating this superiority with either better animal health or higher quality product?

"In a polyculture like pasture, if you can prove that the nutritional value of weeds, the medicinal value of weeds and the phyto-chemical value of weeds dramatically exceed these values in domesticated pasture species, then you have nothing to lose and everything to gain by leaving them there."

Jerry: Yes, there are more and more working success stories. Joel Salatin is a good example. I think that is why his farm is called Polyface Farms. He has a lot of interfacing there. He's got timber, meadows, pastures, crops, ponds - all working together, with each eco-system supporting and successfully co-existing with the others. Many farmers still don't recognise the value of biodiversity. If they could incorporate it, invite it into their farms rather than segregate it, then they would have a healthier herd.

Graeme: Enzymes appear to be a neglected part of nutrition. Can you elaborate on the role of enzymes in animal and human health?

Jerry: Well, I discussed grain versus sprouted grain earlier. This is an example of the importance of enzymes. When you eat the unsprouted grain seed, the phytase enzyme-inhibitor goes to work in the system. The digestive organs - the liver, the pancreas, the intestines, etc - all have to work harder. Dr Edward Howell, who wrote 'Enzyme Nutrition', described an energy reservoir with which we are all born. This concept corresponds to the Chinese medicine theory of the Chi reservoir, and every day you give up some of that Chi. From a western perspective, the Howell's enzyme bank theory best describes expenditure of the Chi. The body needs enzymes for every function, including thinking. The more we stress digestion, the more enzymes are consumed out of the reservoir for digesting and the less enzyme reservoir there is for other functions. Sprouting grains improves enzyme efficiency, and it improves absorption of all foods, especially minerals.

Graeme: I missed some of the key points during your section on parasite management. Garlic and black walnut hulls were two suggested remedies. What other nutri-

tional and management practices can help reduce these problems. Have you experimented with neem oil or diatomaceous earth?

Jerry: Yes, diatomaceous earth is widely used by organic or biological farmers. Neem is sometimes used as an anti-parasitical agent, but I haven't had much experience with this. Wormwood is also effective, but remember that, if you have good, mineralised soils and a variety of herb materials available, this problem is immediately minimised.

“The more we stress digestion, the more enzymes are consumed out of the reservoir for digesting and the less enzyme reservoir there is for other functions. Sprouting grains improves enzyme efficiency, and it improves absorption of all foods, especially minerals.”

Graeme: You suggested that the industrial model of farming is characterised by stress. It is stressful to farmers, stressful to animals and stressful to vets and consultants. How have you personally handled this stress?

Jerry: I stay away from industrial farms [laughs]. No, seriously, I only work with clientele that want to change. I don't mind talking to fence-sitters, but I stay away from industrial agriculture if I can. They are so much tied into that infrastructure that it is almost impossible for them to look at this model because it effectively means that they have to reinvent themselves. My next Acres USA article addresses the question “*Can you have your cake and eat it, too? Can you be a conventional operation and still do things that are holistic?*” There's a challenge to finding the answer to that. How do we take biological principles and make them work in this system? Well, some changes will be necessary, but it's possible and we are doing it successfully every day.

Graeme: Free-choice supplements remain a controversial concept in Australia. What's your opinion of this form of supplementation, and why are there such contrasting opinions about this technique?

Jerry: Well, the concept is still considered unscientific in the States as well. I primarily use it as a learning tool, because, until I can get the farmer to deal with the challenge from the soil up, we're going to have to compensate, we're going to have to provide bandaids.

Graeme: But does it work as a bandaid?

Jerry: Yes, it certainly helps, but to me the most important benefit is the learning tool - if I put a blend of calcium out there, a blend of magnesium out there, a trace mineral blend, some buffering agents like humates, edible clays, some kelp, sea-salt things like that. Then we can watch what the cows consume on a monthly basis and keep a file of that, along with the file of the soil tests and the forage tests. Then, if we watch the changes in the soil and forage analysis and correlate that to the animal's consumption from the free choice box, then we can make some educated guesses. This is a way to learn about the farm as a living organism in ways that lab analysis falls short. Lab analysis is very important, but it is innately limited. When you have living organisms on the farm that have instincts that are acted out in behaviour, and this behaviour is based on

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what the farm has to offer, then we can connect the dots. We can weave the tapestry between the soil, the forage and the animal.

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Graeme: Thanks for your time. I am looking forward to your book when it is completed.

Jerry: Nice talking to you. I hope to see you in Australia at some stage.

JOEL SALATIN

Interview recorded December 1999



*Amongst the 1200 farmers and consultants attending the most recent Acres USA Conference in Minneapolis, **Joel Salatin** stands out like a rabbit in a poultry pen. His striped shirt and tie are a stark contrast to the prevailing preference for cotton and denims. Part innovative farmer/philosopher and part marketing whiz-kid, his choice of dress conforms to neither category. An intriguing mix of old-world values and new-age marketing strategies, Joel promotes a lateral approach to problem-solving. Echoing the snappy affirmations of self-improvement gurus like **Stephen Covey** and **Zig Ziglar**, Salatin has fused a captivating, boyish enthusiasm with impressive verbal skills to present a formidable motivating machine. In his keynote address at the conference, Joel combined a common-sense logic with an emotive plea to save the family farm, in a performance that reduced hardened farmers to tears. The self-published author of several publications including 'Pastured Poultry Profits', '**Salad Bar Beef**' and '**You Can Farm - The Entrepreneur's Guide**' - Joel Salatin is a ground-breaker and a leader. He has identified some of the major problems in conventional agriculture, and he is doing something positive about creating change. Often this must involve the abandonment of a failed paradigm. If farming is no longer an attractive proposition for the younger generation, then we must stand outside our preconceptions and genuinely evaluate the problem. In the following interview, **Joel Salatin** highlights why he is becoming one of the most sought after speakers in sustainable agriculture. Joel thinks outside of the box and his success is compelling evidence of the validity of Einstein's observation that a problem cannot be solved by the same thinking with which it was created.*

Graeme: Thanks for your time. A little background for Australians who are unfamiliar with your work - You are a farmer / author / consultant, and you operate a property called Polyface Farm, which has become a model for sustainable agriculture, attracting thousands of visitors each year. You are also an accomplished motivational speaker, and your passion is the family farm. I understand that you are currently writing a new book about igniting the passion in children to stay on the farm. Could you tell us a little about this project?

Joel: Yes, what we've got right now is an aging farm population. We have so many young people leaving the farm for a number of reasons. What I am trying to do is to capture the techniques and models that will allow for several things: Number one is an 'enjoyable farming experience' - many children don't experience this pleasure, and we need to look at ways to enhance the experience, environmentally, emotionally and economically. Secondly, I'm looking at business models that allow the next generation to piggyback their own salary enterprise, in a complimentary way, on to the older generation's enterprise. For example, if the older generation is farming beef or dairy cows,

perhaps we could look at a vineyard, poultry or pork enterprise, using the same equipment and land base, so that the new generation doesn't have to recapitalise all of that infrastructure. It's about piggybacking additional layers of enterprises on the base rather than facing the daunting prospect of starting from scratch.

Graeme: Yes, I agree with you. You are very much in favour of entrepreneurial flair in rural enterprises. Your most recent book, 'You Can Farm', champions this cause. Have you always had an eye for creative profitability or was this a recent development fired by your desire to create a viable business for your children?

Joel: No, my dad was an innovator way ahead of his time. He was an economist who pushed a sharp pencil, and he realised that the real answer for agriculture was to get a higher dollar return. He realised that the wholesale approach - the wholesale commodity approach - often put a farmer on a vicious treadmill of lower profit margins, higher input costs and lower selling prices, which creates this profit margin squeeze. The answer to this squeeze has been to up-size, to get bigger and bigger and bigger to maintain a constant income level. With that increased size, of course, comes more centralization, disease problems and management problems. If you could visualise a pie graph to fully explain this - most of the farm income on that graph is derived from producing things, whether it's milk or potatoes or tomatoes - those production dollars are often at risk, agriculture is a high-risk enterprise. Price, pestilence, weather and disease are the big four risk factors. However, if we take that same pie and divide it in thirds, and a third of our dollars comes from production dollars, a third comes from processing and a third comes from marketing, then the situation changes - suddenly we have taken a healthy share of the farm income dollars out of the high-risk category. We now have stability. We have three legs on the stool instead of one leg. Like any business it makes a lot more sense to stabilize and diversify the business portfolio than to persevere with a vulnerable, single-commodity enterprise.

Graeme: Yes, it makes perfect sense. I don't see how anyone could argue about that. Your organic status plays a large role in your marketing strategy. Have you always farmed organically?

Joel: Yes. My grandfather started the chain. My father was influenced very early. I got it from him, and now my son Daniel continues the organic heritage. We are enjoying the legacy of never having gone the conventional route.

Graeme: There are many roads to Rome. Gary Zimmer, who spoke earlier at the conference, is involved in a totally different type of farming but, in his speech the other night, he invoked the words of Louis Bromfield who, writing in the 1940's, was passionately promoting the exact things that you are suggesting - a reverence for the soil and a soul stimulated by the beauty and creative endeavour that should be part of real farming. Louis also operated a model farm, and Gary is keen to set up dozens of these farms around the country. How important is it for growers to be able to see a philosophy working successfully?

Joel: I think it's paramount. I think it's absolutely paramount, because people need working, tasteable, touchable models - they need leadership. Existing models that support themselves through grants and external funding don't have internal economic integrity, and people can see through this. We desperately need this kind of leadership.

Graeme: Your children are apparently all involved in the family business. I understand that they have all developed their own individual enterprises within the business?

Joel: Yes, Rachel, our 13-year old daughter is an artsy-craftsy type of person, so she has a large flower garden that she maintains as a source of dried flowers. She takes our grapevine prunings and turns them into grape vine wreaths. Sometimes these sorts of creations are not just dollars but aesthetics. If we give a nice wreath like this to a top restaurant account that spends \$40,000 a year with us, it is really appreciated. The business pays Rachel \$100 for a wreath, but, from the business perspective, there are many rewards in public relations and relationship-building. From Rachel's viewpoint, operating a successful business at a young age can only help build self-esteem. She also bakes zucchini bread and pancakes to sell at the local growers markets. Daniel, our son, is 18 years old and he has a couple of larger enterprises. He manufactures maple sugar donuts where he taps trees and makes his donuts. A gallon of maple syrup will glaze \$200 worth of donuts so that's really value-adding. Of course his main thing is rabbits. He has about 75 breeding pairs. He started with one pair when he was nine and he now has one of the only commercial breeds in the world that is selected for inline bred, forage-based production. These are pastured rabbits, and he has developed a very healthy annual income based on that enterprise.

Graeme: You are in favour of developing what you have called a 'child-friendly paradigm' - an environment that should be aesthetically, emotionally and economically appealing to the next generation. You obviously believe that you have created that environment for your own children?

Joel: Yes. I have this thing that there is nothing that we apply to the soil that our kids can't eat - within reason, of course. There's a joy in not having to mask up for poisons. Then, of course, we try to minimise dangerous machinery - dusty, smelly and noisy equipment is kept to a minimum. We can talk comfortably at our workstations. It becomes a storytelling, visiting time, as opposed to an unpleasant task in the dust and noise.

Graeme: In a recent Acres USA article, you noted that the essential prerequisites for a factory farm are specialisation, simplification, routinisation and mechanisation, but, in total contrast, the successful family farm is diversified, complex, flexible and biological. There is obviously a damned sight more opportunity for an interesting, fulfilling career in the second option. The most likely response I can imagine from conventional growers is that you are talking about a pipe dream which is not economically viable. You have proven otherwise. Could you tell us a little about your successes?

Joel: Well, our successes have been based upon synergistic, symbiotic enterprises, coupled with a marketing mechanism that allows us to capture premium retail dollars. For example, right now we produce about 100 dozen eggs a day from 2000 layers, and these are pasture-fed within feather nets, which are electrified poultry netting. A moveable shelter within the netting is moved every three days, involving 1000 birds on a quarter acre (approx one tenth of a hectare). This model allows one person, working seven hours a week, on three acres, to net \$15,000 a year. Another example is called the 'Biniary'. This is bunnies, vineyard and aviary all in one. This is a quarter acre, totally enclosed with poultry netting. The vineyard trellis poles hold up the netting. The

bird netting keeps predators away from the rabbits and keeps birds out of the grapes when the fruit ripens, and it keeps the pheasants in. The jumbo pheasants debug the vineyard, the rabbits mow the vineyard - both of these fertilise the vineyard. The grapes shade the rabbits, and the vine trellises are roosts for the pheasants at night. The pheasants are diurnal and the rabbits are nocturnal, so they are not even competing for the same square footage in any 24-hour period. The big cost of a vineyard is bug control, dropped fruit which overseasons the pathogens and ground-cover maintenance. They are always mowing, mowing, mowing. The rabbits take care of that, the pheasants take care of the bugs and dropped fruit, and you get this wonderful synergistic effect of the three enterprises together. This model generates about \$5000 net profit per year from a quarter acre. The rabbit house, where Daniel keeps his breeding stock, is two tiers of production - breeding does [rabbits] at eye level and chickens underneath. If you go to any commercial rabbitry, you'll find that you can't walk in for the smell. The beauty of this is that you have a standard two-car garage - a 700-square-foot facility, and the rabbits at eye level are dropping hay, urine and manure down into the bedding. Every three weeks we add a carbon source like woodchips, sawdust, leaves, straw, corn fodder, cotton trash, rice hulls - whatever organic matter is available to put in there. The chickens then incorporate it, scratch it and fluff it with the rabbit urine and manure and create a very low temperature decomposition. Very slow and gentle, it gradually builds up during the year to two and a half to three foot deep. There is no smell, you get two tiers of production in the same facility - rabbits and eggs. We're

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talking about grossing \$9000, netting \$4000 a year in a two-car garage. The other thing is that neither species is at a density that kicks in pathogen problems and smells - all of the normal problems with factory-type farming. The ‘eggmobile’ is another example. The eggmobiles are two portable chicken houses which have 800 layers in them. They follow the cows in the pasture rotation. The cows of course are dropping manure, which is the incubator for pathogens and parasitic organisms, so we run the eggmobile behind the cows three days later. The flies lay eggs in the manure and larvae hatch. The chickens scratch through the cow patties hunting larvae. This spreading process actually triples the land area covered by the animal manure, and it is balanced on the soil - you don't have an over-fertilised repugnancy spot. The chickens effectively eat out the parasitic worms, so there is no spending on systemic wormers and grubicides to kill the bugs in the cows. We are harvesting \$15,000 per year on eggs as a byproduct of this pasture sanitation program. These are the type of symbiotic, synergistic models we can create. The point is that we need to think holistically. We need to think about interrelationships and interconnections, as opposed to the linear, reductionist, straight-line thinking that dogs modern agriculture.

Graeme: It's not a lot different to the permaculture principles put forward by Bill Mollison.

Joel: Exactly. What Bill Mollison has done with plants and landscapes, we have done with livestock. Permaculture has been weak in the livestock department, and I think we have something to offer permaculture in the creative use of animals in the system.

Graeme: My concern with permaculture is that it has become a haven for idealists - a talkfest with little economical viability.

Joel: I agree. The only ones I know making money in permaculture are the teachers. That goes back to your earlier question about these model farms. The fact that so many people are visiting our farm indicates how few working, economical models there are. We need hundreds, we need thousands but they're coming.

Graeme: You refer to single-commodity production as being equivalent to the slavery of multiple generations. Can you elaborate on this concept a little?

Joel: Yes. Single-commodity production generally carries with it an infrastructure involving either machinery, buildings or emotions that are not easily changed. It's hard to retro-fit a \$300,000 swine confinement facility, with a manure slurry lagoon attached. It's hard to fit that to a rose garden, for example. [Laughs]. By the same token, a 3000-acre rice operation is equally ill-equipped for diversification. The emotional connection comes with the old thing - "*Grandpa did it this way, and I did it this way, so, Johnny, you had better do it this way.*" It's an emotional attachment. The single commodity idea makes the next generation come to the table with a whole lot of baggage - emotional baggage, infrastructure baggage, mortgage baggage. Once you have invested hundreds of thousands of dollars in tractors and harvesters, you are tied to that crop, regardless of prices or your personal desire to keep producing that single commodity.

Graeme: Basically, it promotes thoughtless inflexibility.

Joel: Yes, exactly. One of the rules of physics is that for every action there is an equal opposite reaction, and this principle applies when it comes to young people in agriculture. As soon as we start to feel trapped, what do we want to do? - Flee! Part of the problem of rural flight is based upon escape from Grandpa's paradigm.

Graeme: The processes of simplification and routinisation implicit in industrial-type production require, or almost demand, minimum intelligence. In your customary, straightforward style you suggest that it is a foolish culture that entrusts its food supply to simpletons. Do you consider that the American farmers' widespread, unquestioning acceptance of an abomination like genetically modified food is an example of a lack of reasoned consideration?

Joel: Oh, absolutely! Absolutely! There's a word for it - it's called rural brain drain. We've been dealing with this now for a generation. All the brightest, the A and B students, have gone to town and become engineers, advertising executives and marketers, and the C and D students have stayed in the countryside. You see it in all of our cartoons - the red-necked, tobacco-spitting, inarticulate klutz is always a farmer. This is so tragic in light of the heritage of George Washington and Thomas Jefferson, who en-

visioned a culture of Yeomen classicists that worked six or seven hours a day and spent the evenings reading or writing.

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Graeme: I see farming as the most noble of professions. There’s surely no endeavour more important than the production of the food which sustains us all. Growers are entrusted with such an important role, but they need to be fired up so that they are aware of their importance, and they need to feel more of a sense of worth of what they are doing. Conversely, there needs to be a stronger sense of responsibility when it comes to dishing out toxic residues to your fellow man. We have thousands of clients in Australia and, by and large, they are intelligent, forward-thinking individuals, far removed from the red-necked stereotype. There is a rural brain drain at work, but I don’t think it is as pronounced as it is in the US. You are keen on the principles of Stephen Covey, and earlier today you quoted his principle of not attempting something beyond your sphere of influence. In some ways it could be argued that this is the exact mentality that has created a situation where America has three hundred million ‘guinea pigs’ eating unlabelled, genetically modified food. If individuals had created bigger ripples, the cumulative effect might have not led to the current situation where you are now ‘the experiment’. The Japanese, for example, are now saying that they want to watch American children to see what happens to them in ten years, before embarking down that road themselves.

Joel: Well, there is no disagreement. I’ll just say that, if the sign-carrying community had put as much effort into acquiring and promoting safe food as they have into buying Walt Disney videos, we simply wouldn’t have GMOs today. There has simply not been the emphasis, the public scrutiny of food that should exist. I guess there has not been the interest. From my point of view, I’m not going to sit here and wring my hands over Monsanto. My answer to Monsanto is *“Hey, we’re going to get some excited customers, we’re going to grow some good food and lead by example.”*

Graeme: The routine that is necessary in mechanised, assembly-line production is a complete contrast to the dynamic flexibility of nature. Which feature of monoculture do you consider more soul-destroying - this monotonous routine or the enslavement to large, highly specialised machinery?

Joel: Monotony is miserable. When I see people doing the exact same thing day after day, I feel really sorry for them. For us, every new day is a discovery. You are learning and seeing new things, and you are making changes, making positive changes, trying to solve problems. One of Albert Einstein’s famous quotations was: *“You cannot solve a problem by the same thinking that created it.”* Monoculture and industrial mentality

continue to try and solve problems in the same way. If there was a food shortage, and of course there's not, but if we wanted to produce more food, then the answer is not GMOs. The answer is synergistic, symbiotic, diversified models. The answer to sick chickens in a factory confinement house is not a new drug that they're not resistant to. The answer is to shut down the factory and grow the chickens under a totally different paradigm. It's soul-destroying to continue, year after year after year, repeating the same mistakes.

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Graeme: I spoke to a Canadian farmer after your lecture last night. He owns a 500-acre property, which has been organic for 144 years. He has a very successful business with incredible diversity, involving 30 or 40 components, ranging from a portable sawmill to beehives. He is in love with farming. He said it was the most fascinating occupation anyone could ever be involved in. He had the spark that Louis Bromfield talked about. You seem motivated to generate that spark in your fellow farmers. Is this proving a difficult task?

Joel: I wouldn't say it's difficult for anyone who wants to make a change, but sometimes it's difficult if people aren't interested at all. There's a saying that goes, *“There's no sense in trying to teach a pig how to fly - it can't be done and it irritates the pig.”* Your heart is a filter for your head. I've done very difficult presentations, like the young cattlemen's association. You go in and you can just feel the negative energy. It's like walking into a sick room. It's awful. By contrast, last night at the Acres conference, there was a wonderful speaker / audience synergy where the speaker can feed off the audience's energy, and vice versa. This energy exchange is powerful. I've got to the point where I don't waste my time with people who don't want to learn. I'll put my energy into people who do. There are more of them every day, and it's really exciting.

Graeme: In your book 'You Can Farm - The Entrepreneur's Guide,' you quote from a 1913 text by C.C. Bowsfield, called 'Making the Farm Pay'. For the readers' benefit I'll include part of that quote: *“Farm life should be made more attractive, and it can also be vastly more profitable than it is. Better homes and more social enjoyment, with greater contentment and happiness will come to rural people when they grasp the eternal truth that they have the noblest vocation on earth, and one that may be made to yield an income fully as large as that of the average city businessman”*. Nothing much changes, does it?

Joel: No, it certainly doesn't. Actually, I've just been enjoying the writings of George Henderson. He was English, farming between 1920 to 1950 through WWII. I actually came across the book while visiting Australia and was given a photocopied version of it, as it is out of print. You can quote from any page and it remains absolutely relevant today. He talked about overcrowded cities and young people leaving the country. He was a city boy who told his mum at seventeen that he was going to be a

farmer. His friends ridiculed him, but he did it and he was wildly successful. I recently acquired the sequel to the first book called 'The Farmers Progress' by George Henderson. It is really something special. I opened up the centre page and there was a big black and white photo of portable chicken pens, following in the wake of grazing cows and sheep.

Graeme: You dedicate considerable time in your writings and speaking engagement to those component qualities that equate to 'success' - not a small part of this equation relates to the processes or marketing and promotion. Do you think it would be fair to say that you are a natural salesman and self-promoter and it may not be quite as easy for farmers less gifted in this regard?

"Farm life should be made more attractive, and it can also be vastly more profitable than it is. Better homes and more social enjoyment, with greater contentment and happiness will come to rural people when they grasp the eternal truth that they have the noblest vocation on earth, and one that may be made to yield an income fully as large as that of the average city businessman."

CC Bowsfield

Joel: Absolutely! There is no question. When my classmates in school were out playing football I was in the debate team. Communication makes the world go round. You can only poke balls through hoops - or perhaps I should be more Australian - you can only whack a cricket ball for so long. Communication is everything - I have two things to say about that: Firstly, if you want this for your farm and for your children, then assess your current situation and begin a path toward communication-oriented child development. Instead of pushing the kids to be soccer stars, push them to be the captain of their high school debate team or to join the local theatre group. I'm serious - if we don't start channeling them through some sort of communicative repertoire, they are going to be forty or fifty and be in the same boat as their parents at forty and fifty and can't stand up in front of a group and talk. Secondly, there are many self-help tools. There are numerous good books out there about marketing, personal development etc. Hey, turn the TV off! Don't go to Blockbuster Videos for a month and do some reading instead. Read Dale Carnegie or Zig Ziglar. "*You can be wherever you want to be, as long as you get enough other people wherever they want to be.*" These are great concepts. If all this is unattainable, then don't underestimate the power of partnerships. Find someone who's good at what you're not. I know two lady sheep farmers who have enlisted a city cousin to do their marketing, and it's working great. It's a win/win situation, where the two farmers deliver their freezer lamb to the city once a month, to be picked up by a network of customers directly from the cousin's condo. There are all sorts of these sorts of partnerships, which could be forged, if we will just get off the tractor seat and go look for them.

Graeme: In your recent Acres USA article, you touched on the genetic engineering debate and I felt that you covered a slightly different angle on the debate which is worth discussing. You argue that food is animate, not inanimate. The whole potential for this manipulation of our basic blueprint has surfaced because food has become part

of the industrial model. We have come to view it as a mass-product commodity, a lifeless, inanimate commodity which can be altered like the latest model of plastic toy. You would suggest that “*we are what we eat*”, and when food is no longer sacred, then nothing is sacred. The ethical boundaries are gone and life itself becomes devoid of meaning. Would you like to add some more thoughts to this?

Joel: Well, a philosophical base always defines our actions. The GMO mindset goes, “*If I were making a tomato I would have made it like this!*” What arrogance! How dare we! Every single culture from Judeo Christian to Moslem, to Buddhist, to Hindu, to Scandinavian, to Native American, to Aboriginal has had this deep reverence, this respect and humility towards nature. We are just walking into life systems like a bull in a china shop. It’s horrible, and it mocks all of the generations before us. It takes all of that wealth of wisdom and just throws it out the window.

Graeme: I couldn’t agree more. Your Ten Commandments for succeeding on the farm include concepts like commitment, action, planning, measured frugality, consistency and fully utilising your own resources. Do you concede that luck may play a role here. I suspect that you might subscribe to the concept that the harder you work the luckier you become?

“Well, a philosophical base always defines our actions. The GMO mindset goes, “If I were making a tomato I would have made it like this!” What arrogance! How dare we! Every single culture from Judeo Christian to Moslem, to Buddhist, to Hindu, to Scandinavian, to Native American, to Aboriginal has had this deep reverence, this respect and humility towards nature. We are just walking into life systems like a bull in a china shop. It’s horrible, and it mocks all of the generations before us. It takes all of that wealth of wisdom and just throws it out the window.”

Joel: You definitely tend to make your own luck. We are a culture of victims. I know that everybody has problems but I have learnt that if most of us could trade problems with somebody else, we would usually take our own back. I really believe in the resilience of the human spirit to rise to the occasion and overcome difficulties. There’s another quote - “*Show me a hero and I’ll show you a tragedy*”. That’s so true. Gutenberg invented the printing press, because he wanted to give the common man access to the Bible. He wasn’t a genius, it was a noble gesture by a man looking for a practical solution, and he was prepared to look beyond himself. That’s this whole idea of motivation. Coaches are great at motivating, but you can do it yourself with simple concepts. You become how you envision yourself. I wear a suit to these occasions because I envision myself as a white-collar businessman. The mental picture we have of ourselves becomes a self-fulfilling prophecy. Farmers need to place a higher value on themselves, on their labour and on their time. This is the key to self-respect.

Graeme: I haven’t had a chance to read your earlier books - ‘Pastured Poultry Profits’ and ‘Salad Bar Beef’, but I really enjoyed the latest one. Are all or your books self-published?

Joel: Yes, they are. The first book has been reprinted four times and it still hasn't hit the bell curve. It's selling more now than it did five years ago.

Graeme: Can you summarise the basic concept behind 'Salad Bar Beef'?

Joel: 'Salad Bar Beef' is about producing and marketing grain-free beef. We are going back to duplicating domestically what all the wild herbivore populations in nature do. From a nutrient-cycling and migration standpoint, the wild populations are always moving and mobbed up for protection. This affects the way the hooves interact with the soil surface, what it does to the plants, the way the animals eat - it just affects everything. The book is about producing beef from the idea of a salad bar. A salad bar being daily fresh vegetation as opposed to a feedlot, grain-fed approach. Marketing of this product is also covered in depth.

Graeme: In one chapter in 'You Can Farm', on acquiring land, you cover many of the mechanical and emotional considerations when purchasing or leasing land. I would suggest that one of the most important steps in acquiring land is knowing as much as possible about that particular soil, before signing on the dotted line. A good soil test would save a thousand heartbreaks. What do you feel about this idea?

Joel: It certainly is a big advantage to have soil test data, but probably not quite so important in grazing situations. Here, soil amendments are not necessarily your weak link.

Graeme: I disagree. We see soil with inverted calcium to magnesium ratios which could take half a lifetime to correct. It would save considerable heartbreak if farmers soil-tested before buying land. In some situations, it will be the best seventy dollars that they will ever spend.

Joel: I'll defer to your experience on that one - it's not really my area of expertise. There are a lot of visual cues we use for monitoring pasture health, like earthworm castings and weed species.

Graeme: You have mentioned common sense, appropriate crop selection and the use of micro-climates to achieve goals. Can you elaborate further on this concept?

Joel: Well, I've seen people all over the world buy a frost pocket and try to run an orchard there, or you have a wet area and you keep trying to work it to grow a crop. You have to think laterally. If you have a wet area, then come in with an excavator, dig it out and make it a pond or dam. Then you can use the downwind side for something that's frost prone, because winds can run across the water surface and create a frost-free micro-climate. This is something that Wes Jackson calls "*meeting the expectations of the land.*"

Graeme: A central part of your soil fertility program involves the recycling of nutrients via animal manure, composting and earthworm stimulation. Do you actually purchase any fertiliser inputs?

Joel: Yes, I do. I'm really keen on a rock mineral product that is combined with pulped sugar beet, called Planters 2. We also use a whole lot of kelp. We also use a rock phosphate-based product for the poultry. All of these supplements end up in the soil, and I believe that, by running it through the animal, you get a benefit from enzymatic activity which increases the biological response.

Graeme: You also like to see reduced tillage to avoid disturbing microorganisms. There is the argument that oxygen is the single most important ingredient for microbe proliferation. How do you ensure adequate aeration?

Joel: Earthworms are aerators. We have actually had people come to the farm to record the earthworms as they walk around. You know how they suck into the ground after a spring rain. You can't put your hand down on our pasture without putting it on earthworm castings. There would definitely be other things we could do to enhance nutrition, but this is not our weak link at present. Our weak link in our beef is not production, but rather our marketing. We need to sell every single animal at retail prices. We have bought an extra farm so we have a lot more beef to market. You have to determine your weak link and make that the central focus. The problem is that I've sometimes gone on the farm and found that the real weak link was the guy that owned the farm [Laughs]. It makes it hard to be honest.

Graeme: [Laughing]. I guess it's hard to build up much of a client base as a consultant when you have to tell a guy that he is the first thing that has to go! A central theme in your marketing is based on the fact that organic food is of superior quality. This is not necessarily the case. In fact, there is some very ordinary organic food out there. Conversely, there is some excellent food produced using biological techniques that are not necessarily organic. Do you believe that organics is the only answer?

Joel: The problem I have with organics is that it is a non-comprehensive term. It doesn't speak to some of the large variables. For example, organic mulching can vary from good mulches to soil-sappers and plastic. These factors have a bearing on the big picture. If you really get serious about buying organic produce, then you really need to know how the product is produced. We drive 80 kms to buy organic apples because we know the integrity of the growers.

Graeme: Essentially, you are suggesting that your personal nutrition is your own responsibility.

Joel: Exactly. There are just too many variables. There are a lot of differences between how you raise plants and animals within organics. You can have organic feedlot beef or organic pastured beef, and I would suggest that the environmental footprint of those two paradigms is as different as night and day. I try not to use the term organics any more, that's why we have invented other terms like Piggerator Pork and Pastured Chicken, in order to eliminate hardening of the categories [laughs].

Graeme: Thank you for your time. I understand that the winter weather plays a role in the time you put aside for writing your books. I wish you every success for the book in front of you and hope you have a cold miserable winter to allow you the time to complete it.

Joel: Thanks - it was great to meet you. Hopefully I'll be back in Australia before long.

HUMAN HEALTH



DR PATRICK FLANAGAN

Interview conducted December 2002



*Dr Patrick Flanagan is an enigma, a child genius who invented the **Neurophone**, a revolutionary communication device, at the tender age of fourteen. He was snaffled up for service in the Pentagon think-tank in his late teens and featured in a Life Magazine special as one of the leading lights of American science. After decades of research, often associated with a hermit-like, self-imposed exile, **Dr Patrick Flanagan** recently re-emerged with an invention he considers to be his most important work to date. Based on the unlocking of the secrets of **Hunza water**, Dr Flanagan has developed a totally new compound involving negatively charged hydrogen ions encased within minuscule silica spheres. This compound, **silica hydride**, promises to be a major breakthrough in human health. In mid 2003, comprehensive research reports are scheduled for publication in a major peer-reviewed chemistry magazine. When silica hydride is officially accepted as a new chemical, Dr Flanagan may well become a Nobel Prize candidate. I had tried to organise interviews with Patrick in 2000 and 2001 but he is extremely difficult to contact. I was finally successful in December 2002, and I was able to spend a morning with him in his home in the Santa Cruz mountains. This rare interview, one of very few granted during the past twenty years, features a brilliant scientist explaining his masterwork - a finding which may well impact on us all.*

Graeme: Thanks for finding the time to speak with me. It appears that you don't grant many interviews. In fact, the only one I could find was in my Acres USA archives from sometime in the 70s. Have you consciously reduced your contact with the media?

Patrick: Well, yes, I did for quite a while. In 1983 I kind of became a hermit for fourteen years. I became very involved with my research. I lived in a place surrounded by thirty acres of trees on a small river up in Sedona, Arizona. I just focused on research and I refused interviews. That was at the peak of the time when people wanted to interview me. I had TV people calling all of the time. I had movie stars wanting me to entertain guests at their parties. It was that kind of thing, so Gail (my wife) and I stayed in that location for fourteen years and nobody visited us. It was during that time that I did the most important research of my life. I finally came back into the world again in 1997 and she died in 1998. I've made myself available again recently, but I can be pretty hard to find.

Graeme: The product of your research was an exciting new antioxidant called silica hydride. It has been marketed by a multilevel marketing company as Microhydrin. I notice that you are now marketing the product with your own company. Has there been a split with the MLM people?

Patrick: Yes, there has been, but I can't really talk about it because we are in the middle of a lawsuit right now. I am no longer associated with these people.

Graeme: Our company in Australia is particularly concerned with the link between soil health and human health and the mechanics of improving both. You are a pioneer in both areas, and in this interview I'll cover your work with nanotechnology research and your findings in agriculture. However, you are renowned for your prolific creativity. Is there anything new on the drawing board, or are you currently consolidating your earlier work?

Patrick: Well, my current work is kind of a summation of everything I've done in my entire life. Basically it involves my discovery that the H⁻ anion, or the negatively ionised hydrogen atom, is vital in all living organisms - except for cancer cells. Cancer does not include any H⁻ ions. Its metabolic pathways are different from the other cells. Every living organism uses large quantities of these ions in virtually every chemical reaction in the living system, and this is something that no one had known before - except for NADH, which is a co-enzyme used in the production of ATP - the energy molecule of the body. It was acknowledged in biochemistry that the H on NADH is an H⁻ ion, the hydride ion. Essentially we found out that H⁻ ions are used in almost every chemical reaction of the body - for purifying the body, for getting rid of toxins, for repairing DNA and many other things. The only situation that is comparable to it, in terms of overlooking or failing to recognise something of profound importance, is nitric oxide. A few years ago it was discovered that nitric oxide is a very important biochemical transmitter in the living system, and yet it's a deadly poison. No one had ever thought to look for it, yet it turns out to be incredibly important. H⁻ is something that was similarly ignored, and my discovery addressed this oversight.

Graeme: It is a pretty momentous discovery, in my opinion. I'd really like our Australian readers to understand how and why this technology is so important. Can you offer a bit of a summary of the benefits of silica hydride?

Patrick: Yes, certainly. Well, I was a child prodigy in science, and the government took one of my devices, actually they stole it, when I was eleven years old. It was an atomic bomb and guided missile detector. Subsequently, as a teenager, I worked for the Pentagon, in the Pentagon think tank. During my years there I met Dr Henri Coanda, who is called 'the Father of Fluid Dynamics'. If you look up the 'Coanda Effect' in the Encyclopedia Britannica, you will find that it is an aerodynamic principle that he discovered, which enables modern aeroplanes to actually fly. It's actually his principle, not the Bernoulli principle, that enables aeroplanes to fly. When I met him, I was seventeen years old and he was seventy-nine years old. He and I became very close friends. He was a very strong, robust man and very vital. On his eightieth birthday, I said to him, "*When I'm your age, I hope I'm in the shape you're in*", and he said, "*When you're my age, we'll talk about it.*" The next week he invited me into his office at our research facility and he revealed his search for the fountain of youth. He said that water is the most important nutrient we take into our bodies. He suggested that "*We are what we drink*", even more than "*We are what we eat.*" He then described his research into water. He had found that water all over the world has different physical characteristics. We are taught at school that water has a certain viscosity, a certain surface tension, freezing point, boiling point, etc, but Dr Coanda said that these are averages. When you check out water around the world, you'll find that water is different in different places. He said that he had discovered that there is a certain kind of water that is related to longevity and excellent health. He described five places on earth where this phenomenon was readily apparent, and one of them was Hunzaland, which most

health-orientated people are familiar with. He said that he had discovered that Hunza water has certain physical characteristics, but he didn't know what imparted those characteristics to the water. He had spent the best part of his life trying to discover what it was. He related to me the specific characteristics of Hunza water and he said, "*Patrick, if you can create water that has these characteristics, then you will be able to bring long life and health to everyone throughout the world.*" He said "*I'm turning the project over to you, because I will never complete it in my lifetime and I believe that you are capable of completing the task.*" He gave me his research and I began a twenty-year quest to fulfil his belief in me. I treated water with magnetic fields, electrostatic fields, A/C fields, all kinds of energy fields, trying to recreate Hunza water. I succeeded in changing water, but it was always temporary. For example, you can change water with a magnetic field and measure certain changes in the physical structure of the water, but if you vigorously shake or stir the water, the effect of the magnetic field disappears. I used to treat water with magnets, then drink it very slowly so I didn't create turbulence.

"On his eightieth birthday, I said to him, "When I'm your age, I hope I'm in the shape you're in", and he said, "When you're my age, we'll talk about it." The next week he invited me into his office at our research facility and he revealed his search for the fountain of youth. He said that water is the most important nutrient we take into our bodies. He suggested that "We are what we drink", even more than "We are what we eat."

Graeme: Did you have any actual samples of the Hunza water to use as a guideline for your research? I would imagine that would be fairly critical as a comparison point.

Patrick: Well, actually I had some help from a woman called Betty Lee Morales. She was a famous figure who owned 'Eden Ranch' outside of LA. It was an organic ranch, and she was one of the early pioneers in organic food. She used to lecture widely in this field. She and her husband had visited Hunzaland many times and knew the Emir of Hunza. She was also aware that their water was the secret to their long life and health. She gave me samples of Hunza water and I used that as my sample to compare my experiments. Eventually, I discovered that crystals affect water very powerfully - particularly diamonds, rubies and emeralds - crystals with a high degree of molecular structure. If you clean the surface of a crystal and then put it in water, the water molecules will line up with the electric charges in the lattice structure of the crystal and impart very dramatic changes to the water, remembering that water molecules are di-polar, with negative and positive sites. I had a 25-carat diamond once that someone had loaned me for my experiments. Remember that the more structured the crystal, the greater the effect. The diamond is the hardest structure, and a diamond of this quality has a substantial lattice structure. When I put that diamond in a container of water and left it for about half an hour, the surface tension, which is a measurement of how wet water is, went from 73 dynes per centimetre (which is normal water) down to about 37 dynes per centimetre. This is a huge change! If I carefully drank that water, I could feel changes in my body. I could perceive it in my nervous system. Then I got some man-made rubies, the kind that they make lasers with - discards - and I filled a small

brandy glass with these rubies. Next, I would put distilled water into the glass and leave it next to the bed every night. In the morning, I would carefully drink it without creating turbulence because, if you were to stir this water vigorously, it would erase the effect completely. I started thinking about the glacial colloidal minerals in Hunza water. If you let those minerals settle to the bottom and pour the water off the top, the Hunza water still retains a low surface tension, a higher viscosity and it has a different boiling and freezing point than ordinary water. If you shone a light through that supposedly clear water, you still see tiny colloidal minerals - because of the Tindall effect, there's a cloud. It doesn't matter what you do to this water, stir it vigorously, even electrocute the water, it will still retain its characteristics. I realised that those little colloidal minerals have very high negative electric charges and they structure water just like the crystals. These minerals remain in the water - you can't filter them out - they are virtually impossible to filter out. I reasoned that it was these minerals which were imparting the unique characteristics to the Hunza water.

Graeme: Did Henri Coanda realise that it was the colloidal minerals that were the key?

Patrick: No, Dr Coanda had no idea what created the effect. He said that it might be a magnetic field between the valley and the mountains in Hunzaland, or it might be the difference between the temperatures in the glaciers and the valley which created an energy effect. He didn't know.

Graeme: So what was the next step in the discovery process?

Patrick: Well, next I took the Hunza water and dried some of it and looked at the minerals under electron microscope scanning and I also had them analysed. I basically discovered that the main mineral in the Hunza water is a form of silica not found anywhere else. Silicon dioxide (SiO_2) is the most prevalent metal in the world. The sand on the beach is silica, but there are over 140 different kinds of silica now catalogued, and this was different from all of those. I then embarked upon a process of using nanotechnology to attempt to manufacture the kind of silica I found in Hunza water. I eventually succeeded in doing that.

Graeme: I was going to ask you about why you chose silica. I suspected that it was related to the conductivity of this material. I never realised that silica was the predominant material in Hunza water.

Patrick: Well, it's well known, in colloidal chemistry, that any kind of colloidal silica particles have a negative charge. This charge exists even down to a pH of 1, which is very unusual, because acids have hydrogen protons with no negative charges, so they tend to neutralise negative charges. You can take silica all the way down to pH 1, and it still retains the negative charge. It's the only mineral that does this! The silica in Hunza water had a very high negative charge - 140 millivolts, which is quite amazing - and also, the colloids were very, very small. So I worked with dissolving silica in various chemical solutions and tried to precipitate it in the form that was found in Hunza water. I eventually discovered a way of doing that in 1983 with nanotechnology. Even today, twenty years later, my particles are still the smallest silica particles ever made by anyone in the world. My silica particles are tiny spheres and they are hollow. They are 50 angstroms or 5 nanometres in diameter, which is extremely small. They group together to form larger spheres, kind of like what are called buckyballs. That is, the

smaller spheres will form larger spheres up to 1 micron or 2 microns in diameter, but the 2-micron ball might involve 100,000 small spheres. So I discovered how to make these and, when I added them to water, it gave me all the characteristics of Hunza water - well, all that I could measure at the time.

Graeme: During my research for this interview, I read about your invention of something called a Vortex Tangential Amplifier. Was this vortex technology linked to the manufacture of these tiny silica particles?

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Patrick: Yes, that’s correct. You see, water in a perfect, non-turbulent vortex has a laminar flow. That is, water in the vortex flows in layers. Layers and layers of molecules, all sliding past each other at different speeds without turbulence. The thickness of these layers is about 5 nanometers - very, very small layers. I discovered how to precipitate my silica between the layers in a vortex. The rolling action of the layers actually rolls the silica into a ball. My first commercial product based on this technology was called ‘Crystal Energy’. This is a liquid concentrate of this type of silica, which exhibits the same physical characteristics as Hunza water.

Graeme: How did this product perform?

Patrick: Well, from a personal perspective. I had been a gymnast. In fact, I was a world-class gymnast by the time I was seventeen. Gymnastics is very hard on the body. I had damaged every joint in my body many, many times. Both of my shoulders, for example, have been pulled out of their sockets hundreds of times. I was a wreck when I was in my thirties. I had bursitis, all my joints ached and creaked when I walked - the mornings were worst. My ankles cracked like twigs snapping when I walked in the morning. After a few months of drinking the crystal energy water, all of my problems cleared up. Friends who had known me fifteen years earlier said that I looked younger at that point than when they had first met me. This was during my hermit period. No one came to the house. We would meet these friends at restaurants in town. They would ask about how I had achieved this transformation and I would tell them about my Crystal Energy discovery. We ended up giving tens of thousands of bottles away to friends and their families and the demand became so great that we started selling it. That became a very successful product. However, I was still not satisfied. I kept coming back to the Hunza water, to see if there was anything I had missed. It was basically pure intuition which led me to the next link. I had been reading the works of Albert Szent-Gyorgyi. Albert Szent-Gyorgyi was a Hungarian scientist who won the Nobel Prize for his work in metabolic chemistry. He was the discoverer of Vitamin C. Linus Pauling made Vitamin C famous, but Albert discovered it. In his book, he talks about hydrogen being stored in the organs of the body. He called it ‘active hydrogen’. It’s a biologically active form of hydrogen. He described how they detected it in 1923 in the tissues, but they couldn’t figure out what its purpose was in the living system. This

caught my attention. Back when Szent-Gyorgyi was doing his work, they didn't know about hydrides - H⁻ ions. They knew about them in the sun. They knew that we had hydride ions on the surface of the sun, but no one knew that they were found in the living system. So I developed a device, a laser device for detecting the hydride ions through what's called 'photon detachment' Now I was able to detect large quantities of hydride ions in bodily fluids and also in the fluids of plants - in carrot, orange, lemon and apple juices. I had just one vial of Hunza water left from my initial research, which had begun thirty years previously. I had stored the Hunza water in little heat-sealed vials, hermetically sealed. I tested that last remaining vial. It was loaded with H⁻ ions. So this was another ingredient in Hunza water that I had missed. At this point I had already developed an H⁻ hydride gas generator, which made hydride ions in gas form - plasma. I would bubble this plasma through water and it would charge the water with the hydride ions and I would drink it and it would give me lots of energy. My grey hair started turning dark again and all kinds of good things started happening. I wanted to find a way to get these H⁻ ions to friends. When I made them in water they wouldn't last beyond a couple of days. When you make fresh carrot or orange juice the hydride ions dissipate quite rapidly. I discovered that the juice stays fresh as long as the H⁻ ions are in the juice. The moment the H⁻ ions dissipate they start to coagulate and start to form bacteria.

Graeme: So when you measure ORP or redox potential, is that measuring the antioxidant potential, or the presence of the hydride ion?

Patrick: Yes, it is, but there are many things that have low redox potential which don't give you H⁻ ions. When you're using redox you have to be aware of the presence of hydride ions - it's more reliable to use the laser device I made - laser photon detachment - or you can use nuclear magnetic resonance spectrometry. So what I eventually discovered was that the colloidal minerals, the tiny hollow silica spheres I had developed, will store H⁻ ions indefinitely in a dry form. Even in a wet form they will last a very long time. Remember that my thirty-year old Hunza water was still packed with hydride ions. I discovered how to impregnate the tiny silica spheres with H⁻ ions and that became the product that was previously known as Microhydrin and is now Mega H, Megahydrin, Active H - it has several names...

Graeme: I notice that the MLM company is still marketing Microhydrin - how is that working?

Patrick: Well, the company that markets Microhydrin is no longer using my product. They claim that they are making silica hydride but we will wait and see. We now have several publications covering my product in peer review medical journals on my product and we have just been accepted for publication in a peer review chemical journal. This is very profound - the article will be published in February or March. It is a forty-five-page article written by myself and my research associate Cory Stephanson. Cory and I wrote this article demonstrating twelve different laboratory techniques which validate the that I have actually created a new chemical - a previously unknown chemical compound which is silica hydride. It is found in Hunza water but it was not known to science. We used ion beam spectrometry and x-ray defraction and electron beam defraction - all kinds of techniques to prove the structure of our particles, and the fact that we have H⁻ ions stored and that they are stable. That article will establish me officially as the founder and discoverer of silica hydride. At that point I can apply for

patent because, with chemical recognition, silica hydride will go into the chemical dictionaries and the chemical databases around the world. The patent will protect my technology.

Graeme: Are you familiar with some of the other water work being conducted around the world? We have just returned from high-level meetings with the Romanian government about the potential for introducing a biological farming system to their country. Their agriculture is in chaos and the food quality is shocking. In Bucharest we also met with Dr Ioan Manzatu, who apparently also worked with Dr Henri Coanda and has since developed and patented an energised water product called ‘Structured Water’. Actually, he has developed an entire product range. His company is called Biotehnos. Is there any similarity between his approach and yours?

“So what I eventually discovered was that the colloidal minerals, the tiny hollow silica spheres I had developed, will store H- ions indefinitely in a dry form. Even in a wet form they will last a very long time. Remember that my thirty-year old Hunza water was still packed with hydride ions.”

Patrick: I’d have to read his patent to answer that question and let you know. I originally called my product ‘Structured Water’ way back in 1983 and I wrote a book on it, called ‘The Elixir of the Ageless’, with my wife. I talked about structured water and how water could be structured with electric charges, and things like that, and since then a lot of ideas in that book have been copied around the world. Many people talk about Henri Coanda who never even knew him. You see, Henri Coanda never wrote about Hunza water in any of his publications. His belief that “*You are what you drink*” was never written - he only gave that to me verbally.

Graeme: He was heavily involved in work with snowflakes - he had a snowflake generator, didn’t he?

Patrick: Yes, he made snowflakes. At a certain temperature below zero the water circulates in the veins of the snowflakes and that water has a certain structure that stays liquid, even at many degrees below zero. Eventually it freezes, so he argued that snowflakes have a certain lifespan, and that by studying that lifespan he could tell what kind of water people have in certain areas. He could estimate the lifespan of people in a given area by the water characteristics. But returning to your original question, I’d love to find out more about the research in Romania.

Graeme: I’ll send you what I have when I return to Australia. Dr Manzatu was very excited about the potential of his ‘Structured Water’ in agriculture - Have you checked out the potential of silica hydride in agriculture, and would it be cost effective?

Patrick: Oh yes, I certainly have. We’ve used it in agriculture - I’ve used it in foliar feeding. The lower surface tension magnifies nutrient uptake. It’s wetter water and the nutrient is absorbed through the stomata much more effectively. There are also benefits associated with energetics.

Graeme: Is it cost effective?

Patrick: Yes, it is. We've also done work with sprouting seed. If you add some of my product to the water when you're sprouting, the seeds sprout much faster and have a higher viability than normal.

Graeme: Henri Coanda was very concerned with maximising the benefits of his research for the widespread good of mankind and he chose you as his torchbearer. Are you confident that the multilevel marketing approach is the best technique to provide affordable benefits to the greatest numbers?

Patrick: No, I'm not! MLM has it's place... Historically, when you make a new discovery it takes about fifty years until people recognise it. Thankfully it's happening much faster with this product, but my Neurophone - a hearing device I invented when I was thirteen years old - took almost 50 years before it was really recognised and now it's doing well. The nice thing about MLM is that it can be well suited for something totally unique and totally new, because people talk and they can educate each other. They hold meetings with videos or tapes - they need to hear the story...

Graeme: We have a similar situation with some of our products and we have been approached by MLM companies to market them. As we develop our human health range I am very conscious of the need to keep things affordable - with MLM there are so many parties having a bite of the cherry that the end price is simply unacceptable.

Patrick: Exactly! Multilevel has to have between a 700% and a 1200% mark-up and that makes the product very expensive and prevents ordinary people from using it.

Graeme: It doesn't really fit with Dr Coanda's humanitarian game plan, does it?

Patrick: No, it doesn't. Now we have direct retail sales and some MLM but we also have the industrial area, which also includes agriculture. For example, there are thousands of steel mills all over the world which make high carbon steel and when the steel comes out in sheets they have to run it through an acid bath, which is hundreds of yards long. They use a very powerful nitric acid to clean the steel so that it can be painted. The acid destroys equipment and when it loses it's effectiveness every few months, it becomes a hazardous waste product which has to be managed. We tested my crystal energy product on high carbon steel and we were able to clean it just as well as they could with nitric acid. It normally costs \$3 million to change the washing tank every three months and it costs about \$1 million with my product and there is no hazard to the environment. Actually, the end product would be good for the environment. There are many other possible industrial uses which we haven't even begun to explore.

Graeme: There are several different theories related to Hunza water and the longevity of the Hunzakuts. Joel Wallach, for example, claims that it is the colloidal minerals found in the glacial water which is the key, rather than the energetics - How would you counter his claims?

Patrick: Well, Joel Wallach used to buy my book and use it as a sales tool until he came up with his own audio tapes. The thing about colloidal minerals, which is not well understood, is this - our bodies can't use minerals unless they are in colloidal form. For example, if you take a magnesium salt like magnesium sulfate or epsom salts, your body has to remove the sulfate from the magnesium in order to get a colloidal magnesium particle, and then that colloidal magnesium is used in making enzymes. Ultimately, all minerals that go into your body have to be converted into a colloidal

form before they can be utilised by the cells. If you have really small colloidal minerals in this nano size range then the body is able to utilise them directly without having to remove anions like chlorides and sulfides.

Graeme: Joel's material, and a similar product that we market called LifeLine 127, is derived from running distilled water through ancient humic shale. Does he have a very small particle size, or what is the key to that?

Patrick: When analysing this material, I haven't been able to determine that it is colloidal in form. I know that it's highly conductive, which means that it must contain mineral salts. Pure colloidal water has very low conductivity.

Graeme: I'm wondering if fulvic acid may be involved in the equation. It's an electrolyte, it reduces surface tension and increases nutrient uptake. There are also numerous other health benefits attributed to this organic acid and it's part of the colloidal mineral blends. What do you think?

Patrick: The Hunza water is slightly alkaline and I haven't been able to detect humic or fulvic acid, but I believe that Joel Wallach's products, and others from the same source, are excellent products because people are getting exceptional results with them. Perhaps there is a link with humic or fulvic acids...

Graeme: I was also interested in asking your opinion of a water energising technology we are marketing in Australia. It's called 'The Water Wizard' and it involves water flowing through a cylinder through twin vortices and over a series of rare earth magnets. It has quite a profound effect on plant growth. What's happening here?

Patrick: When water flows in a laminar manner through vortices it takes on very special characteristics. I'd love to check out The Water Wizard. There is still a lot that none of us know about water.

Graeme: I'll send you a household model when I arrive back. Are you familiar with Grander Water from Europe?

Patrick: Thank you. Grander Water involves a concept that doesn't really make sense to me. The water to be treated apparently just flows past an internal vessel containing 'imploded' water and the energy is transferred. I'd have to look more closely at that one.

Graeme: Well, you can take the little 'Grander' stainless steel wands intended for personal use and stir any liquid and change it's properties. I've seen the results and tasted the change.

Patrick: It does sound amazing.

Graeme: I'm fascinated with the mechanics of energisation. There are numerous partial explanations of this phenomena. I'd love to put the pieces together. Is there a link with the tiny light particles called biophotons and the hydride ion? You may be familiar with before and after photographs of treated water, where the energised water develops a structured light show, like glowworms. According to Dr Popp from Germany, these biophotons are critical for most life processes. I'll show you some photos taken by Dr David Schweitzer in England on a fluorescent microscope...

Patrick: Wow, these are impressive! Did he detail his photographic technique?

Graeme: No, but those details are probably available on one of the websites for an English water energiser called the Vortex Energiser. Schweitzer, who is supposedly the son of Albert Schweitzer, also conducted experiments where he was able to measure a marked reduction in the biophoton light show in the presence of negative thoughts, and he could measure a dramatic increase in light particles in the presence of positive thinking. When you consider that the brain is 90% water, this can be seen as evidence of the power of positive thinking.

Patrick: Wow, I do believe that. I know water is sensitive to thought because in my lab I've made what's called Einsteinian purity. It's water so pure that it has to be stored in a pure teflon container that was inside another bigger teflon container which was inside yet another one, because it absorbs right through the walls. That water is so pure that it responds to human thought. You can measure the conductivity of that water, which is very, very low - we're talking about nano-amperes going through the water. When a person would walk into the room it would register that person's energy field.

Graeme: I'm still trying to pull the pieces together... Is there a link between these tiny light particles that Popp refers to as biophotons, and the presence of negatively charged hydride ions?

Patrick: I think it's highly likely. I've even detected hydride ions in pure distilled water. Something I don't understand is that when I treat water in a pyramid it has more hydride ions than before treatment.

Graeme: Sounds like you've stimulated the absorption of outside energy. I'd really appreciate it if you could do some investigations along these lines for us - I'll send you a couple of different water energisers.

Patrick: That would be great.

Graeme: In the chapter in which you featured, in the book 'Secrets of the Soil', you theorised that the hydrogen bonds of water molecules are subjected to such stress due to the velocity of the vortex, that they are stretched to the point that they absorb planetary influences. Are we talking about hydride ions being formed at that point?

Patrick: It's quite possible, but at that point I didn't have the capacity to measure hydride ions and wasn't even aware of their existence - I'd have to revisit my earlier work. The thing about the Steiner reverse-stirring technique they were talking about in 'Secrets of the Soil' is this - when you switch the vortex from left to right there is a lot of stretch and strain on the water molecules - they are all going in a laminar manner - and then you reverse it.

Graeme: The increase in energy associated with the Steiner reverse-stirring technique is a measurable reality. It can be monitored very easily using radionic scanners. The theory is that the vortex promotes access to ether, or the life force, as Easterners call it. The biophoton increases seem to support that theory and now I'd love to know the relationship between hydride ions and etheric energy?

Patrick: I can tell you this. Years ago I was the first person in the US to manufacture and sell negative ion generators. I developed a close friendship with another manufacturer of negative ion generators, who lived in Lugano, Switzerland - Dr Walter Stark. At one point he was visited by a Tibetan mystic known as the Kamarpa. This guy is equivalent to the Dalai Lama - his sect of Buddhism is actually the largest in the world.

He visited Walter because he had heard about the negative ion generator and he felt that what it was making could be what the Tibetans call 'Prana'. After checking it out he said that it had similarities to the life force, but it wasn't Prana. One of the things that the Karmapa said to my Swiss friend was that Prana had a negative charge. What I'm leading to here is this...there is a small amount of hydrogen in the air we breathe and I believe that it is in the H- form. I believe that the H- ion is the most etheric particle that we can take into our bodies, and the most important.

Graeme: In agriculture our approach is to develop a 'functional hybrid', taking the best from all worlds in a pragmatic approach where the only guideline is "*Does nature approve?*" In this context we would consider that the Steiner reverse-stirring technique has considerable potential for any grower, without adopting the biodynamic dogma. What do you think?

Patrick: I really think it would be of value to anyone. I have done an enormous amount of work with vortices and water and the vortex definitely has a profound effect on water. I've studied left hand and right hand vortices, light in nature, circular polarised light beams. When left and right come together they form linear polarised light. I like the idea of this double vortex in The Water Wizard. There really may be something to this. There are energetic effects from a single vortex. I really need to go back and look at vortices in terms of the hydride ion.

"One of the things that the Karmapa said to my Swiss friend was that Prana had a negative charge. What I'm leading to here is this...there is a small amount of hydrogen in the air we breathe and I believe that it is in the H- form. I believe that the H- ion is the most etheric particle that we can take into our bodies, and the most important."

Graeme: One of the key benefits of silica hydride seems to be it's capacity to neutralise free radicals. Why have free radicals become such an issue in the contemporary health equation?

Patrick: Well, free radicals are generated just through the metabolism of food. If we ate all raw food we would be getting very large quantities of H- ions in our diet to easily neutralise these free radicals. The moment you dry food or cook it the H- ions are the first things to go. Actually, enzymes require H- ions to be active. That's why when you cook food the enzymes - in actual fact the H- ions disappear first, and then the enzymes stop working.

Graeme: And we wonder why the majority of us have digestive problems! Apparently the indigestion drug Zantax is the biggest selling drug of all time. You can't digest without enzymes and they are supposed to come from our food.

Patrick: Yes, you're right. We were supposed to eat a large percentage of raw food. There are so many sources of free radicals in the modern environment to neutralise. In the house, for example, the carpets and drapes are slowly deteriorating and the dust particles are all being absorbed into our lungs. Free radical damage is considered the main cause of the aging process. Our DNA gets damaged through free radicals and we

can't repair it. Our bodies have DNA repair mechanisms but you need H- ions to repair DNA. Most people, in fact all people, are deficient in H- ions.

Graeme: Is there any hard evidence to support the links between silica hydride and longevity?

Patrick: Well, using human cells in-vitro (cell cultures), we have doubled the life-span of the human cells. That was with H- ions at the level that would equate to taking four capsules a day.

Graeme: What about from an anecdotal perspective? Have you had good customer feedback?

Patrick: People report personal miracles. There have been tremendous results with people with neurological damage, for example, whether it is injury by impact or by chemical damage. We had a man who was paralysed. He had been in a wheelchair for forty years. After taking my product for three months he got the feeling back in his legs and began to walk - today he can walk normally.

Graeme: I have a daughter with brain damage. Part of the reason we became so passionately involved in this mission to improve food quality and sustainability was related to the introspective time spent sitting next to her bed while she was in a coma, following her accident. Rachael is still partially paralysed on one side, she speaks at about half speed and she has a teacher's aid with her at school. Would you think that there would be benefits in putting her on a course of silica hydride?

“People report personal miracles. There have been tremendous results with people with neurological damage, for example, whether it is injury by impact or by chemical damage. We had a man who was paralysed. He had been in a wheelchair for forty years. After taking my product for three months he got the feeling back in his legs and began to walk - today he can walk normally.”

Patrick: Based on our results, I would definitely say so - I'll give you some to take back with you. She should take four tablets a day. Sometimes miracles do occur with the nervous system. We've had a diabetic who had no feeling in his legs from the knee down for fifteen years. He took the product and got full feeling back in his legs after three weeks. There have been very good results with diabetes in general. We've had so many miracles but we are not permitted to talk about them in our advertising. There has been almost everything you can imagine - thousands of cases. It is an amazing substance which is vital for repairing the human body. Personally, I'm 58 years old, but I feel far better than I did in my thirties. The gymnastics damage has been completely repaired. I still have damage to my brain because my mother gave me 3lbs of mercury to play with as a child. They didn't know about the dangers at that time. I'm not sure that this damage is completely repairable but it may well be what makes me unique, who knows?

Graeme: Both Rosa and I attended a three hour presentation on a diagnostic treatment approach called *Biological Terrain Assessment*, or BTA, at the recent Acres USA conference. I was reviewing your website and saw the trial using silica hydride and

monitoring the results with BTA. The positive changes over two weeks were simply amazing. What's your opinion of the BTA approach?

Patrick: Yes, there is no doubt of the validity of the BTA approach. My only reservation relates to the fact that they have established an 'ideal'. They say that according to BTA guidelines "*this is a truly healthy person*". I don't think anyone has measured what a really healthy person is. We may find that after consuming H- ions for a period it may be necessary to raise the bar in terms of the BTA ideal.

Graeme: There was an anomaly in the BTA trial where urine resistivity increased to double that considered to be the ideal level. It may not be significant but it raises the question of negative side effects. Have you ever seen any negative outcomes with people using silica hydride?

Patrick: Well, when you take my product people start cleansing and dumping toxins and things that have been stored in their bodies for years and years. You might see some of the BTA parameters get worse in the beginning. In general, we find that you need to keep a person on the product for at least three months. In the beginning you might be flushing toxins, but after awhile the body begins to replenish it's hydride supply in the organs and that's when the repair process really begins. It starts repairing DNA, for example, at that point. Some people get Herxheimer reactions when they start taking it. In these few cases we recommend that they slowly build up the dose. I had one lady who was exposed to anthrax when she was a little girl and survived the ordeal. When she first tried it she got very ill on the first tablet. I asked her to dissolve a capsule in a litre of water and to take one teaspoon every hour throughout the day. She wrote me about three months later and said she was now able to take the product regularly and that she had never felt better in her entire life.

Graeme: It must be incredibly satisfying to have achieved something like that...

Patrick: It is! I have thousands of people who have told me that their life or the life of one of their relatives was saved by my product. In one case, one of my customers had a relative who had twelve hours to live in intensive care. He was unconscious and they were able to get the doctor's permission to put the product in his feeding tube. Within three hours his blood chemistry began returning to normal and a true miracle occurred. Three days later he was out of the hospital, completely turned around. Over a period of months he completely recovered. I'm not suggesting that this product is curing disease - our bodies have miraculous healing powers if they have the right nutrients. Part of the success of medicinal drugs is related to the fact that they suppress symptoms so that the body can kick in. Antibiotics, for example, suppress bacteria for long enough so the body's natural bacterial fighters can get in and finish the job off. Actually, silica hydride works very well with medical modalities - for example, it enhances the effect of antibiotics. We have people who have taken antibiotics and got no response, but when they take my product with the antibiotics they suddenly get rapid results.

Graeme: I assume that it would be an ideal adjunct to vitamin and mineral supplements to magnify their effect - Wouldn't it be a good idea to develop a vitamin and mineral range which incorporated silica hydride?

Patrick: Actually, we are currently in the process of developing such a range. In one study we used a double-blind crossover study in which a group of people would clean their bodies out and not take any vitamins for a week. Then they would take a vitamin

without our product and we would measure the metabolites of the vitamin to see how much was absorbed. In the next phase, the same people cleaned out again for a week and then took the same vitamin with silica hydride added. The results indicated that when we take vitamins we absorb about a third into our bodies and the rest is eliminated. When we added the silica hydride, as close as we could tell there was 100% absorption.

“In one case, one of my customers had a relative who had twelve hours to live in intensive care. He was unconscious and they were able to get the doctor’s permission to put the product in his feeding tube. Within three hours his blood chemistry began returning to normal and a true miracle occurred. Three days later he was out of the hospital, completely turned around. Over a period of months he completely recovered.”

Graeme: Couldn’t part of the reason for poor uptake be related to compromised enzymes? If you don’t have that link with the gut to get the vitamins and minerals through, it’s a long, hard road. If the hydride ions are improving enzyme activity, this could be the key.

Patrick: Yes, it’s true that enzymes can play a role, but part of the improved uptake, in this case, is related to surface tension and wetting capacity. All food particles, even oils, have to be wetted before they can be absorbed by the body. Oils are wetted by mixing the oil with bile, which makes chylomicrons which are then wettable. The oil particle is surrounded by molecules that can be wetted by water and can be absorbed through the lymphatic system. Even fats have to be wettable. Silica hydride lowers the surface tension so much that it enhances the absorption, because we can wet products so much better and therefore absorb much more.

“The results indicated that when we take vitamins we absorb about a third into our bodies and the rest is eliminated. When we added the silica hydride, as close as we could tell there was 100% absorption.”

Graeme: Alkalinity has become the hot topic in natural health circles - there are a number of books available on the subject, including ‘Alkalize or Die’. Do you agree with this emphasis, and what role does silica hydride play in this regard?

Patrick: Well, virtually all of the metabolic byproducts of the body are acid, and real problems arise when the cells become acid internally. At this point, ordinary alkalisers like sodium bicarbonate are ineffective. The bicarbonate ions can’t penetrate the cell in order to neutralise the acids in the cell. By contrast, H⁻ ions can enter into the cells and neutralise acids because acids have positive charges, and H⁻ neutralise positive charges. The hydrogen atom is the smallest molecule - it can enter any place in the body. There are no barriers to it anywhere. It can enter the cell and neutralise acidity.

Graeme: That's a great thing! One other question I wanted to ask. Some of the advertising literature suggests that silica hydride is an antioxidant that's 500 times more powerful than any other antioxidant. Is this just marketing hype, or can this claim be supported?

Patrick: Well, it is correct, but our bodies utilise all kinds of antioxidants for all kinds of purposes. We need Vitamin C and the phytycyanins, etc. One other important thing about our product is that it has the ability to recycle other antioxidants because all antioxidants, except for H-, become free radicals themselves once they have lost their electrons. For example, Vitamin C releases a hydrogen ion when it neutralises a free radical - it then becomes dehydro ascorbic acid. Dehydro means it's lost the hydrogen. Our product, in the body, can recycle Vitamin C over and over again. We call silica hydride the primordial antioxidant because it is the only antioxidant known that when it neutralises a free radical, it does not become a free radical.

Graeme: So, despite the marketing, it is not really a replacement for other antioxidants, it is more of a magnifier.

Patrick: Yes, that's right. Linus Pauling, for example, took 10 - 20 grams of Vitamin C every day. He could have taken much, much less if he had combined it with my product because of this recycling capacity. I generally recommend that people eat raw food and take vitamins, minerals and antioxidants, but those alone won't do it. H- is the primordial electron source for chemical reactions and most people are very deficient in it.

“Our product, in the body, can recycle Vitamin C over and over again. We call silica hydride the primordial antioxidant because it is the only antioxidant known that when it neutralises a free radical, it does not become a free radical.”

Graeme: I'd love to hear more about your Neurophone technology. I understand that it took years of trials and tribulations to finally get this product to the market. Why was it so difficult?

Patrick: When I first invented it, it was 1958 and I was thirteen years old. I applied for a patent and wrote my own patent technology but the patent office said there was no existing technology like this and that it couldn't possibly work. I eventually had to fly to the patent office, and demonstrate my device on a deaf employee at the patent office, so they were obliged to grant my patent. I then applied for a second patent and then the defence department thought it might have defence potential and they literally stole my invention. They put it under secrecy for five years. I had to fight the government with law firms in Washington DC and Texas in order to finally get them to release it. For forty years no one knew how it worked, and then in 1997 a doctor at the University of Virginia duplicated my Neurophone and discovered that we have a small organ in the inner ear that's an organ that detects balance - but it's also an ultrasonic hearing organ. This ultrasonic hearing organ is called a saccule. The saccule can detect ultrasonic sound, but only if it's transmitted through the skin or through the bone, not through the air. When we swim with whales and dolphins and we think we are hearing their sounds some of the time we are actually hearing their ultrasonics through the saccule. The saccule is the main hearing organ for ultrasonic sound in whales and dolphins and it

suggests that we may somehow be related to these creatures. The Neurophone works with a modulated ultrasonic sound around forty kilohertz. When you use the Neurophone it has very interesting effects on the mind. It increases intelligence, it creates phase coherence in the left and right hemispheres of the brain and it could be developed as a hearing aid for profoundly deaf people (as we know what's required in that area). However, we use it mainly to alter consciousness and to improve the functioning of the brain.

“... we have a small organ in the inner ear that’s an organ that detects balance - but it’s also an ultrasonic hearing organ. This ultrasonic hearing organ is called a saccule. The saccule can detect ultrasonic sound, but only if it’s transmitted through the skin or through the bone, not through the air. When we swim with whales and dolphins and we think we are hearing their sounds some of the time we are actually hearing their ultrasonics through the saccule. The saccule is the main hearing organ for ultrasonic sound in whales and dolphins and it suggests that we may somehow be related to these creatures.”

Graeme: Is it currently available on the marketplace?

Patrick: It is. We’ve just developed our latest model, the Neurophone DSP. We have a website - neurophone.com - and it details all of the different models. The latest one is purely digital.

Graeme: You’ve previously invented several devices for use in agriculture including the Flanagan Oscillating Ion Generator, the Electrocatalytic Seed Stimulant and the Earth Resonance Generator. In our country, at least, we are in the midst of an exciting paradigm shift amongst farmers. There’s a huge change happening and we are at the forefront of it. I think that the timing is probably right for this kind of technology. Do you still make these devices?

Patrick: No, I don’t. I had to prioritise - I have hundreds of inventions. I had to focus on one thing and give up some of the others.

Graeme: Were those devices effective?

Patrick: They certainly were. All my devices are effective, but it would take a gigantic marketing organisation to market all of them. Then there is the massive manufacturing task... I don’t have that capability. I feel that my work with the negative hydrogen ion is far more important than anything else that I’ve ever done so it has all my focus at present.

Graeme: I agree that this seems like an extraordinary breakthrough. I thank you for giving us so much of your time. We will be in touch with regard to marketing some of your technology. See you in Australia sometime...

JERRY BRUNETTI

Interview recorded December 2002



American writer/consultant, **Jerry Brunetti**, is the founder and CEO of **Agri-Dynamics**, a company established in 1979, which specialises in sustainable stock health. He is also the brains trust behind **Earthworks**, a rapidly growing Pennsylvanian company which manufactures a range of biological fertilisers, including a compost tea system. 2003 should see the publication of three books by **Jerry Brunetti**, as he plays catch-up after several 'lost' years managing a major health problem. Jerry is a charismatic conference speaker who delights audiences with his effortless fusion of entertainment and information. Almost four years ago, he was diagnosed with a blood cancer called 'Non-Hodgkinson's Lymphoma' and was given just six months to live. That dismal diagnosis could theoretically only be improved by submitting to chemotherapy, but Jerry refused. He immediately embarked on an intensive investigation of non-toxic options and eventually developed a rigorous personal treatment program based on the regeneration of his immune system. Jerry's subsequent success has generated tremendous interest and he now finds himself giving presentations about human health as often as soil and animal health. Rosa and I spent several wonderfully relaxing days with Jerry in December of 2002 in his Pennsylvanian farmhouse. During that period, I spent an afternoon conducting a new interview which covered a variety of subjects but eventually focused on his findings in human health. In this interview, Jerry exposes a variety of nutrition myths and looks behind the veil, at the real causes of many of our problems in agriculture and human health.

Graeme: In the original interview we never really discussed soil health in relation to animal and human health - How important is this?

Jerry: Well, usually when I do animal health workshops I start out with the soils issue, because you can't grow the nutrient density in the forages, or in any human food for that matter, without a healthy, mineralised soil. You can't address sustainable health issues with people or animals if the food is grown in unbalanced, demineralised soils. Health cannot be managed with supplements alone. Foods are complete, nutrient-dense matrixes of all components - identifiable and unidentifiable. Some of the unidentifiable components simply can't be supplemented. We have to get these things from the soil. We need biological activity, mineral density and appropriate mineral ratios in the soil to ensure that our food is our medicine as it was intended to be.

Graeme: You are probably in a better position than most to evaluate the relative animal / human health benefits associated with various approaches towards soil nutrition. For example, how does the Albrecht approach compare to the conventional approach in terms of animal health response?

Jerry: Well, the conventional approach is pretty much predicated on yield, with little regard for the nutrient density which is required. In order to achieve the desired nutrient density in pasture, for example, you are looking for amino acids rather than just focusing on protein tests. The problem is that people don't actually check for protein, they just test for nitrogen as a reflection of protein (all protein contains around 16% nitrogen). They measure free nitrogen, rather than the amino acid quality present, so it is quite misleading. The second thing is that carbohydrates should be measured in the form of saccharides, because saccharides are a real reflection of mineral uptake. If the calcium is moving up into the plant, you are producing some interesting compounds, such as calcium pectates. In terms of rumen nutrition, calcium pectates provide a very beneficial, soluble, starch-like fibre without any of the detriment that starch produces in the rumen. Starch in the rumen produces toxic levels of acid, creating metabolic acidosis. Curiously enough, most lactating animals, like dairy cows, suffer premature death or are culled prematurely for the same reason that people develop chronic illness, that is, metabolic acidosis. That's a food issue. In humans, it's a case of too much refined carbohydrates. In animals, it's associated with supplementation of grain, because we are not producing enough nutrient density in the pastures. Energy should come from the sugars - the saccharides produced by plants, and the fatty acids - the esters - that are produced by plants. When we supplement with grain we don't get the mineral content. Starches are extremely devoid of minerals, while grasses are mineral-rich so, when you get your energy from grasses, you get the right kind of energy, coupled with amino acids and high levels of macro and micronutrients. This makes for the nutrient density it takes to create a healthy cell and to sustain longevity at the cellular level. It all starts with the soil. Humus and minerals allow biological activity to mobilise minerals from the soil into the plant, creating all of these complex and vital substances.

Graeme: But is the Albrecht approach more likely to create these desired conditions?

Jerry: Well, the proof of the pudding is in the eating. The NPK approach just doesn't do it. In the dairy industry the NPK approach produces high levels of blood urea nitrogen, and this is equally true of people consuming foods that are improperly fertilised. High levels of nitrogen in the blood are critically important health-wise. Ammonia is an extremely toxic material consuming a tremendous amount of energy. It wears out the liver and kidneys and it stimulates the growth of pathogens. It suppresses phagocytic activity in the system and it interferes with the oxygen-carrying capacity of the blood, triggering a whole cascade of problems.

Graeme: Are you talking about the injection of high levels of nitrate nitrogen?

Jerry: Yes, nitrates initially, but they ultimately convert to ammoniacal nitrogen in the bloodstream. You end up sponsoring premature aging and produce what they call 'delta cells'. When food is produced with the NPK / pesticide approach then you don't have the electrolytes, which are really trace minerals and macrominerals like calcium, magnesium, potassium and the trace elements, with alkalisng properties. If you don't have those electrolytes, you lose your buffering capacity within the cell and in the blood and, as a consequence, ammonia becomes the vehicle to buffer the body from acidosis.

Graeme: Can you explain the link between cellular pH and electrical activity at a cellular level and nutrition?

Jerry: It all boils down to regulating the interior and exterior pH of the cell so that you can create the right levels of negative and positive polarity within and outside the cell. The interior of the cell is acidic and positively charged and the exterior part of the cell is alkaline and negatively charged. It is this bipolar situation which generates electricity across the cellular membrane. It amounts to about 70 millivolts and that's what opens up the cell membrane to allow waste to get out, allowing nutrients to get in and respiration to occur. The creation of the correct electrical charge is all based on proper nutrition that you can only get from the soil up.

Graeme: How well do the energy approaches like biodynamics, radionics and the Reams system deliver in terms of providing what you term as 'proper nutrition'?

Jerry: The aim of these systems is to attract a vital force in the root zone or in the atmosphere surrounding the plant. This vital force supports the transfer of energy to plants via minerals. The minerals are really the physical manifestation. If you look at the Reams Biological Theory of Ionisation, they are claiming that it's not the chemical nature of the fertiliser that does the work, it is the energy that's released from achieving the proper ratio. People working with energy agriculture are dealing with the vital force that surrounds everything, and trying to engineer it in such a way that they can create a magnet for this vital force. This ensures maximum nutrient uptake of the right balance of minerals, which generates the energy to create complex substances that are critical for animal and human health. There is the same thing occurring in our bodies

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that's occurring in the soils. There is this similar relationship between calcium and anions. If they are in the proper balance and synchronised appropriately there is this similar release of energy.

Graeme: Are the mineral ratios for the soil from the Albrecht approach reflected in the human body?

Jerry: Very much so. If you look at pH, most people monitor soil pH and they have no idea about why their pH might be 'right' or 'wrong'. In the Albrecht model we get the ratios right and the pH takes care of itself. In the human body it's pretty much the same thing. If you try to alkalisise the body with buffers, rather than foods, you will find yourself in a never-ending battle, because what's not happening is the ionisation of minerals which ultimately alkalise. When you eat the right kinds and ratios of acid and

alkaline foods the pH takes care of itself. Interestingly, the ideal pH of the soil, the body fluids and the plant fluids are all pretty much the same - around 6.4. We know that pH, in all of these instances, is a monitor of being on target. We know that if we eat 75% alkaline foods and 25% acidic foods we have the ratio where pH is self-correcting.

Graeme: So the 75%-25% ratio is the critical one?

Jerry: There's a whole list of acid and alkaline foods. It's not to say that acid foods are necessarily unhealthy. There certainly are some foods that are acidic which I would avoid as they contribute to acidosis - the refined carbohydrates certainly fall into this category. There are also problems with grain products. Even the not-so-refined carbohydrates can create problems. We have to take precautions when eating grains because we've been around for a million years, but we've only been eating grains for about ten to twelve thousand of those years.

Graeme: Should we be looking towards the few grains that are alkaline-forming like spelt and millet?

Jerry: Well, there are certainly some grains that are much better than others. There are other issues with grains beyond the acid-forming issue - there are the phytates and phytic acid issues and also the issue of enzyme 'inhibitors'. In reality it is only the Avian species which is designed to eat grain and not get stressed from it. We are not designed to handle high levels of phytic acid and the enzyme inhibitors really do interfere with the uptake of other nutrients, as do the phytates - as nutritional anthropologists like Weston Price proved. The most successful consumption of grain has always been linked to techniques to compensate for these problems. These cultures soaked the grain before making a porridge, or they sprouted the grain to get rid of the phytates and enzyme inhibitors. This is also the gluten factor that creates allergies in many people. There are a few grains that don't have gluten problems including quinoa and amaranth. Oats and rice are also gluten-free. The point about grains is, if you're going to eat them, consider soaking or sprouting to remove some of the problems.

Graeme: I guess that goes for animal food as well. I've got a couple of other questions about soil and plant health. Compost tea is the flavour of the month in biological agriculture - How do you view the role of this material in terms of enhancing animal and human health?

Jerry: Well, a lot of it is the fact that diversity is a really important issue in holistic agriculture and it's one of the things that's missing on a lot of farms, including organic and ecological properties. Mono-cropping is still widely practised because people have become accustomed to comfortable specialisation - you're either a fruit farmer, a cattle farmer or a hay farmer. If you go into wild places the diversity is huge. There are a number of reasons for this. Number one is that each plant has its own ecological niche. The rhizosphere is very much a coral reef in itself. We have different microorganisms living symbiotically or synergistically with the root systems of all of these diverse plants. These thousands of different species of microbes all have their own attributes. They might fix nutrients, mobilise nutrients, protect the plant from fungal disease... The other ground rule is that diversity begets diversity - the more diversity you have, the more diversity shows up. Everything's ultimately a food for something else. If you create diversity on your farm, you will inevitably have more

microorganisms, more higher organisms, and more wildlife on your farm. The other side of the diversity issue is the nutrient density which shows up in various plants. Plants don't just produce proteins, carbohydrates and fats - they produce a lot of phytochemicals, many of which aren't even identifiable. There are certainly thousands of them in each species. This is where we can see food as a medicine. We typically look at nutrition in terms of vitamins, minerals, proteins, carbohydrates and fats and we stop there. We don't look at these other things which might be made up of these basic components but have very specific functions. We are now finding, for example, that a lot of the pigments in various fruits - the berries, for example, are loaded with antioxidant compounds like lycopene, ellagic acid, astaxanthins and anthocyanidins and all these

“The most successful consumption of grain has always been linked to techniques to compensate for these problems. These cultures soaked the grain before making a porridge, or they sprouted the grain to get rid of the phytates and enzyme inhibitors. This is also the gluten factor that creates allergies in many people. There are a few grains that don't have gluten problems including quinoa and amaranth. Oats and rice are also gluten-free. The point about grains is, if you're going to eat them, consider soaking or sprouting to remove some of the problems.”

vast, newly-discovered compounds that are extremely important for feeding the immune system. The diversity issue is so important. Compost tea allows growers to compensate to some extent for this lack of diversity. We are multiplying diversity in a breeding tank and applying it to a diversity-starved soil or plant. Golf courses are a prime monoculture example. You have a classic case of monoculture desert here - you have a single species of grass, in most cases. If you take a compost blend containing a variety of different compost sources, like those produced from dairy and chicken farms, forest litter and mushroom compost, then you have an inoculum with huge diversity applied, very inexpensively, to great effect. We are compensating for the lack of biodiversity in these situations.

Graeme: The other thing we push about compost teas relates to the capacity of this tool to gradually help overcome what I call 'the attrition factor'. If you have had your soil life analysed and you have very low levels of beneficial microorganisms, then there is a reason for that deficit and, in all likelihood, the original root cause is still a problem. It might be a poor calcium to magnesium ratio which limits the availability of all-important oxygen, or it might be a copper excess with ongoing consequences for beneficial fungi in the soil. Most often it will be related to toxic chemical residues in the soil. If you go into these situations with a dry compost application, there is no guarantee of success. In fact, it is quite likely that your single inoculation of beneficials will be neutralised by the same conditions that created the original microbial deficit. By contrast, if you come in with weekly applications of a good compost tea, then you might lose 95% of the species in that first application, but next week you're back spending another \$4 per hectare and introducing another 50 litres per hectare with trillions of organisms. This time you might lose 90%, but the remaining 10% is going to work at detoxifying this hostile environment. Next week you're back again and so on...

By the end of the season you may have spent \$50 per hectare, but it's odds on that you have now restored a functional food web. I can't think of a better way to spend \$50! You've got a choice of doing this or doing nothing.

Jerry: Right! That's a really good point. If you're going to do compost tea it has to be a frequent application for all of those reasons.

Graeme: We find it a good practice to combine a single dry compost application with regular compost tea applications.

Jerry: Yes, I agree. At the very least, the compost gives you some kind of ongoing food source for the tea.

Graeme: We usually include things like Aloe Vera, kelp and / or humic acid with the teas to ensure that they have food.

Jerry: Yes, that's the way to do it.

Graeme: We often find that specialised approaches are developed and validated within a specific set of environmental conditions. While they may have proven winners in those conditions, there is no guarantee that this success can be replicated. Albrecht, for example, never worked with 50 and 60 CEC soils. When you've got 10,000 ppm of calcium in a soil, whether you have 58% or 68% base saturation, calcium is not so critical - you have such a huge base. What do you feel about this issue?

Jerry: Yes, I think you have a good point. If you have a 30, 40 or 50 CEC soil, it is often economically impossible to play the Albrecht numbers game. In my experience, these heavy soils are acidic and very thirsty for calcium. You can get a good response from calcium carbonate in these conditions, with quite small applications. The acidic soil promotes the calcium release and the calcium-hungry plants respond immediately. Conversely, a heavy soil that is saturated with calcium usually has a high pH and applied calcium is not so available. Nature is kind of cooperating in heavy acid soils - you can apply calcium in small amounts frequently, with good results. The evidence of your success is, of course, with leaf analysis. Conversely, in a soil heavily saturated with minerals, you often find that the uptake is poor when you check it with a tissue test. Biological activity is often poor and mineral lockups are common in these soils.

Graeme: The common thing with a heavy soil in Australia is not acidity but alkalinity. We have 50 CEC soils with pHs of 8.2 and that pH is generally based on magnesium or sodium. Often there is a completely inverted calcium to magnesium ratio. The issue in these soils, particularly if you are trying to adopt a more biological approach, is that you have no oxygen. They are tight and closed and, as all of the beneficials are highly aerobic, this is a problem. You can take biological products that have worked wonders in every other soil, and see nothing. It comes back to the 'bridge' - the microbes are the bridge between the soil and the plant, and they won't function in anaerobic conditions. The other thing that has come through after years of looking at leaf analyses in relation to soil problems is this - in heavier soils, where the Albrecht numbers game can't be played, we have seen that balance is far more important than numbers. This is a sentiment echoed by Bruce Tainio in a recent interview. We find, for example that, if phosphate levels are just 30 ppm and it is not financially feasible to lift that element to the ideal 50-70 ppm, then we will increase it to 35 ppm but we will ensure that we maintain the ideal phosphate to zinc ratio of 10 to 1. In that instance, we

will balance zinc to 3.5 ppm - neither element is at their Albrecht ideal but the system still works well if this balance is achieved. The ratios, or balance, is more important than the numbers game. This is a reassuring thing for those growers who thought that soil balancing was out of their league due to tight budgets.

Jerry: That's a good point. I'm used to dealing with acidic soils, but we have dealt with some calcitic sands with a high CEC around 30 or 40. They are extremely saturated with calcium and the pHs are high. There's no magnesium, no potassium and sodium is elevated. Often these soils also have high sulfur. In this case, the yield-limiting factor becomes oxygen. This is something that Don Schriefer felt very strongly about. The first thing you do is subsoiling or perhaps tilling. We have subsoiled on several occasions without spending a dime on fertilisers and had tremendous results. As you mentioned, nothing works without oxygen. Don Schriefer was absolutely right. He used to talk, in order of priority, about air, water, decay (which is basically recycling by microbes) and, last of all, came fertility from fertiliser. Another acronym which farmers can remember is A WOMB - which stands for Air, Water, Organic matter, Minerals and Biology.

Graeme: I know it's a bit of a chicken and egg scenario, but which do you think comes first in order of importance - mineral balance or biological balance? The biodynamics people would argue that there are huge mineral reserves in the soil and all that's required is the right conditions for release of those reserves. The jury is still out as far as I'm concerned. What are your feelings?

Jerry: Well, Newman Turner was an example of this. He was a British dairy farmer in England in the 50s and he wrote the book 'Fertility Pastures'. He believed in general fertility, but he believed that his pastures had enough base fertility, even though his soil tests weren't necessarily showing it all. However, once he got on a real good, biologically-based grassland management system with his cows, the mineral fertility just kept on getting better and better and better, in spite of the fact that university agents were strongly advising him that he needed to apply superphosphate, nitrogen, lime and potassium. On his farm, the animals really became the biological catalysts with their hoof action, manure and urine deposits and, of course, their exudates out of their noses.

Graeme: I haven't heard anything about nasal exudates as biostimulants before...

Jerry: Yes, there was a recent article in Acres USA about a Minnesota dairy farmer who suspected that the saliva from cattle contained excretions that acted as plant biostimulants. They had it tested - they made up a solution from the nose excretions and saliva and sprayed greenhouse plants. Sure enough, it acted as a biostimulant. So we now know that grazing animals just feeding on the pasture can act as biostimulants.

Graeme: Returning to Newman Turner's philosophy - Are you suggesting that farmers should ignore their soil tests in some cases?

Jerry: I think farmers need to realise that soil samples are little more than road maps. They don't give you a true representation of everything about that soil. It's just a one-dimensional guide so you can hit a target. If you do some other things, like measuring biology and checking nutrient uptake with tissue tests, and you look at these things in relation to each other, then you start getting a more complete picture of the situation. If you have livestock, then the real evidence is how the animals are performing - especially the reproduction. Reproduction is an incredibly strong indicator of

whether or not the mineral balance is incorrect. If the balance is out, there will always be problems. Reproduction is a major problem in the livestock industry.

Graeme: Just returning to the ‘which came first’ or ‘which is more important’ discussion regarding mineralisation vs. biology - I’ve argued for years that, if you have 1 ppm of zinc and you need 5 ppm, then you can’t get the required 4 ppm from out of thin air. You need to apply zinc. However, sometimes I see something extraordinary that suggests that maintenance of balance can be achieved very effectively in some soils just using biology. Recently, I visited an organic cereal grower on the Darling Downs in Queensland. This area features soil with inherently good base fertility, but nevertheless there are huge amounts of commercial fertiliser sold in the area. This grower had balanced his soils twenty-two years previously and had never used any fertiliser since. You could bury your arm up to your elbow in his beautiful friable soil and it smelt so good you could almost eat the stuff! He looked after his biology - he fed the soil with green manure crops and practised crop rotations. He had won top yielding crop in his area several times, but despite all of the nutrients removed with these heavy crops, he had never had to top up. One of the reasons may have been his earthworms - he had really good counts of earthworms and this is one strong link to ongoing fertility. They have their calciferous glands adding calcium to the soil and analysis of castings usually reveals substantial nutrient increases.

Jerry: Actually, the European earthworm has been a major contributor to ongoing fertility in this country. We have a native earthworm but it is not very aggressive. Remember we didn’t need vigorous earthworm activity so much back when we had total forest cover. New England is a good example - it was one of the earliest areas to be settled. It was a stony area with the only fertile areas in the valleys and the riverbeds. Earthworms were imported in pot plants and as eggs in animals’ hooves. It was the spread of European earthworms throughout New England that allowed this area to be a much more fertile place than when it was first discovered. Then they spread west. We would have a lot more agricultural problems now if not for the European earthworm.

Graeme: Just talking soil for a little longer before moving on to human health - what inputs and practices have you found most effective in your soil work?

Jerry: Well, like most people in our work, we focus on calcium and then we try to balance the cations. Stock farmers in our area all have problems with excess potassium so, even if they have sufficient calcium, the potassium excess limits calcium uptake. Part of this problem is related to heavily stocked small farms. The large amount of manure produced is very rich in both potassium and phosphate, and yet these farmers will often also haul in chicken manure because it is so cheap - so we have very high levels of phosphate and potassium. Some of these soils might have 70% calcium base saturation but very low organic matter so the calcium uptake is poor. Initially we try to get them to reduce inputs - compost the manure or export it off farm if they don’t need it. It’s the same deal with phosphate. Where there are often zinc issues due to the phosphate excess, we work at trying to get the biology up on the farms. We try to get them farming grain rather than corn in some paddocks. We try to get them off using slurry. Slurry is anaerobic - these farms already have tight soils. Subsoiling is often a good idea to build oxygen levels in the soil and to increase root mass. If you can get your root masses down another foot, you’ve actually bought a lot of acreage in terms of the benefits of subsoiling, and you also have a lot more drought resistance.

Graeme: You don't see a problem in building biology when that same biology is responsible for release of both phosphorous and potassium, which are already in excess?

Jerry: No, there is such a strong link with calcium and biology it became all-important to get that calcium moving. Often we suggest foliar feeding as well to get some calcium into the plant.

Graeme: What about boron? We usually find that pasture farmers, with the exception of lucerne growers, tend to ignore boron and yet it plays such a role in calcium uptake.

Jerry: Yes, definitely. We like to foliar boron because it is cost effective and it's taken up really well through the leaf. The potassium excess in these soils causes a boron deficit and boron already has a problem staying put in low humus soils to begin with. Boron is a really important thing. We also add some trace elements into our foliar programs.

Graeme: Calcium is bombarded on all fronts in these soils. It is suppressed by high potassium, limited by low boron and low organic matter and, if your soils are anything like ours, there will be a lack of the fungi that play a major role in calcium availability.

Jerry: Yes, and there is also the high phosphate. As it's chemically unstable it not only suppresses zinc but it also takes calcium out of the solution. Magnesium uptake is also suppressed in the presence of high phosphorus.

Graeme: I could happily talk soils with you all day but I'd better move along. Since the original interview you've been forced to confront a major personal health crisis. How has this impacted on your life?

Jerry: From a professional perspective, it made me realise how important it is to have the whole picture. The more fragmented, the more specialised we become in terms of problem solving, the more problems we create and the less we solve. I have a need to address my life-threatening illness with alternative techniques, but the caveat there is that the treatment of symptoms can pre-empt the search for the ultimate cause of this illness. If we see ourselves as manifestations of this organism that's called Earth, and we, as a manifestation, are developing absolutely outrageous levels of this illness called cancer, the only thing this can mean is that the organism called Earth has cancer. If we don't address this from humanity's perspective, we can never escape from the abyss of this horrid disease. It's not just bad luck, bad lifestyle or genetics. It's a fact that the whole planet is sick on multiple levels, including the environment, including our disregard for the sacredness of food, including the fact that we are so disconnected from nature. We are so enamoured with the problem-solving capacity of technology - even when the problem is directly or indirectly coming from our own hands. In this regard, it made me realise that you can't get too holistic - there's never an end to trying to reconcile the holistic questions, because the more you start investigating things, the more you realise that you have to constantly re-ask questions that you've answered before. You begin to recognise just how connected everything truly is. That's the hard one, because it asks you to be much more spiritually sensitive, as well as scientifically compatible with the problems at hand, so in that regard it humbled me, but it also enlightened me, and it also really activated me. I've become a whole lot more compassionate about what needs to be done - scientifically, politically, spiritually, community-wise and so forth.

Graeme: So you would almost call your health problem a good thing?

Jerry: In a lot of ways it's been a real blessing, although a lot of hardships have presented themselves. It slowed my thought processes down and I realised I was as much a reductionist as the next person, except that I was using natural modalities to address very complex problems - when, in fact, the problem is knowing the right questions to ask. Ultimately, the question is a global one - How are we going to create a place that's going to be suitable for our own posterity, generations from now? That's the pressing

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question we need to ask.

Graeme: From a personal perspective, it is inevitable that your extensive research and understanding of treatment options will lead to a demand for your services as an unofficial cancer consultant. How do you feel about offering this advice?

Jerry: I feel more than willing, but at the same time I only have my own story to tell. I can suggest that my story can be useful to everyone, to the extent that it creates a forum. People who are asking me questions can then go back in their own lives and then start asking their questions and creating their own stories. The good news is that there is a huge amount of resources out there. Then it comes down to honing one's discernment skills - this might include intuition, it might include faith. It includes the ability to trust yourself and to love yourself. It asks you to do things you never really thought much about. They are often things that everyone should be doing anyway and they are not necessarily easy things to do, but they're only difficult because they are so unfamiliar in our culture.

Graeme: And they're difficult because the stakes are so bloody high if you're wrong! If your intuition fails, there are no second chances.

Jerry: That's true, but ultimately you take an approach where you intellectually or empirically gather information. What makes intellectual sense might be what appeals to you. There are people out there who are going to be very comfortable with chemotherapy and radiation because it fits their paradigm.

Graeme: But, realistically, chemotherapy and radiation are just single things. They might be unpleasant but it's just as easy to go with the flow and accept the recognised approach. What you've done is such a multi-pronged approach - you've covered so many bases, if one thing fails you have several back-ups, but there is a lot more effort involved in your program.

Jerry: It's the old saying, *“If you throw enough mud at the wall, some of it is bound to stick”*, but there's a limit to that. I did a lot of different things but I have substituted several things as I found more valuable options. I really had to approach it the same way as

a farm problem. You can go onto a farm and say “*Okay, let’s just do everything*”. You throw a lot of lime on the ground, you foliar feed the crops - you might even insure with a few pesticides. Maybe something will happen, but in all likelihood you won’t be able to keep up this kind of a program. It’s an economic issue, a time issue and it’s also a hit and miss issue - we usually have to narrow things down. Which common thread do we always have to come back to on the farm? It was the same sort of common thread I came back to in a sick body - I’ve got to deal with my biological terrain - the inner landscape of my body. I’ve got to deal with issues like mineralisation. I have to consider detoxification. We detoxify farms with the soil food web and humus and minerals that detoxify soil. You have to mineralise the landscape so that you can build cells again, so you can feed the immune system. You have to deal with the pH issue because the acid/alkaline issue is really a physics issue. It’s really positive and negative charges which have to be in the right balance.

Graeme: The soil is really quite a good analogy for human health, isn’t it?

Jerry: Yes, it’s the inner landscape. It’s the soil of the body that really begins to make sense. To me that makes sense because I’ve had thirty years of experience - slowly learning the hard way of trial and error, dealing with mentors and other colleagues who are verifying what works. If I’m going to honestly acknowledge myself as an organism of this planet, which runs under these fundamental rules that good scientists have discovered, then I have to acknowledge that the same rules might apply to me. How do you apply these rules? You do it with diet, you do it with detoxing, you do it with supplementation - the dynamic is very similar to a farm scenario.

Graeme: Is there any risk that your involvement with so many others’ battles with cancer might somehow sap the energy required to continue your own fight?

Jerry: No, because part of what I live for is to fight the good fight. I enjoy being part of political change. This disease is as much a political issue as it is a scientific issue. I don’t think there’s any debate about the science - I think the science stands on its own merits. People have been proving since the early part of last century that nature works in these very measurable and mostly predictable ways in animals, plants, soils and people. It has been verified by numerous scientific giants like William Albrecht, Royal Lee, Weston Price, Francis Pottinger and Ira Allison.

Graeme: I’m not familiar with Ira Allison.

Jerry: Ira Allison was a medical doctor who was referred to as the ‘Miracle of the Ozarks’. Back in the 50s he cured 356 patients of so-called incurable undulant fever, merely with trace mineral supplementation. There wasn’t a single relapse after three years. These guys were showing that the so-called contagious diseases like tuberculosis, brucellosis and hoof and mouth disease were simply not contagious if people and animals were properly nourished. That kind of information is very powerful. Albrecht was demonstrating that, and Sir Albert Howard showed the same thing with his work in Kenya with hoof and mouth diseases. These virulent plagues don’t occur in mineralised animals, so I know that’s one of the things I need to focus on for myself and the others I work with.

Graeme: Then you have to focus on the uptake of those minerals into the body and, just like the soil, this function is particularly dependent on biology.

Jerry: Yes, you're correct, you have to have good digestion. Good digestion involves the right ratio of acidic and alkaline foods in the diet. It means that you have to have enzyme-rich foods so you're not taxing the body's digestive enzymes. It means sometimes supplementing with digestive enzymes.

Graeme: How does the city person, for example, access these enzymes?

Jerry: Well, if you're living in the city, one of the things you can do is to juice vegetables and fruit - there is a lot of enzyme activity in fresh juices. The juice cocktail I make is designed as an enzyme supplement.

Graeme: What does your cocktail include?

Jerry: I make a juice consisting of ginger, red beet, celery and carrot and then I grow cereal grasses that are also included. These include a mixture of rye, wheat, barley and oats, which are harvested as young plants, as a grass. These young plants have none of the issues with phytates and enzyme inhibitors, in fact they are a tremendous source of enzymes, minerals and chlorophyll.

Graeme: And these young grasses have higher levels of enzymes than other plants?

Jerry: Yes, they do and they're extremely alkalising - they are one of the most alkalising of all foods, so I throw a few ounces of them in the mix. If I'm feeling lazy and don't feel like juicing them separately, then I'll use a combination of dehydrated green powders... one's called 'Pure Synergy' and the other's called 'Perfect Food'.

Graeme: So the wheatgrass can be juiced along with the other vegetables?

Jerry: No, it requires a special juicer to avoid oxidation of the enzymes. Often I'll also add some powdered enzymes into my cocktails, which are high in protease. I use protease because I want to get it into the blood - it is a very good antimicrobial, decontaminating substance. So this juice not only provides me with a lot of enzymes, but it also provides me with raw materials to detoxify.

Graeme: Digestion has become a huge issue with most of us and enzymes are the link.

Jerry: Right. As digestion goes, so goes your health. Interestingly, one of the first things you look at in a livestock operation is the digestion of those animals. How do you determine that? You look at the manure. You check the manure for particular size, colour, odour and pH. You find that as the digestion starts to fail, then the problems start to occur.

Graeme: And it's exactly the same thing in agriculture - when digestive microbes in the soil have been compromised, the problems begin.

Jerry: When digestion is working, a number of things happen. First of all, the gut is really the second brain - the 'body brain'. The cells that line the small intestine communicate with the rest of the body. As you start digesting material, all this information goes up to the head brain and the body starts getting ready for whatever. Actually, it's a great way to educate the body as to what it needs to do, how it needs to defend itself from antigens and allergens, or whatever. It's the gut that is the first and foremost computer, deciphering what's coming in and how to deal with various inputs. If you have a gut that is deteriorating then communication starts to deteriorate and, as a consequence

of that, the immune system is not getting adequate amounts of information. That's one of the big problems with most people who are sick. It's not really an immune deficiency relative to the number of immune cells floating around in the lymphatic fluids, but rather it's the ability of those immune cells to talk to one another.

Graeme: So it's a communication problem?

Jerry: Yes, it's a huge communication problem, and that comes from a variety of things - it comes from poor nutrition, toxins, radiation and stress. It can also come from various issues that have attacked the immune cells. Of course, we know now that the viral or bacterial infections that are showing up are, to some extent, linked to poor nutrition. These microorganisms are opportunistic. Once again, the same thing occurs with plants. Albrecht was right when he said that insects and disease are not a cause of crop failure, but rather a symptom of a crop that's already starting to fail. That's exactly the case with animals and humans.

Graeme: I'd like to further pursue your findings in relation to pH and immune function. We have repeatedly confirmed Bruce Tainio's findings in relation to the significance of plant sap pH. In fact, we have yet to find a single exception to the concept of acidity promoting disease. Our research scientists have never encountered a plant that has become diseased when the sap pH is 6.4 (the ideal) or above. Acidic plants are un-

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doubtedly more prone to disease. I understand that a pH of 6.4 is also the ideal in human saliva and urine. Is this an example of the maxim 'a cell is a cell is a cell'?

Jerry: I would agree with that maxim for the most part. Biological terrain measurements are a little more involved than just pH, but pH is a very easy, very quick and comprehensive indicator of whether health is improving or failing. The reason for this, once again, is related to the electrical conductivity between the interior and the exterior of the cell. When the pH of the saliva is 6.4 in the morning and rises during the day, it reflects the pH of bodily fluids surrounding the cell, including lymphatic cells. This fluid will eventually mirror the pH of the blood, which is 7.4. Blood pH doesn't vary during the day. The interior of the cell tends to be slightly acidic while the exterior is slightly alkaline, so we have a positive and negative battery generating 70 millivolts. This electricity opens and closes the cell membrane, to allow electrolytes to get into the cell and waste to get out, and it allows for cell repair. When pH drops on the outside of the cell, the inside of the cell must also drop if the cell membrane is to maintain that same differential. Now you're starting to get into a very acidic environment - to the point that the cell prematurely dies because it can't maintain itself in that harsh, acidic environment.

Graeme: So when we see book titles like ‘Alkalize or Die’ it’s not an oversell - it really is that important!

Jerry: Yes, it definitely is that important. It’s a real fundamental, just like soils. In the work that you and I do, we understand that if we correct mineral balance in the soil then pH will be self-correcting - well, the same applies with this. I try to eat alkaline-rich foods that are high in the alkalising minerals like calcium, magnesium and potassium. Then I make sure I consume the catalysts required to actually get calcium into the blood. One of the most important calcium catalysts is Vitamin D. Vitamin D is the ioniser, and you have a really hard time getting calcium to move from the gut into the bloodstream unless Vitamin D is present. It plants itself into the intestinal wall at sites called Vitamin D receptors or VDRs. Vitamin D is a large, long molecule with a double-charged oxygen molecule at the end, which attracts the double positively-charged

“Albrecht was right when he said that insects and disease are not a cause of crop failure, but rather a symptom of a crop that’s already starting to fail. That’s exactly the case with animals and humans.”

calcium ion. It drags it right into the bloodstream. Then there are fatty acids, which tend to drag calcium to the cell sites - it’s so important to have these fats for good calcium absorption.

Graeme: So this is part of the fat connection?

Jerry: Yes, it is. It’s the saturated fats, the animal fats, that are really rich in Vitamin D, rather than vegetable fats. In fact, you can’t get Vitamin D from vegetable fats - it only comes from animal fats and sunlight.

Graeme: So we see a major flaw in the omnipresent propaganda relating to the dangers of saturated fats?

Jerry: Yes, it’s totally contrary. In fact, if anything, vegetable fats are the most harmful. Even in the studies that have suggested that animal fats are the causes of cardiovascular disease and cancers, the plaque discovered on the linings of arterial walls is mostly polyunsaturated fats, which come from vegetable oils. It’s the trans-fatty acids that are really the issue, rather than the cholesterol levels.

Graeme: It’s highly unlikely that we were ever designed to eat the amount of concentrated vegetable oil found in a tub of margarine.

Jerry: That’s right. Up until recently, we were never even capable of extracting the oils out of grains, because the grains are so hard. The only thing we ever extracted oil from was soft fruits, like olives, which were easy to press. You need a lot of heat and a lot of high pressure to extract oils from grains. This means that these oils are highly oxidised, and there’s virtually nothing more carcinogenic than peroxidised lipids. The body is not accustomed to this alien fat. We evolved eating fats from animals and fish and very little fat from vegetables. The Weston Price and the Price- Pottinger people are pretty much right on the mark - people like Mary Enig and Sally Fallon.

Graeme: I’m not familiar with Mary Enig.

Jerry: She wrote a book called 'Know Your Fats'. She's a PhD and she's affiliated with the Weston Price and Price-Pottinger folks.

Graeme: So the whole argument about the link between cholesterol and heart disease is incorrect?

Jerry: Yes, it is. It's total bunk - it's complete myth.

Graeme: Well, what are the major contributors to heart disease?

Jerry: Well, the major contributors relate to free radical damage linked to vegetable fats and other toxins in our environment that have caused lesions on the lining of the arteries. Then we compound this with the inadequate levels of antioxidants in our diets, including trace minerals like selenium - there are huge trace mineral deficiencies. Naturally-occurring, fat-soluble vitamins like Vitamin A and Vitamin E are often ignored. Fruits and vegetables contain a wealth of compounds, as I mentioned earlier. I'm not promoting a carnivorous diet, but I think people who are vegans are really walking on thin ice.

Graeme: What about CLAs? Where do they fit into the picture?

Jerry: Conjugated linoleic acids (CLAs) are a real key. What happens is that fatty acids in plants, which are eaten by a ruminant, become biohydrogenated. This is a good kind of hydrogenation, done with microbes in the rumen. They convert linoleic and linolenic fatty acids in the plants into conjugated linoleic acid.

Graeme: Is this the key to the importance of pasture feeding vs grain feeding?

Jerry: A grain-fed diet need only contain 15% grain and you have reduced CLA levels considerably. A grass-fed animal has between 500 to 600% more CLAs than an animal supplemented with grain.

Graeme: What's so important about CLA?

Jerry: It's extremely important for the immune system. It has an anti-carcinogenic effect; it burns fat; it builds lean muscle mass and it's strongly linked to longevity.

Graeme: Shouldn't cattle growers who grass-feed from balanced soils be pushing the many benefits of enhanced CLA? Wouldn't it be a major marketing advantage?

Jerry: Yes, they should be. The studies are compelling - there are over two hundred different studies on CLA showing the benefits to human health. It's very hard to find in the diet. Basically it only comes from grass-fed ruminants.

Graeme: So vegans will never access this valuable material?

Jerry: Yes, and the other things vegans miss is an animal source of Vitamin A. They say they get it from their carrots but they're really getting betacarotene, which must then be converted to retinol (Vitamin A). This conversion is dependent upon enzymes which most of us are lacking. Retinol comes from butter, cream, cod liver oil or other fish oils. It's such a powerful antioxidant - it simply must be in the diet. Growers who are growing nutrient-dense foods that are free of toxic residues should be emphasising to their clients that food is a medicine. Truly, the best medicines are foods because there is nothing more complex or synergistic than a food. A supplement, at best, is an isolate of some kind. Organics is largely sold as chemical-free but it's not necessarily

the most nutrient-dense. On a lot of occasions, foods grown with conventional fertilisers have more nutrients.

Graeme: Yes, it's what Gary Zimmer calls 'organic by neglect'. He believes that organics should be tied more closely to mineralisation. In fact, he believes that it would often be of more value to enforce the need for mineralisation than to enforce petty restrictions. The other positive side-effect of growers, organic or otherwise, producing nutrient-dense food is that they very soon begin to understand the link between nutrition and disease and pest pressure.

Jerry: As consumers learn about the link between nutrient density and taste, then they will find it very hard to accept sub-standard food.

Graeme: Well, we seem to be in the midst of some kind of revolution because the supermarkets are beginning to demand quality above all else. Sometimes it's recognition of a demand for old world flavour from their clients, but I suspect that most times it is more selfish. They want produce with shelf-life because then there is far less waste.

Jerry: Yes, it's a win-win that foods that are most nutritious are also the most practical to store from a merchant's perspective. I agree that a change is beginning, but only because what's bad is getting worse. Forget the ethics, the bottom line is always the economics. Change becomes a case of necessity. It's very much like the upcoming healthcare crisis - as the baby boomers hit sixty, you will see an amazing crisis in degenerative illnesses. These are obviously already raging, but far worse is to come. In the next ten years, when we discover how unaffordable disease management can be, it will be time to make other choices. We must become proactive and, ultimately, soil health is the root cause of the nutrition issue. The cost of good food is insignificant in comparison to the cost of cancer management.

Graeme: I have a friend who has a large organic food shop. He has suggested that over 60% of his clients have been sent to him because they have cancer. If we're talking about being proactive, rather than reactive, why the hell would you wait? For a few extra dollars a week you've bought yourself an insurance policy.

Jerry: Yes, I agree. Cancer is a slow brewing illness - it's not like a virus - it has a long history. We have to wrap our brains around some scary statistics. There have been 75,000 new chemicals released into the environment since World War II and most of them are unregulated. It's unfathomable how much damage we are doing to the sixty trillion cells we are walking around as.

Graeme: That's before we even begin to contemplate the cocktail effect. There are billions of possible combinations and it would be foolish not to assume that some of them are going to be problems.

Jerry: If you know that good synergy exists, then obviously there is at least as much potential for bad synergy.

Graeme: I feel that a proactive approach towards health should automatically include an appreciation that we all have issues with toxicities - it's inevitable! The catchphrase for modern health management should be 'personal detoxification'. What sort of techniques did you employ to get rid of your toxins as part of your own cancer-fighting game plan?

Jerry: Well, I addressed the food issues relative to acidity and alkalinity, then I set about decontaminating myself. A urine analysis revealed elevated mercury levels - I used a chelating compound called DMPS. It's injected into the body and then urine is collected for 24 to 48 hours and analysed for heavy metals. My mercury excess could only really have come from my amalgam fillings, so I had them carefully removed. I also realised that, as a forty-eight-year-old man living in a toxic, industrialised society,

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who had just been diagnosed with cancer, there was every likelihood that I had some detoxifying to do, so I adopted a decontamination protocol, the centrepiece of which was far infrared sauna.

Graeme: I was intending to ask you about this technology. It sounds like it is essential equipment for anyone planning a proactive approach towards their health management - How does it differ from a conventional sauna?

Jerry: It's a very good way to dump toxins, including metals. Frankly, I agree that it would be advisable for anyone with a serious illness to invest in one of these. I was doing this once a week for four months and now I go to a day spa once a month, but I'm seriously considering buying one of these units.

Graeme: Are they expensive?

Jerry: Well, you can buy a single person unit for around US\$2000 or a three-person unit for just over US\$3000. The benefit with these machines relates to their capacity to raise core body temperatures up to the desired 103°F. The difference between regular saunas and far infrared relates to wavelength. The far infrared (FIR) has a different wavelength. The regular saunas are convection heat - the resonance of the far infrared ray penetrates deeper, and the resonance of the wave manipulates the cell to release more burden, more toxin. You can get the core body temperature up higher with FIR than with convection heat. FIR can do more to core body temperature at 160°F than a convection sauna can do at 190°F, so you are much less uncomfortable with the heat.

Graeme: The aim seems to be to generate the equivalent of a state of fever - fever is the body's detoxifier during illness.

Jerry: Yes, at 103°F the immune system becomes much more aggressive. Cancer cells start to die. Toxins begin to release very efficiently. In all of my research into cancer recovery, it seems like hyperthermia has a big role to play.

Graeme: I'm getting one of those machines! I understand that you have also been researching the potential of hyper-immune milk - What is the story behind this approach?

Jerry: Merck patented a technique in the 1940s which involved the manufacture of sera by hyper-immunising cattle and horses, then extracting milk or blood to be used as sera for a variety of illnesses. In my case I found, through blood tests, that I was harbouring a number of pathogens, including cytomegalovirus; human herpes virus nos 6,7 and 8 and Epstein-Barr Virus. I have been asymptomatic with these but they have been present in my blood. Many people harbour these sorts of things. If something is thrown out of balance, these dormant viruses begin attacking the B lymphocytes - the B cells. The B cells are the immune cells that produce the immunoglobulins, or the antibodies. One of the reasons why I contracted cancer was due to the failure of my immune system. I appeared to have little resistance to any opportunistic pathogen - virus or bacteria - in the time leading up to my diagnosis.

Graeme: How is your immune system performing now?

Jerry: I still haven't achieved the luxury numbers I'm chasing, but I'm on my way. There has been a huge improvement since I started these various protocols.

Graeme: Just returning to the acidity issue again, as it seems so important - What are the principal causes of acidity?

Jerry: A few things are involved - one of them is a lack of alkalising minerals. Just like the majority of plants, most of us are lacking calcium. A lack of Vitamin D is second, as calcium won't perform without it. Foods that demineralise are also major culprits, and sugar is the big problem here as it tends to leach out alkalising minerals. Refined sugar has become such a huge part of the American diet. Acidifying foods are also a problem and, once again, sugar is a prime culprit. The other major acidifier is stress, and there's no shortage of that in our modern society. Stress also slows down digestion, absorption and elimination, so toxic metabolites like ammonia start to increase. Uric acid levels start to increase because you're not really metabolising protein.

Graeme: The other issue, I guess, relates to the stabilisation of food. Virtually all of the processed foods on the supermarket shelves involve acidic stabilisers, from ascorbic acid to phosphoric acid. I doubt that we were ever designed to handle these kinds of acid intakes. A can of coke, for example, has massive sugar levels, combined with phosphoric acid stabilisers. It's a double whammy from an acidifying point of view.

Jerry: Yes, the extra phosphoric acid in soft drinks actually knocks out the calcium to phosphorous ratio in the blood. Then the blood will go acidic so it starts demineralising the bone to produce a buffer, then we have problems with osteoporosis. The same thing happens in cows. They often have calcium-related metabolic disorders because of lactic acid-induced acidosis, from eating too much grain.

Graeme: Sugar is not the only issue from this perspective. We also have white flour and pasta which form a large part of many diets.

Jerry: Yes, all refined carbohydrates are a problem. Refined sugar is the worst though, because it's such an addictive substance and it's so demineralised. Now we've got soft drinks sweetened with high-fructose corn sugar, which is even worse. This

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material bypasses mechanisms in the brain which tell the body that it is satiated with sugar, and consequently we consume a heck of a lot more than we ever should.

Graeme: I guess the manufacturers are using this brain-bypassing feature to sell more drink.

Jerry: There's no doubt of it. The soft drink bottles just keep getting bigger. Now we have half litre and one litre bottles for a single serve. Billions of gallons of these drinks are consumed in this country - they are a liability to health management.

Graeme: Are consumers better off drinking diet drinks, or is the aspartame just as bad?

Jerry: Aspartame is a neurotoxin. Some of the early FDA work showed that aspartame induced grand mal seizures in experimental primates. This research should never have been overlooked. Aspartame is also capable of converting to formaldehyde and, ultimately to formic acid at high temperatures. There are some suggestions that the Desert Storm GIs, who were consuming huge amounts of soft drinks that were cooking in the desert sun, were getting compounds that were no longer aspartame. There is a suspicion that this may have contributed to some of the problems they came home with. There were also vaccination issues with these guys.

Graeme: In the soil, we regard calcium as the king of nutrients because it is the 'trucker of all minerals'. I recently watched some videos about coral calcium and they really emphasised, or probably overplayed, the critical role of calcium in human

"Aspartame is a neurotoxin. Some of the early FDA work showed that aspartame induced grand mal seizures in experimental primates. This research should never have been overlooked. Aspartame is also capable of converting to formaldehyde and, ultimately to formic acid at high temperatures. There are some suggestions that the Desert Storm GIs, who were consuming huge amounts of soft drinks that were cooking in the desert sun, were getting compounds that were no longer aspartame. There is a suspicion that this may have contributed to some of the problems they came home with. There were also vaccination issues with these guys."

health. Is it also the king in this realm?

Jerry: It's not necessarily more important, as all minerals have critical roles to play, but it is more important in the sense that calcium does truck the other nutrients to the cell membrane, just as it does in the soil.

Graeme: I figure that if 80% of leaf analyses we conduct show a deficiency of calcium then we could never be getting enough calcium from our food. Is calcium deficiency a major problem?

Jerry: Yes, and it's a combination of the fact that, not only are you getting inadequate levels of calcium, but you're getting excessive compounds which leach calcium or in-

terfere with its uptake. Of course, Vitamin D is also a huge thing because you can't ionise calcium without it. Most people are Vitamin D deficient.

Graeme: How much sun do you need to produce enough Vitamin D to ensure calcium ionisation?

Jerry: Well, in temperate regions you actually need three or four hours of sun from 10 am to 2 pm to get good alkalising levels of Vitamin D.

Graeme: That's the exact time that we are told to keep out of the sun in Australia.

Jerry: Well, there's UVA and UVB, but it is UVA that is the problem. At present, skin cancer rates are increasing, despite the fact that more people are staying out of the sun. There is an argument that long term exposure to fluorescent light creates a comparable threat in terms of skin cancer. I'm not suggesting that there is not a link between UV and skin cancer, but sunlight is also an important health aid. We have to balance out these things.

Graeme: 66% of American adults and 62% of Australian adults are currently considered obese. The argument that 'fat makes you fat' has been rammed down our throats since I was a boy. Why are we still so fat if everything is 'no-fat' or 'low-fat'?

Jerry: There's two issues here. Fat does not necessarily make you fat but you will notice that when the nutritionists talk about 'reducing fat' it used to always be animal fat - now it's all fat. Recent research has confirmed the serious problems associated with vegetable fat. 75% of the plaque related to cardiovascular disease consists of polyunsaturated fatty acids. It's a bit embarrassing to have to admit that you may have nailed the wrong guy after all these years, so the message has to be more subtle, like 'reduce fat intake'. In actual fact, it is carbohydrates that are the chief culprits in the obesity epidemic, not fats.

Graeme: Well, this short update has turned into my longest interview to date. It was fascinating and I thank you for your time.

Jerry: No worries, mate! I'll see you in Australia in March for our tour.

DR ARDEN ANDERSEN

Interview recorded December 2002



*Dr Arden Andersen began his career as a soil scientist and agricultural consultant but, as his understanding of the link between the soil and human health developed, so did his realisation that he would be best equipped with a foot in both camps. After completing his medical degree, **Dr Arden Andersen** continued his Ag consulting while also working as a medical practitioner in a private clinic. He refers to his fused roles as 'medical agronomy'. I interviewed **Dr Arden Andersen** for a second*

time in December, 2002. This time the focus was to be human health, as there are few of the master consultants more qualified to discuss the links between soil health and human health. Arden offers revealing insights into the root causes behind many of our health problems and highlights the need for a greater understanding of the nutritional link to sickness and disease.

Graeme: It's been four years since I interviewed you last - I thought it might be a good idea to update that earlier interview, prior to the publication of the book. Have you been happy with the balance between your work in agriculture and your profession of medicine?

Arden: In some ways I'd like to spend more time in agriculture. I'm an outdoors person but I've enjoyed both. Medicine has helped in understanding some things in soil and plant metabolism. I think that some of the testing technologies in medicine could have an important role to play in agriculture, to improve the capacity to make evaluations as to what and why things are happening.

Graeme: What sort of analyses could we improve?

Arden: Well, for example, the transport of nutrients could be looked at more closely. There's the assumption that nutrients are transported in the ionic form. This may be true, but does that necessarily mean that this is the way that they should be transported within the plant? In a truly healthy plant this may not be the case. In medical research, in relation to free radicals, we see that free radicals are very damaging unless they are sequestered or protected in some way, or the tissue is protected in some way. The phloem and xylem in the plant are not unlike the arteries and veins in a blood circulation system. They are susceptible to the same types of assaults and insults from free radicals.

Graeme: How similar are human and plant cells?

Arden: There are differences, but the interaction with cell membranes, transport across cell membranes and so on is very much the same. The thing about it is that both

plant and human cells are eukaryotic cells. In some of the new research into autism we are finding that the compounds that the body uses to sequester heavy metals, mercury in particular, are the same compounds that are found in all eukaryotic cells.

Graeme: One of the many features of the use of humic and fulvic acid in agriculture is the capacity of these materials to increase the permeability of the plant cell membrane. We are now beginning to realise a whole host of benefits associated with the use of these materials in animal and human health. Are some of these benefits also related to increased permeability of the cell membrane?

Arden: I think so. The integrity of the cell is still very much related to a complex system of fatty acids, protein molecules and carbohydrates. Fulvic and humic acid are really just complex carbon compounds. The cell membranes are not that dissimilar between human and plant cells. The permeability of the cell is correlated to the integrity of the component parts and the proteins that actually transport things across the cell. We are discovering more and more about the roles of these proteins. Inevitably we will find that there are more similarities than dissimilarities between human and plant cells.

Graeme: You are in a unique position to observe and evaluate the link between soil health and human health. How profound is that link?

Arden: It's absolute and very intimate. I think that we can categorise it in terms of toxicity. More and more research is now linking pesticides, herbicides and fungicides to human ailments - to nutrient inhibition and to disease. There are links with organic phosphates and cancer issues. They are also linked to interfering with B vitamins. Three universities, including Texas and Santa Cruz, have correlated herbicides to Parkinson's Disease. Organophosphates have also been correlated to Parkinson's Disease. If we only look at issues of toxicity, there are potent links between agriculture and human health. However, if we then move over into the nutritional side of it, every issue in the human body has a nutritional link. Conventional medicine doesn't necessarily make that connection, but if you start looking at biochemistry then there is no argument. Almost every enzyme we can name has a trace element co-factor that activates it. If that trace element is not present, that enzyme is not activated and something doesn't work like it is supposed to. Where are you going to get those trace elements? From your food, but first they must be present in the soil. When current nutrient values in books are compared to those from fifty years ago there is an alarming reduction, ranging from 25% to 75%, in our food's nutrient values today.

Graeme: People are obviously aware, even if their doctors aren't. Why else would the shelves be filled with vitamin and mineral supplements today, when this wasn't the case twenty years ago? It is based on grass-roots demand, rather than recommendations from professionals.

Arden: Absolutely! That is a multi-billion dollar industry. Even the Journal of the American Medical Association recently recommended that everyone should take a multivitamin supplement. That's a tremendous step forward. It is also an indictment of the agricultural industry's failure to keep/put adequate nutrition in the food.

Graeme: Even a vitamin man like Linus Pauling made the statement that "*every sickness, every disease, every ailment has a mineral link*". Do you feel that this is an accurate claim or has he overstated the case?

Arden: I think it was a very, very accurate claim. The fact is that the all-important immune system needs nutrition to respond correctly to invasion, whether it is cancer cells or infection by pathogens. We know that rebuilding tissue requires nutrition. The entire healing process is nutrition-based and Linus Pauling was right on.

Graeme: Our argument has always been that the plant was the intended vehicle for mineral delivery. Why else would plant-derived minerals be 98% bio-available? Our minerals weren't supposed to come from a bottle.

Arden: Without question. However, from a treatment perspective, if someone is very ill then a 'synthetic' is going to raise them to a given level of health. Taking them from that level up to the next step involves a better quality nutrient. Then it needs to be in a biological form. So many people around the world today are at such a low nutrient level that any addition of a nutrient is going to raise their health level. That's why we have such success with nutritional IVs, which are synthetic. I can significantly improve people's health with just IV [intravenous] nutrition - high doses of vitamin C, B complex, trace minerals and so on. Our bodies have been insulted and assaulted by our environment, our diets, our stressors. We need nutrition to reverse the insults and the right nutrients of high quality are necessary to achieve that result. High quality does not necessarily mean these nutrients have to be plant-derived to be effective. They just have to be the right nutrients at the right time delivered the most appropriate way for the body at that particular time. Plant-derived nutritionals from plants with low refractometer readings and low mineral densities are not really nutritionals. They are sales promotion.

Graeme: There are a number of unanswered questions in relation to GMOs. In fact, it could be argued that there are three hundred million guineapigs living in this country. Can you actually identify and quantify health problems associated with the ingestion of genetically modified foods?

Arden: There are so many variables in society today, so it's pretty difficult to isolate that one thing. However, I can say that we are seeing, across the board, more and more allergies to soy, corn and canola. These are the three main GMO crops and they are components of the majority of food products consumed in this country - particularly fast foods. Almost all fast food is fried in canola. Soy is an additive in a huge variety of things, from supplements to food. Corn oil, starch and flour are so ubiquitous in our environment. We are seeing within our own practice, and when consulting with allergy specialists, that these three items are extremely allergenic and they have become increasingly so during the past ten years. Can I say exclusively that GMOs are the cause? Probably not - I can only report what is happening.

Graeme: Can we compare the mineral balance required by the human body with that required by the plant? Are there similarities in terms of ratios and so forth?

Arden: That's a good question which I've contemplated a lot. The calcium to magnesium ratio is very important with animals and humans, as it is in the soil, but here we typically look at a 2 to 1 ratio, rather than the broader ratio we look at in the soil. In some cases, I might go to a 1 to 1 ratio, depending upon their ailment, if they have heart disease, for example. If we go to a 1 to 1 ratio in the soil, we have concrete. The physiology of plants and microbes differs from mammals but the importance of this ratio is no less.

Graeme: While we are talking calcium... we do many hundreds of leaf tests a year and 90% of them reveal calcium deficiencies. The obvious assumption is that many people are going to suffer associated calcium deficiencies. Is that the case? Is there a calcium link to the aluminium excesses that are linked to Alzheimers? Could the iron excesses, so often diagnosed as haemochromatosis, sometimes be linked to calcium shortages?

Arden: That's a very good question. I think that the jury is still out on this one. Certainly we know that society, as a rule, is calcium-deficient. Osteoporosis is a terrible problem - healing is calcium-related. Calcium must be present in the right balance to maintain cell integrity. We do know that aluminium can displace both calcium and magnesium. Heavy metals, like lead in particular, can displace calcium in the bone marrow. We know that balance is critical, as it is in the soil. A few years back, I was involved in large-scale tissue testing in California and Arizona and we found tremendous amounts of aluminium in the tissue. In relation to Alzheimers - there are recent findings by Boyd Hayley, out of the University of Kentucky, which suggest that Alzheimers is more closely related to mercury - but aluminium enhances mercury's toxicity. If we have a little mercury and then we tag on aluminium... now we have a big problem.

Graeme: One of the interesting things we have found over the past couple of years relates to the link between sap pH and plant health. We have researched Bruce Tainio's theory that a sap pH of 6.4 reflects a healthy plant - whether it is a pumpkin or a pear tree - and that disease susceptibility is related to acidic sap pH. We have yet to see disease in a plant with a sap pH exceeding 6.4. Acid sap is related to a cation shortage. In human health, saliva and urine should also have an ideal pH of 6.4.

Arden: Sure, that goes back to Reams's original work in human health. 6.4 was the figure for urine and saliva. I can't disagree with that - it appears to be valid.

Graeme: How important is alkalinity in human health?

Arden: Alkalinity is very, very important. A lot of what we consume creates acid waste products in the body. Dr Baroody's book 'Alkalize or Die' is an excellent book which deals with this problem.

Graeme: Does acidity promote a predisposition towards diseases like cancer?

Arden: I think it is valid to make some generalisations like this. I know Reams certainly did. When the body slips into an acid waste state, our immune system is highly taxed. It's not clearing dead cells like it's supposed to. We aren't digesting or assimilating like we are supposed to, and those are the circumstances for cancer to occur. Basically, all toxicities in the body end up becoming acid waste, so pHs are going to drop.

Graeme: If we are looking at this toxicity question, is it fair to say that if we want to develop a proactive approach towards our health, then detoxifying becomes the number one issue. If technology like far infrared saunas offers one of the best detoxifying options, shouldn't we be promoting this sort of thing?

Arden: Certainly, but there is one caveat here. You don't want to induce more detoxification than what the body can handle. I grew up in the era when everyone talked about 'healing crises'. I kind of accepted that, but in the back of my mind I wasn't necessarily convinced that this was correct. I now realise that if you have adequate nutri-

tion to Epsom, you do not get sick detoxifying. Otherwise we would be sick all the time, every time the liver had to dump something. It's a natural process that occurs twenty-four hours a day, seven days a week - as long as there is adequate nutrition present. It's a natural process, it is not a 'tidal process'. It only happens in a sporadic fashion when the body is lacking the nutrition to sponsor ongoing detoxification. For example, I've had patients who were desperately in need of detoxification, but I couldn't use inducers like chelation therapy because they didn't have the energy to do this. One particular patient couldn't handle the heat of saunas either. The next logical step is to assume that they should, at least, be able to handle baths like Epsom salts or a clay bath. This person absolutely crashed after an Epsom salts bath. When you are so deficient in nutrition - your biochemical pathways are so underfunctioning that sustainment is the rule of thumb - you cannot handle any release of toxicity. The first step in these cases is to nutritionalise these people to get them up to a level where the body can Omega-3 safely. Then we can induce that with far infrared saunas, which are excellent by the way, or baths with Epsom salts, cider vinegar or clays. We might use enemas.

Graeme: Can we assume that most of us have toxicity issues, living in our modern environment, even if we appear relatively healthy? Shouldn't we all be proactive and detoxify as a matter of course?

Arden: I think that's a very good suggestion and we should also be proactive with the nutrition necessary to really help supplement that detoxification process. Many people, for example, think that fasting is the key to detoxifying. That's partially true, but when you fast, you kick the liver into detoxification mode. That's wonderful, but the liver must have enough nutrients to complete that pathway. What happens if you go into a fast and you run out of glutathione or sulfur or some of the nutrients necessary to complete that detoxification? Now you have the intermediate toxins, which are more toxic than what you started with - the person can get even sicker by going into a fast. How do you deal with that? You supplement.

Graeme: Presuming that you were not nutritionally compromised, you mentioned five or six detox options - what would you consider to be the most effective?

Arden: I think saunas are best. They sweat out toxicities - it's a natural mechanism. They are excellent for removing pesticides.

Graeme: Is the concept of building the body temperature up to 103°F to induce the equivalent of a fever a good way to go?

Arden: It is, but you must build up to that level as it may be too stressful for some people. You should start at fifteen minutes and build up to fifty-minute sessions. It may take two weeks to get to that point, or it may take six months. You must also ensure you have good fluid intake to avoid dehydration.

Graeme: I recently read Dr Batmanghelidj's book 'Your Body's Many Cries For Water', where he theorises that many illnesses are related to dehydration because we simply don't drink our eight glasses of water each day. How many people suffer this cellular dehydration?

Arden: I would say that it's probably the majority of the population that are just not getting enough fluid. There are a lot of social issues associated with having to urinate every hour while at work, so they get into the habit of only drinking at meals. We

should be drinking half of our weight in ounces, so if we weigh 200 lbs we should be drinking 100oz a day. From a metric perspective, a 70-kg person should be drinking 2 to 3 litres minimum each day. That's a minimum. If you're out in the sunshine or exercising that amount should be increased. For a lot of people it's not socially acceptable to drink that much fluid. The body, however, needs this amount of water for proper cleansing to occur.

Graeme: Then there's the concept that "*Water ain't water*" and there appears to be tremendous growth occurring with companies specialising in energising water. What is your opinion of this approach?

Arden: You're absolutely right. There is a lot more to water than simple H₂O. I don't care for city water because it is packed with contaminants. Generally, I would prefer distilled water to start with, and then if you can energise or ozonate, that's wonderful. If you want to mineralise the distilled water there are various multiminerals options. Just because there may be minerals in spring water doesn't mean that these are minerals that you personally need. The ideal way, I believe, is to distil water and then run it through one of the Schauburger-style energisers. However, logistics come into the situation. I advise not to get hung up on the energised issue. The bottom line is that it is better to drink whatever is available and clean rather than becoming dehydrated.

Graeme: We've been working with a biological approach in the soil which we call MEND. This is an acronym for Microbially Enhanced Nutrient Delivery. It appears that there is a similar microbial link to nutrient uptake in the human digestive system. If Zantac is the largest selling drug in history, are we still biologically equipped to ensure maximum mineralisation?

Arden: Absolutely not! One of the things I see in practice is that people who are on acid blockers or antacids generally become minerally deficient. You need the acids to activate the enzymes to digest and assimilate the metals. Most people don't have indigestion or reflux because they are producing too much acid - they have it because they have sensitivities to certain foods that are causing that reflux.

Graeme: Would there be a gain in combining appropriate digestive enzymes or microorganisms with supplements to magnify their effect?

Arden: Yes, definitely. My recommendation is that everyone should be taking digestive enzymes. We don't have the mineralisation in the food, and therefore we don't have the digestive enzymes in the food, and our systems are stressed. The pancreas was not meant to produce all of the enzymes necessary for digestion. It was only meant to be a supplement for what was supposed to be in the food.

Graeme: When we talk about fresh fruit and vegetables as a primary source of enzymes, how do the enzymes produced by microorganisms compare? I'm a bit hazy on this.

Arden: Yes and no. Some are very similar but, generally speaking, plants usually produce their own enzymes that will break the plants down over time - protease, amylase, lipase, cellulase and so on. Microorganisms also produce those enzymes in order to break down their food supply. Those enzymes are going to be intermixed in a system which governs the breakdown of our food.

Graeme: Do you share Sally Fallon's belief regarding the neglected food value of saturated fats like butter? Has butter been given a bum rap?

Arden: I don't disagree, but there is one caveat and that is: butter is not butter is not butter and fat is not fat is not fat in animals. I'm not sure that Sally is addressing this issue. There is a huge difference between grass-fed ruminant animals and grain-fed ruminants. There are marked biochemical differences. I agree with Sally completely, if we are talking about grass-fed animals - but typical dairy animals in this country are grain-fed, causing them to overproduce saturated fats. This is not the healthy type of fat which we were intended to consume.

Graeme: What about the balance between Omega-3 and Omega-6? Do you consider this to be a major health problem?

Arden: Yes, it is a major problem in most of the developed world. There is a very significant Omega-3 deficiency compared to Omega-6. 95% of the population qualify in terms of this imbalance. The major source of the Omega-6 overload is vegetable oils.

Graeme: Do you consider that there are any health benefits associated with energetic devices like the Rife Machine or radionics? I understand that there are legal constraints in the US.

Arden: I don't use them in my practice as they are not permitted in the US. However, I do think that they have considerable value. Radionics has been used in medicine in England quite successfully for some time.

Graeme: We have had some personal experience with energetics devices. Rosa, my wife and business partner, has suffered from chronic fatigue-type symptoms for several years and they were getting progressively worse. After meeting with Bruce Tainio in Spokane for an interview, we began to wonder about the negative influences of electromagnetic radiation and geopathic stress. We invested in one of Bruce's neutralising devices and the change was so dramatic it was barely believable. It changed Rosa's life overnight. It has been suggested that there is two-hundred million times more EMR in the atmosphere than fifty years ago. Do you see this as a significant health issue?

Arden: Without question. It is a major problem. There is a book out called 'Discoveries of a Dowser' by Kathe Bachler. It was an Austrian study supported by the Austrian government which proved, by using information from 300 practising physicians and thousands of patients, that geopathic energies can, and do, have adverse effects on human health. That treatise was about physically moving away from their negative energy, but I am aware that there are devices that can neutralise those energies. I have dealt with these problems in agriculture in dairy barns, cattle areas and so on. The industry can attempt to discount the effect of these energies in human health by writing it off as a placebo effect. Tell that to the dairy herd out there that completely changed their behaviour since we installed one of these devices. Now they will go and eat in extensions where they wouldn't eat before. Remove the device and they will stay away from that area. This is hardly a placebo effect.

Graeme: I was interested in your observation that we live in a very different world to the one in which Albrecht and Reams devised their game plans. How do we compensate for these changes when we develop a program working with those systems?

Arden: Both Reams and Albrecht talked about the relationships between nutrition, soil, animal and human health, and that's absolutely correct. Reams talked about inputs of chicken manure, with foliars of fish and seaweed. Today we have destroyed a lot of the organisms. Most of the manures are not fit to be used because they're full of antibiotics and deworming chemicals, so they don't break down as they should. We've destroyed the inoculation capacity of these kinds of products. It's just a different situation.

Graeme: So we really have to look more at composts - compost tea and humic acid to reinoculate these biologically-compromised soils.

Arden: Absolutely. In the days of Reams and Albrecht we could do more medicine with foods and less with supplementation. Today, the foods don't have the nutrients so we have to supplement. It's the same with the soils. Fifty years ago we could achieve results with minimum inputs of natural fertilisers because we still had the soil life to do the job. Today we've destroyed our soil life, and there are also very few trace minerals left. It's a sicker system today.

Graeme: I understand that the US government is set to introduce large-scale irradiation of meat. How do you feel about that proposal?

Arden: I think it's crazy. Again, they're not looking at the associated degradation of food. Again, it's the paranoia thing that you mentioned in relation to the national psyche. They are either trying to prevent deliberate contamination and/or inadvertent contamination with things like salmonella and E-coli. If you look at root causes you must ask "*why do we have so much E-coli present?*" It's because the nutrition is screwed up in the animal. We are feeding them grain and loading them with antibiotics. The meat is already contaminated when it leaves the farm. It's the same deal with chickens and salmonella. It's really just another ploy to address the symptom rather than the cause. It's also another political ploy of "*how do we dispose of or make use of nuclear waste? - Let's use it for irradiating food*". Then we have to pay for the service, rather than them having to pay for disposal. It will decrease food quality and increase health problems without a doubt.

Graeme: What do you consider the three most valuable or necessary supplements people can take if they are wanting to develop a proactive approach?

Arden: An antioxidant blend is critical because the free radical load is constantly increasing. The B vitamins are essential, because we are in a high stress society and we burn a lot of B vitamins. Finally, I think a broad-spectrum mineral supplement is essential.

Graeme: Would it also be worth taking probiotics to help with the uptake of all supplements?

Arden: Yes, certainly, but people need to look at longer term courses of probiotics. New research now shows that you need to take probiotics for about six months after an antibiotic before you really get the regeneration. You may get physical placement in a couple of weeks, but you don't get the reactivation of all the enzyme systems in the gut.

Graeme: I understand that you have a new book due for publication.

HUMAN HEALTH

Arden: Yes, it's for the layperson. I cover most of the systems of the body - the cardiovascular system, the neurological system and the muscular-skeletal system. I talk about options for treatment and I list many of the most common diseases, and cover the conventional treatment approach, but I'll also give the natural options.

Graeme: What's it called?

Arden: I don't have a name yet but I'm working on it. It will be available sometime in 2003.

Graeme: I'll be looking out for that one and I wish you every success with it. Thanks for your time - it was great to catch up again.

Arden: No problem. I look forward to a signed copy of your new book.

KENNY AUSUBEL

Interview recorded December 2000



*Ecological visionary, **Kenny Ausubel** is a master presenter. At a recent conference I attended, the standing ovation that followed his sixty-minute emotional roller-coaster of a presentation was almost inevitable. He had touched his audience. There were cheers, tears and gasps of dismay as a master storyteller spun his tale of heroism and despair, egotism and persecution. His story was of medical politics and the systematic exclusion of alternatives to the mainstream. His central character was **Harry Hoxsey**, a third-generation herbalist who had inherited a family formula that could cure **cancer**. The chief protagonist was **Dr Morris Fishbein**, head of the AMA for twenty-five years - an elitist, reactionary and staunch defender of the status quo. Fishbein was determined to drive the Hoxsey heretic from the country, and he hounded the unfortunate herbalist from state to state. At one stage, Harry operated the largest cancer clinic in the world, servicing 12,000 patients in Texas and many others in branch offices in seventeen states. However, despite a remarkable cure rate involving thousands of patients, Fishbein continued his dogged persecution. The saga came to a head when Harry did the unthinkable and launched a legal challenge against the AMA. The judge was unable to deny the sheer number and variety of Harry's cures, and against all odds, the humble herbalist won his case against the all-powerful doctors' union. The court proceedings led to the public humiliation and eventual demise of the dreaded Dr Fishbein (at this point in the presentation, the audience burst into spontaneous cheering). Despite his victory, Harry was still eventually driven from the country and forced to set up in Mexico, where his clinic remains today. Kenny Ausubel chronicles the amazing story of the **Hoxsey Cancer Clinics** and the return of alternative therapies in his book '**When Healing Becomes a Crime**' (available from NTS). Kenny Ausubel is an award-winning author, investigative journalist and film-maker (the video of his film on Hoxsey is available from NTS). He is also the founder of the 'Bioneers', a group dedicated to promoting and developing biological solutions to environmental and industrial problems. The 'Bioneers' have a large, annual conference, a magazine, website and radio show. The website address is: www.bioneers.org.*

Graeme: I really enjoyed your presentation covering the history of Harry Hoxsey and his cancer treatment. Does your new book 'When Healing Becomes a Crime' include Harry's successful herbal recipe?

Kenny: Yes, it does - well, as much as we know about it is in there. There is still a certain level of secrecy. I list several of the formulas, which have been published at various times, and there is in-depth coverage of the various herbs involved. In a few months' time, a US Federal Government report is to be released. Researchers were sent to the Hoxsey Clinic in Mexico and they found what they termed 'note-worthy cases of

survival'. We hope that this will lead to further investigations in the US, which will ultimately make these treatments legal and available.

Graeme: Do you think the recipes you have published from Harry's records may have been missing a couple of key ingredients? - That's pretty standard commercial practice when you are trying to keep the copyists at bay.

Kenny: No, I don't think so. I'm convinced that the secret was in the compounding of the herbs. I cover this in the book. Harry never used alcohol, for example, in any of his compounds - not in the extraction or the processing of the herbs.

Graeme: It was exciting to hear you suggest that there are positive signs of change regarding alternative therapists and the potential for their acceptance. Could you tell us more about these changes?

Kenny: Well, there are several large forces at work now. First of all, the celebrated, so-called 'War on Cancer' is a qualified failure. While there are some success stories with conventional treatment, the overall survival rates have not improved during the last thirty years. This is 33 billion US dollars later in the US alone.

Graeme: There has been no improvement at all in survival rates, despite the new drugs and new treatments?

Kenny: No. Cancer mortality has actually risen, and this has led to masses of cancer patients migrating to alternative therapies. In one study involving 13,000 cancer patients at the MD Anderson Cancer Centre (the largest in the country), they found that 83% of these people were using alternative cancer treatments. This is without doctors recommending them or even knowing what they are for the most part. So, what we are seeing is the birth of this alternative market, and now in the US, alternative medicine, at large, is going mainstream. It's just taking a little longer for the cancer therapies to catch up. In the coming years, I think that more and more of these therapies will enter a cycle of testing, leading to ultimate approval. In ten years, I believe the face of cancer treatment will be unrecognisable.

Graeme: You mentioned that the success of the Hoxsey treatment varied in relation to previous exposure to radiation and chemotherapy, as these treatments destroy the immune system. In fact, success rates fell to 25% with patients who had experienced these conventional cancer treatments. Do you feel that the chance of success with a system designed to strengthen the immune system is severely diminished when there is no immune system left to strengthen?

Kenny: To be honest, it depends upon the person and the stage and type of cancer. For example, chemotherapy drugs are effective in only about 3% to 5% of cancers, and these are the most rare forms. Surgery certainly has an important place in cancer treatment but I think that both chemotherapy and radiation are very questionable. Radiation is generally not considered a cure. They use it to slow things down. Both treatments are very hard on the immune system and most alternative therapies, including Hoxsey's, are based on stimulating the body's defence and immunity. I think, perhaps, that the conventional treatments should be the treatments of last resort. You might want to start with the alternatives, then if they don't work, you still have a fallback.

Graeme: Otherwise you are basically neutralising the effect. You have one force lifting immunity and another depleting the system. It's hard to achieve a positive net result.

“Cancer mortality has actually risen, and this has led to masses of cancer patients migrating to alternative therapies. In one study involving 13,000 cancer patients at the MD Anderson Cancer Centre (the largest in the country), they found that 83% of these people were using alternative cancer treatments. This is without doctors recommending them or even knowing what they are for the most part. So, what we are seeing is the birth of this alternative market, and now in the US, alternative medicine, at large, is going mainstream. It's just taking a little longer for the cancer therapies to catch up. In the coming years, I think that more and more of these therapies will enter a cycle of testing, leading to ultimate approval. In ten years, I believe the face of cancer treatment will be unrecognisable.”

Kenny: Mildred Nelson (the head of the Hoxsey Clinic) would, before she died, more often than not refuse patients who had already had chemotherapy because she had no base left to work with. It's very tough for patients, because they are caught in this medical crossfire. They don't know what to believe. Usually they get diagnosed and they've never thought about these things before. Suddenly the doctors want you in treatment twenty-four hours later and you don't have time to do any research or make any decisions. Patients want the best of all worlds - they want reliable information and they want the truth about their choice of options. Unfortunately, doctors can seldom tell them anything about the alternatives and, because most of the alternatives have not been scientifically tested, there is no good data and you don't really know what to believe. Then seldom do the physicians tell the truth about what your chances are with conventional therapy. Why is it that chemotherapy at best is helpful in one out of twenty cases and yet they give it to four out of five? What are they doing? They know it's not going to work and is hideously expensive and incredibly painful and it's often dangerous. They have what they call 'treatment deaths' with chemotherapy, where anywhere from 8% to 20% of patients are at risk. The treatment itself is going to kill you. I go into this in the book and it's pretty blood-curdling. It's massive over-medication and massive malpractice. Patients are awakening to this and are beginning to ask a lot more questions. Doctors themselves are not the bad guys here. They are really pawns in a system that's geared to profit. Cancer treatment in the US is 10% of the entire health care budget. It's the dominant specialty of American medicine. The average billing for each patient is over US\$100,000.

Graeme: Wow! That much per patient?

Kenny: Often it's a lot more. I saw a bill from a woman who was give experimental chemotherapy. It was for US\$750,000!

Graeme: What about those who fall between the cracks with no insurance? Do they just miss out on treatment?

Kenny: They don't get treated. That's it! There is no safety net in the US.

Graeme: It's a nasty little system all right. It makes me thankful for the Australian welfare approach.

"Then seldom do the physicians tell the truth about what your chances are with conventional therapy. Why is it that chemotherapy at best is helpful in one out of twenty cases and yet they give it to four out of five? What are they doing? They know it's not going to work and is hideously expensive and incredibly painful and it's often dangerous. They have what they call 'treatment deaths' with chemotherapy, where anywhere from 8% to 20% of patients are at risk. The treatment itself is going to kill you."

Kenny: Well, here in the US, this is the medical Wild West. There is a lot of greed and it's a very unfortunate situation for patients. Just to give you a contrast - treatment at the Hoxsey Cancer Clinic is just US\$3,500, and that's for life. They have never sent out a bill. It's all done on the honour system. If you can't pay up front, then you make arrangements for monthly payments or whatever. You can't even spend one day in a conventional hospital for US\$3,500, so that's what you are dealing with.

Graeme: So, the 'cancer wars', as you call them, continue. How many clinics are there that have been forced to operate in Mexico due to persecution in the US?

Kenny: There is well over a dozen, but the Hoxsey Clinic is the only one I've investigated. I know that some of the other clinics don't have a very good reputation.

Graeme: That's the problem I guess. When there is no regulation, it can be an invite for the con men.

Kenny: The US medical system has created this. If we had fair testing and accurate reporting of real information, it would be much harder for these quack clinics to exist. We have to ask who are the real quacks. There is quackery on both sides of the fence, so we have to be even-handed about that. At least, with something like Hoxsey, the worst it can do is not work. At least it's not going to harm you.

Graeme: You checked out the options pretty thoroughly, and I was wondering about your own perspective. If you found tomorrow morning that you had developed cancer, what would be your choice of treatment?

Kenny: Well, it depends on the type of cancer and the stage. There are half a dozen treatments that I am really impressed with, and each of them has a different specialty. If I had lymphoma, lung cancer or colon cancer, I would definitely go to the Hoxsey Clinic. If I had brain cancer, I'd go to Dr Burzynski. He was a brilliant researcher who endured years of persecution. He identified chemicals in the human body capable of not only treating some forms of cancer, but also of diagnosing and preventing the dis-

ease. He has excellent results with brain cancer. There are other situations where I might consider surgery. I cover a range of options in the book.

Graeme: I understand that there was an Australasian branch of the Hoxsey approach at one time.

Kenny: Yes, in Texas during the 1950s, the Hoxsey Clinic was the largest private cancer clinic in the world, with 12,000 patients. One of its patients was Dr Eva Hill from New Zealand. She was a physician who had a very severe skin cancer, which was cured by Hoxsey. In fact, organised medicine in the US has never disputed the fact that the Hoxsey treatment does cure external cancers. So Dr Hill went back to New Zealand and opened up a clinic. She was embroiled in a huge legal battle with the medical authorities for years, which ultimately resulted in a decision in her favour. She continued to treat cancer patients well into her nineties! Her clinic closed in the mid 1980s.

Graeme: It's hard to imagine why a successful approach would be just dropped. Didn't anyone want to continue her work?

Kenny: Well, she had been through so many struggles with the medical establishment, no one else wanted to pick it up.

Graeme: What was the response to your movie about the Hoxsey witch-hunt?

Kenny: The documentary called 'Hoxsey - How Healing Becomes a Crime' played in movie theatres in twelve cities. Then it was on HBO, which is the main cable channel, where it had the highest viewer response of any documentary in their history.

Graeme: Did the movie create any kind of political impact?

Kenny: It did - we showed it at the Kennedy Centre in Washington DC to about seven hundred people, including many members of congress. We were told that the film increased the openness toward alternative treatments.

Graeme: Has the liquid herbal formula ever been converted to pills or capsules?

Kenny: It has been, but it was found to be less effective. The tincture and liquid extract is much stronger - for some reason it increases the potency of the herbs. The compounding is secret, the formulas are public. It is a two-pack treatment. There is a red paste and a yellow powder. The red paste contains bloodroot and specific minerals. The yellow powder is actually a non-toxic form of arsenic, along with some other minerals. The red paste is non-selective - it will eat anything in its path, including healthy tissue, so there is some skill involved on behalf of practitioners when they are using this material. The yellow powder is intelligent. It's actually selective and will only harm malignant tissue. It's so delicate that it can be put in your eye or your ear. In fact, sometimes they put it into a liquid preparation and inject it. One of the case histories documented in the book concerns a patient who had cancer of all of the salivary glands in his mouth. The doctors wanted to cut off half of his jaw - literally half of his face and then plate his whole pallet in gold, so they could radiate his brain! His wife didn't want him to do this for obvious reasons. He went down to the Hoxsey Clinic in Mexico and they injected the yellow powder into his mouth. He immediately felt a burning sensation and within a matter of weeks, the tumour turned black and hard and then popped right out. That was nineteen years ago, and the cancer never returned! He has no disfigurement and he is a happy man.

Graeme: Your investigative work with alternative therapies is only part of your portfolio. You are also a founding member of ‘The Bioneers’ - could you tell us a little more about this organisation?

Kenny: I had started a biodiversity seed company in 1989, called ‘Seeds of Change’. Obviously this was never going to change the world, but it was one step toward a solution, so I started to look around for people who might have other steps to offer. When I looked at this variety of environmental solutions, I realised that they invariably involved living systems. These people had looked deeply into biology to understand how nature operates. Then we can apply those principles as human beings, to live in harmony with the natural world. If there is one system-error that we have made as a culture, it’s the thinking that human beings are apart from nature. We are not! We are very much part of nature, and this is the essence of the Bioneers’ philosophy. I coined the term ‘Bioneers’, short for Biological Pioneers. In 1990, I brought together a bunch of people with biological solutions and held a conference. We have now been doing that for eleven years. We hold it near San Francisco in California. Last year we had an attendance of 2,600. It’s now become a national radio series. Actually, the series will be playing on Australian ABC radio during the coming year.

Graeme: What does the radio series involve?

Kenny: It’s thirteen thirty-minute programs each year. We also have a newsletter and a website. We also do a lot of farming workshops, involving sophisticated, advanced training for organic growers. We cover everything from seed diversity to biodynamics, permaculture, organic horticulture, marketing, etc. We are also involved in the promotion of indigenous agriculture.

Graeme: Yes, I read about your work with the Iroquois Indians in the marketing of their unique, traditional white corn variety.

Kenny: Yes, we brought the owner of a very respected restaurant and her leading chef up to visit with the Indians for a weekend. They cooked and they cooked. Native chefs love contests. They take great pride in their work. They made every single dish from appetisers to desserts out of this wonderful white corn. This is the actual corn that the Iroquois shared with George Washington at Valley Forge, when his troops were starving during the American Revolution. The chef and the restaurateur were both impressed with the potential of this corn. It is now on menus in New York and in a leading Philadelphia restaurant and it will soon be marketed to other restaurants throughout the US. The corn actually made it into the holiday issue of ‘Gourmet Magazine’ this month in the States.

Graeme: That’s great. Just returning to Harry Hoxsey and his treatment, for a moment. What were his success rates with cancer?

Kenny: Hoxsey said that for ‘virgin’ cases, which hadn’t been treated with surgery, radiation or drugs, he was able to achieve an 80% success rate. He had a 99% success rate with skin cancer and that is not disputed by conventional medicine.

Graeme: Melanoma is a major killer in Australia. I suspect that there will be considerable feedback following this interview.

Kenny: Hoxsey is justifiably famous for his remarkable success in treating melanomas. Actually, the one case that this soon-to-be released federal report mentions, is a

melanoma case. Although melanoma is an external cancer, it rapidly spreads and becomes internalised. Curing melanoma is a big deal, and surely this is enough to justify large-scale testing to make this treatment available.

Graeme: You also mentioned that the Biotech people may be barking up the wrong tree when pushing the hereditary angle, when figures suggest that 70% to 90% of cancers are caused by environmental factors. Can you please elaborate on this concept?

Kenny: Yes. A very large study just came out of Scandinavia, where they looked at identical twins. The Biotech industry was pushing the potential for a genetic cure for all cancers once we know the genes and the triggers and we manipulate them accordingly. Well, that's not how it turned out. This study supported earlier research, which showed that 70% to 90% of cancers are directly caused by environmental and occupational factors. What this means, in effect, is that we should be able to avoid all this cancer, because it has been caused by toxins we can strive to avoid. Treating cancer is damage control - we should be looking at root causes. That's what organic or non-toxic farming is about, that's what the 'Bioneers' is about. It's about how we can create the next industrial revolution, which is non-toxic, that actually eliminates waste, that has a closed loop with zero toxic emissions and, if anything, gives back to the environment to make it a more healthy place. We know how to do these things. This is not 'airy-fairy', 'pie-in-the-sky' stuff.

Graeme: You mentioned a concept called 'Natural Capitalism' related to the opportunities for business to capitalise on increasing sustainability through becoming more efficient. I recently visited a Victorian wool scouring plant, which had developed a large-scale composting operation based on their waste product. It had been a major cost to dump this waste, but now they have turned a liability into an asset. I find that we are living in very positive, exciting times.

“This study supported earlier research, which showed that 70% to 90% of cancers are directly caused by environmental and occupational factors. What this means, in effect, is that we should be able to avoid all this cancer, because it has been caused by toxins we can strive to avoid. Treating cancer is damage control - we should be looking at root causes. That's what organic or non-toxic farming is about”

Kenny: I agree - I think that the doom and gloom mentality associated with environmentalism is a sad thing. Things are bad, in fact they are a lot worse than many people realise, but what people have not been hearing is that there are solutions to all of these problems. As the work with Natural Capitalism shows, the industrial system at large is 94% wasteful, 94% inefficient - that represents a gigantic opportunity, and when you start to retool to eliminate waste and toxic emissions, you suddenly discover tremendous cost savings. It's a great business opportunity as well as a wonderful opportunity to transform the way that we live. These things are not only happening, they are inevitable and we will hear more and more about it in the coming years.

Graeme: You mentioned that some of the companies which have really pushed this approach, like the Swiss company Ciba-Geigy, are keeping closed-mouthed about their successes, because it represents a competitive edge.

Kenny: Yes. They are trying to beat their competitors to the punch.

Graeme: In your book, 'Restoring the Earth', you suggest that the biological pioneers you champion herald the coming Age of Biology where we finally learn to live our lives within the limits of the natural world. Do you see the GMO issue as a hiccup in the realisation of that dream?

Kenny: No, I think the GMO issue represents the ultimate psychosis of this whole mentality. It's the equivalent of splitting the atom on the molecular level - perhaps even more dangerous than that. Nature operates by boundaries and there is a reason why species don't breed with one another. Genetically modified organisms are a different form of pollution, because this biological pollution has a life of its own. We really have let the genie out of the bottle here. Thank goodness for the Europeans and their rejection of this technology. I understand that Australia and New Zealand may also halt the introduction of this madness. It is only here, in the Wild West of the United States, that these rogue corporations can have their way. I'm fairly optimistic that it may stop, because ironically one of the central principles of globalisation is that a business plan needs to be global. When a major market like Europe drops out of the business plan, the whole thing falters.

Graeme: I can't understand the logic of the multinationals in relation to GMOs. I was reading recently that the insurance companies won't even insure them for litigation. Contamination problems are surfacing daily. As I see it, lawsuits will be flying like confetti. They must know the risks here. I just can't see what their game plan could be. Do you have any ideas?

Kenny: Well, I think their philosophy is that, if brute force doesn't work, you haven't used enough of it. They are incredibly arrogant. They're used to getting their own way and just ram-rod these things through. They have complete contempt for the public will and are master manipulators of public relations. They have got away with so much for so long, there is an ingrained arrogance. This time I really don't think they will get away with it. They are trying to enforce something that is anti-biological - it's anti life. I think they will be stopped in agriculture, but I'm not so sure about medicine. This is an area where they can employ a kind of emotional blackmail. They say we can cure you of cancer - it's like this Golden Rice nonsense where they claim they are aiming to cure blindness in the third world. If Monsanto really wanted to cure blindness they could set up a non-profit organisation as a tax break. They really couldn't care less - this is all about money and power.

Graeme: The USA seems to have passively accepted the genetic pollution of their food to the extent that you have virtually turned into a nation of three hundred million guinea pigs. Why the apathy? Why was there no outcry?

Kenny: That's a really good question. I've been surprised that there hasn't been an uprising on this issue. My own view is that it relates to the public relations skills of these people. I really think that this country has gotten 'done down' in a lot of ways in terms of how we get our news. There's been such an extreme concentration of media ownership among corporations that it's very hard to get news out, except through alter-

native channels, which unfortunately don't reach most people. But there is also an increasing passivity in the US, which is very disturbing.

Graeme: Yes, theoretically that PR machine would still be operating in Europe. If we can't even get passionate about the food that sustains us then there is a major problem.

Kenny: I think the PR machine is more efficient in the US. I guess there is also more cronyism but I agree that something else is happening. It may be related to the kind of food people are eating. Nutrition in the US gets worse by the year. There is an undesirable link between nutrition and intelligence. Perhaps the US diet is creating a 'dumbing down' effect. The recent research related to the green revolution grains was pretty damning.

“I think the GMO issue represents the ultimate psychosis of this whole mentality. It's the equivalent of splitting the atom on the molecular level - perhaps even more dangerous than that. Nature operates by boundaries and there is a reason why species don't breed with one another. Genetically modified organisms are a different form of pollution, because this biological pollution has a life of its own. We really have let the genie out of the bottle here.”

Graeme: I'm not familiar with that research.

Kenny: Well, this research came out of Britain from the Royal Society. The study was principally related to third world countries but they looked at the green revolution hybrid grains. These hybrid grains are designed to have very short stalks so there is very little biomass to recycle in the soil. These short stalks do not uptake minerals very efficiently and it's causing several mineral deficiencies. Iron deficiency is a major problem - iron is directly related to the brain and intelligence. They measured an associated decrease in intelligence. People's IQs were measured on a large scale and they are steadily dropping. India was amongst the worst off. The grains actually lead to a bigger stomach, because they are harder to digest, and a smaller brain. In effect the green revolution hybrid grains are causing a decrease in intelligence. It's very frightening when you think about the implications.

Graeme: Whenever I visit the US, I'm constantly amazed at the extent of the junk food mentality here - I mean - where are your fruit and veggie shops? The Mall of America down the road has at least fifty fast food outlets and not a single fruit shop. Babies sit in prams with a can of coke in one hand and a pink coloured doughnut in the other. I rode in a bus recently for thirty minutes and literally every passenger was crunching on some sort of salty snack food. There is no doubt that the US is much further down the road in the poor nutrition department.

Kenny: I know, it's very disturbing. Think about the damage when people eat like that from childhood on. Maybe that's part of what makes people apathetic.

Graeme: In your lecture you discussed the potential of what you call 'real biotechnology' in terms of de-polluting and rebuilding. I was particularly fascinated

with the story of the mushroom guy and the diesel spill. Can you tell us more about his story?

Kenny: Yes, Paul Stamets is a mycologist who's very highly respected in the field. He wrote a book that's become the 'bible' of the mushroom industry.

Graeme: What is the book called?

Kenny: It's called 'The Gourmet and Medicinal Mushroom Cultivator'. He's discovered multiple species of mushrooms and fungi. Actually he says that they have discovered him. He considers himself an ambassador of the fungal realms [laughs]. There was a very bad diesel spill right near his farm up in Washington State and he was very concerned about it. The usual companies came in wanting to use their high-tech bio-remediation technologies to try and treat this stuff. Paul managed to convince the state of Washington into letting him have a go at this. They gave him a cell of contaminated soil, which was about twenty feet wide and a hundred feet long - identical to what they gave the nine other companies. He inoculated his cell with oyster mushroom spores, much to the derision of his competitors. All ten cells were covered with tarps and then they came back in six weeks to check relative progress. They opened them one at a time and Paul's cell was last in line. Each time they pulled back a tarp they were greeted with a terrible smell and an obvious failure. When they pulled back Paul's tarp the entire area was covered in oyster mushrooms and they were huge - around twelve inches in diameter! Paul had demonstrated a basic Bioneer principle - in nature there is no waste, everything is somebody's lunch. The mushrooms had treated the diesel fuel as food, but the exciting thing was that when they tested the mushrooms themselves they were virtually residue-free. Hydrocarbons were reduced to parts per trillion after only six weeks. Now this is what I call real biotechnology. It turns out that mushrooms can even digest chemical and biological weapons along with a wide range of toxins.

Graeme: Is he marketing his discoveries?

Kenny: Yes, he's actively commercialising his technologies.

Graeme: Is there any agricultural potential for his research?

Kenny: Yes definitely. I forgot to mention this in my lecture. He's an avid gardener and he has been experimenting at home. The tragedy of chemical farming is that it is biocidal - it kills the bacteria and fungi that actually make the soil. Paul figured that if mushrooms have co-evolved over millions of years with plants then why not work backwards and try to reconstruct some of these relationships? It's very similar to the idea of 'companion planting' in organic gardening. In his first year just messing around in his own garden he was able to increase his production by 150% by putting certain mushrooms in with his garden plants. He also said that the vitality of the plants was greatly increased.

Graeme: We really have only scratched the surface of the potential of biology and yet we have the arrogance to go out there and change the blueprint. I'll contact this guy and check the possibilities.

Kenny: Yes you should. He's brilliant. That's why I call him a 'Bioneer'. This is the magic of biology. We are so ignorant, we really know so little.

Graeme: You also mentioned some research into the benefits of biodiversity in agriculture. Has there been any recent research you can tell us about?

Kenny: Well, the biggest recent study was from China. This is not backyard stuff - it involved 100,000 acres and 10,000 farmers across the country. They had a tremendous problem with rice blight, and the disease was related to years of monoculture. They were using increasing amounts of fungicides, with no result. So what they did was revert to an ancient Chinese system where plantings involved more than just the one variety. They planted two varieties, which created a polyculture, and they found that this simple change increased their yields and it eliminated their blight. Biodiversity is not just a good thing or an aesthetic - it's a very practical strategy in the natural world to create abundance as well as health.

Graeme: Was this just simply mixing two species or was there some sort of synergistic effect?

Kenny: Undoubtedly there was some sort of affinity between the two species and I'm not sure of the details. It was based on results achieved before the dawn of modern science. There is undoubtedly a great deal to be learnt from native indigenous cultures in this regard. Centuries of living with and observing nature has produced a wealth of valuable knowledge, which is often overlooked or ignored. When you look at a natural ecosystem like a forest, you realise that it is a foodweb and the longer the system has been in operation the more diverse it is and the more resilient it becomes.

“The point is that these nutritional gains need to be marketed correctly. The other thing is really about how farmers can tell their stories better. Consumers feel good - they feel like it's a social mission to support farmers who are doing the right thing. That's a market to be tapped, but we need to communicate our story to the consumer. The public needs a connection to place and a connection to the person they are supporting.”

Graeme: That is exactly the situation described by Professor Elaine Ingham in her 'Soil Foodweb' lectures. The higher and more diverse your microbial count, the less disease pressure and the better the crop. Are you familiar with her work?

Kenny: Yes, she does wonderful work. It's a highly practical approach. When you farm biologically you are genuinely restoring the soil - you are growing topsoil - you are growing the diversity and increasing the health and vitality of the plants and increasing abundance.

Graeme: You have suggested that food and farming are scheduled to move centre stage over the next few years. It's ironic that the GMO issue has magnified the focus. It looks like an exciting time ahead for eco-farmers.

Kenny: Yes, the trends are all there. Organic farming now generates over twenty-two billion dollars globally and the growth rate in the US alone is over 20% a year, but it's growing even faster in other countries. I think the over-riding context is that we are going to see an increasing convergence of issues around environment and human health, and at the centrepiece of all this is organic or biological farming. Eating

is the most important thing we do and the way we produce our food will become a major issue. There are so many issues. There is the coming antibiotic crash - agriculture currently uses 40% of antibiotics, but it is this overuse and the flow-down effect that is creating massive problems with antibiotic-resistant pathogens in human health. Antibiotics will be largely removed from agriculture, because there is simply no choice. The convergence of this and many other issues will push organic foods to centre stage.

Graeme: I agree and it's great. When we talk sustainability in agriculture, often the bottom line is economic sustainability and really, in this current climate, it's a case of survival. Marketing of produce in this context is at least as important as growing that produce. Can you provide any creative suggestions for value-adding which might help our farmers to become more profitable?

Kenny: Well, I think that the idea of branded agriculture is very important. We need to actually go 'beyond organic'. Organic deals mostly with things that you shouldn't do - the bad things. We don't do this and we don't do that. It doesn't really address restoration or improving the vitality or flavour of the produce. I like the concept of 'restorative farming' where we are building soils to enhance flavour and quality to improve the nutritional content of food. The point is that these nutritional gains need to be marketed correctly. The other thing is really about how farmers can tell their stories better. Consumers feel good - they feel like it's a social mission to support farmers who are doing the right thing. That's a market to be tapped, but we need to communicate our story to the consumer. The public needs a connection to place and a connection to the person they are supporting. It's like fairtrade - we usually hear about it in relation to third world sweat-shops, but what about farmers? What about fair-trade for farmers? Good Farmers should be among the best paid professionals, after all, they feed us and keep us happy and preserve the land. If they tell their story well and perhaps tie it to a brand, there is great marketing potential.

Graeme: I couldn't agree more strongly. We call it Nutrition Farming. There was one final thing I wanted you to elaborate on from yesterday's lecture. You mentioned a concept called 'Living Machines'?

Kenny: Yes, John Todd's 'Living Machines'. There's a chapter in my book about it. This is another case of 'real bio-technology'. He has designed these things called 'living machines', which mimic natural ecosystems where waste equals food. It's a solar greenhouse, which uses no petrochemical inputs at all and it's a whole sequencing of ecologies, which begin with bacteria in large, clear, translucent tanks where the sewerage waste-water first enters the system. Then it goes through a whole sequence of plants and ultimately snails and catfish and, by the time the water comes out the other end, it's actually pure. It could actually be used for drinking water. Now he has applied this technology not only to sewerage but to heavy-duty industrial toxins - to fats and oils and greases. He works with waste from Ben and Gerry's Ice-creams, for example. If you can remediate Ben and Gerry's you can remediate anything [laughs]. These things are much less expensive to build than a conventional waste treatment plant. They are much more effective and much more beneficial for the environment. This is another 'true biotechnology'.

Graeme: Thanks for your time. I've really enjoyed speaking with you

Kenny: You are most welcome. Hopefully I'll see you in Australia soon.

PHYLLIS BALCH

Interview recorded December 2001



Phyllis Balch is a certified consultant who spent twenty years researching her book 'Prescription for Nutritional Healing'. This book, now in its third edition, has gone on to become a phenomenal international success, with sales now exceeding seven million copies and showing no signs of slowing. The book covers almost every major and minor illness, offering a profound range of self-management options for anyone who has recognised the undeniable reality - your health is ultimately your own responsibility. I've personally found this book an invaluable guideline, and most of my family and extended family have benefited from problem-solving programs designed with this resource. Late last year, I travelled to Florida to interview Phyllis and to pursue my growing interest in human health issues.

Graeme: Your 'Prescription for Nutritional Healing' book has become something of a bible for our family. I see it as the modern equivalent of the doctors' books my Mum used to rely upon to diagnose family health problems. She felt she had to supplement the advice of a family doctor whose treatment was limited to 'take an aspirin' or, if the illness was severe, 'take two aspirins'. Part of the appeal of your approach is the 'proactive' philosophy involved. Your book focuses on the root cause of illness. We finally move beyond the 'reactive' treatment of symptoms. It's a tremendous contribution! Did you consciously set out to provide a proactive alternative when writing the book?

Phyllis: Thank you. I'm pleased that the book has been of value to your family. I had one main goal when I began researching this book. I set out to speak the truth. I really didn't feel that the public was given the full picture. I was convinced that a great many disorders were related to a lack of nutrients. I designed the book so that people could develop their own treatment programs. I really wanted to give people an option to take control of their own health. It took me twenty years of research to get the book done with the most reliable information that I could find.

Graeme: Natural therapies and vitamin / mineral and herbal supplements accounted for 55% of the Australian health dollar last year. Has there been a similar trend in the US?

Phyllis: I'm not sure that the US has mirrored Australia and Europe to this extent, but the natural health sector has increased every year during the past decade.

Graeme: Your book has apparently been a phenomenal publishing success. What are the total sales figures and, are good sales continuing with the third edition?

Phyllis: It has been pleasing to see so many people benefit from the book. At present, with international sales included, there have been approximately seven million copies

sold. Overall, book sales are in a slump at present, but my book still remains the number one seller in its field.

Graeme: ‘Prescription for Nutritional Healing’ was written by your ex-husband and yourself, while your new book, ‘Prescription for Herbal Healing’, is a solo effort. How close was your writing collaboration originally?

“I was convinced that a great many disorders were related to a lack of nutrients. I designed the book so that people could develop their own treatment programs. I really wanted to give people an option to take control of their own health. It took me twenty years of research to get the book done with the most reliable information that I could find.”

Phyllis: We didn’t have a good synergy. I’m afraid that Doctor Balch was not a believer. I guess not many doctors were, twenty years ago, when I started this project. He basically thought that I was wasting my time. It’s funny how success breeds credibility. Now he has become a believer.

Graeme: We are very much concerned with the link between soil health and human health in our work in agriculture. A central concept in ‘Nutritional Healing’ is the link between disease and nutrition. Do you feel that minerals have been given sufficient emphasis in terms of their possible role in the ecology of disease?

Phyllis: At present, there is an underemphasis, but everything goes in spurts. It becomes almost a fashion thing in the industry. Right now, the big ones are phytonutrients and antioxidants, and I’m sure something new will eventually arrive and put them in the background like minerals are now. There definitely isn’t enough consideration of trace minerals, and they really are the key. They are recognised for their importance in assimilating all nutrients. The cells are not getting what they need. It’s like putting out a fishing pole without bait.

Graeme: The argument for the enhanced bioavailability of plant-derived minerals is pretty compelling. Do you support the idea that it would be preferable to source our minerals from plants rather than bottles?

Phyllis: There is no doubt that plant-derived minerals are absorbed far more efficiently. Plants were designed to be the intermediate between animals and the soil. The only reason we source our minerals from a bottle is because the minerals in our soil are depleted.

Graeme: In this context, we argue that people should mineralise their home gardens and pay their children or the elderly to produce their vegetables. If they allocated the money they currently spend on vegetables and vitamin / mineral supplements to this purpose, their family could access plant-derived minerals, enzymes, antioxidants and vitamins. They would also discover ‘champagne’ food with real taste and shelf-life. The other benefit would be the fact that their children would learn the satisfaction in literally feeding the family, and they would also be rewarded financially for their enterprise. Do you think that this concept has merit?

Phyllis: Yes, definitely. I was raised this way, but finding the time is not the only thing preventing people from growing their own food. It may be different in Australia, but in the US most city people simply don't have the ground available for growing. Some of the grocery stores have begun to stock organic fruit and vegetables but, unfortunately, the general public is still in the dark about the importance of eating good quality, organic food.

“There is no doubt that plant-derived minerals are absorbed far more efficiently. Plants were designed to be the intermediate between animals and the soil. The only reason we source our minerals from a bottle is because the minerals in our soil are depleted.”

Graeme: I read recently that Zantac is the biggest-selling drug in history. As usual, drugs are thrown at symptoms. What do you believe to be the root cause of the massive digestive problems in our society?

Phyllis: I believe the biggest problem is that people aren't eating enough raw foods. This is the main source of enzymes and you can't digest your food without these catalysts. People favour cooked, processed foods that lack the enzymes needed for digestion. Enzymes are vitally important for the intake of nutrients for proper bowel function and for the prevention of illness.

Graeme: How do you rate the American diet? Is it gradually improving or is it slipping into a kind of fast food apathy?

Phyllis: It is definitely slipping. It's partly to do with the pace of life and the fact that, in most cases, we have both parents working. Single people are more likely to be 'food-conscious' than families and, while this is better than nothing, it is hardly desirable. Often it's a case where the elite are improving their diet while the majority of people are slipping back. Hollywood is a good example. The Hollywood scene is now tremendously health-conscious, but they can afford the best America has to offer.

Graeme: Tell me about the new book, 'Prescription for Herbal Healing'. Obviously the focus is narrowed, but does it keep the same format as the first book?

Phyllis: The format is similar, because my readers find it user-friendly. I've focused on herbs because they are a completely viable alternative to drugs with all of their side effects. Herbs are buffered and they have tremendous healing powers without the problems and excesses of drugs.

Graeme: We recently interviewed researcher Bruce Tainio in Washington State. He has developed a frequency monitor that can be used to monitor the intrinsic health value of food and herbs. His results suggest that essential oils have around ten times the benefit potential of fresh herbs. Does the new book cover essential oils?

Phyllis: Well, they are a concentrate of the herbs. Essential oils are just that. They are essential because the body does not manufacture them and the brain or cells cannot function well without them. Whether it is salmon, flaxseed, perilla or primrose oil, the body must have them.

Graeme: The AMA has a history of draconian enforcement of their approach, an approach, which is often based on maintaining the status quo. How entrenched is the drug approach in mainstream medicine, and, do you see any softening of the hard line?

Phyllis: If there is any softening, it is only due to public demand for certain products. It's not that they bracket supplements with drugs and treat them the same. The supplements are treated far more harshly. They push to take supplements off the market if they can find one problem for one person, while drugs can kill thousands yearly and remain on the market.

Graeme: Do you believe that cures are suppressed if they threaten the status quo, or is this just conspiracy theorising?

Phyllis: I believe that there is a natural tendency to suppress anything that 'takes money out of the system'. If the public doesn't need to visit the doctor to get medicine, and when the alternatives are much cheaper than prescribed drugs, then it is unlikely that a 'natural' cure for anything would be supported.

Graeme: Are there valid cures for cancer out there? I recently interviewed investigative journalist, Kenny Ausubel, about the suppression of Harry Hoxsey's cancer cure. Have you had any experiences with this or any similar cures?

Phyllis: There is no such thing as a simple cure that will work every time. In my experience, there are invariably a number of factors involved. There are, however, a number of treatments out there, which are valued and should be considered. It comes back to root causes. If people had the right nutrients to support a well-established immune system, then we wouldn't have a cancer plague. One important part of the holistic approach to the cure of cancer is a complete review of diet and giving the body what it needs - supplementing your deficiencies.

Graeme: I read an interesting book recently, entitled 'The Body's Many Cries for Water', where many of our major maladies were linked to a lack of water. Do you think the author may have oversold his case? How important is hydration in human health?

Phyllis: Hydration is very important for our health. It is a major, often unrecognised problem amongst the elderly. Older people tend to lose their desire to drink. They no longer recognise thirst. The brain dehydrates first - similar to the damage associated with alcoholism - and then the organs start to shrink. Dehydration is behind many illnesses of the elderly and it should receive far more attention. Good quality water is critically important for all of us, and most of us don't consume the amount the body needs.

Graeme: I'm often curious about some of the theories that are floated. A few years back, we saw Hulda Clark's book, 'The Cure for All Diseases', where she floated the concept that parasites are the cause of many diseases, including cancer. In your opinion, is there any validity to her theory?

Phyllis: There may be some validity about parasite damage, but I really feel that their role in disease has been overemphasised. Parasites live within and all over our bodies, but they must be in balance. Once again, that balance is diet and nutrition-based. There can certainly be problems when we lose that balance.

Graeme: I suspect there is always an element of overstatement in the numerous ‘silver bullet’ books on the market. Perhaps you could help us sort out the wheat from the chaff in this respect. What is your opinion on the current fad for blood group diets?

Phyllis: I don’t support this concept at all. Some people have embraced these diets for the simple reason that it allowed them to consume meats and other foods they crave. I think there is enough research evidence to support the fact that the vegetarian diet is the most effective. There are new studies showing lower cancer rates, particularly breast cancer, amongst vegetarians. There are also less heart problems and better bone density.

Graeme: What about the premise that the majority of us would benefit from a liver-cleansing diet, due to the toxins in our environment?

Phyllis: Liver cleansing diets are definitely beneficial. Fasting, where we just consume juices and good quality water, is a great cleanser, but there are daily things we can do to cleanse our system. A great approach is to fast from immediately after the evening meal until noon the next day. Fresh fruit, juices or herbal tea can be consumed in the morning. This effectively gives the body an 18-hour fast. This is part of my daily regime.

Graeme: The current trend for high-protein diets?

Phyllis: I don’t find anything special about this form of diet. It puts an additional strain on the liver and kidneys and it can even be dangerous if used for long periods of time. We weren’t designed to be full-time carnivores.

“Liver cleansing diets are definitely beneficial. Fasting, where we just consume juices and good quality water, is a great cleanser, but there are daily things we can do to cleanse our system. A great approach is to fast from immediately after the evening meal until noon the next day.”

Graeme: Similarly, there are also ‘silver bullet’ products that have become ‘flavour of the month’. What is your opinion on the following - Noni juice?

Phyllis: This supplement has its merits, but it is not a silver bullet.

Graeme: ...olive leaf extract?

Phyllis: This is a powerful antibiotic. It is excellent for colds and flu but it should not be used on a daily basis.

Graeme: ...wheat juice?

Phyllis: Wheat juice is great. Fresh wheat grass contains many of the enzymes that are so sadly lacking, and it is a powerhouse of nutrients. It is a fantastic supplement for everyone, and it doesn’t require a large area to grow it for yourself.

Graeme: I often feel sorry for the public as they attempt to sift through the huge array of supplements to choose the most effective option. Antioxidants are a good example. We started with Vitamin C as the ultimate antioxidant, then proanthocyanidins

(grape seed extract) was supposedly 100% more effective. Now we see Patrick Flanagan suggesting that his discovery, Mycrohydrin, is hundreds of times more potent than all of its predecessors. How do we differentiate between antioxidants in terms of their base function? What is the operating principle of an antioxidant like garlic in comparison to something like Vitamin C? Can we get all the antioxidant action we need from a single product or do we need a variety of inputs?

Phyllis: Antioxidants have different functions, just like vitamins do. You can't just take one type to get its full effectiveness. For this reason, it's misleading for manufacturers to compare effectiveness. Antioxidants should always be rotated or combined with other antioxidants. You can't really compare garlic to Vitamin C. I consider garlic to be the most powerful of all herbs, but if I were allowed only one antioxidant, it would have to be Vitamin C.

Graeme: Nutritionist Sally Fallon contends that the unsaturated fats in the American diet now total 20%. This is a 500% increase since the start of the century. Do you consider this excess a problem?

Phyllis: Yes, we do have an imbalance of unsaturated fats in our diet. Cells need essential fats to rebuild, but, as with all things, balance is critical.

Graeme: The South American herb, Guarana has really taken off in Australia as a soft drink stimulant. Are there any potential problems here? Is it really any different than other caffeine drinks like coffee and coke?

Phyllis: Yes, this is an issue. Guarana is advertised as something that is completely harmless when, in fact, it contains caffeine just like coffee and coke. Excess caffeine is behind many heart conditions and nervous disorders.

Graeme: Ayurvedic remedies appear to be gradually gaining in popularity. How do you rate this particular approach?

Phyllis: I am an increasingly enthusiastic supporter of Ayurvedic remedies. In fact, I see them as one of the most helpful and beneficial of all the herbal remedies.

Graeme: In Part 3 of 'Nutritional Healing', you deal with remedies and therapies in-depth. Is there any particular therapy you favour?

Phyllis: It is always difficult to stipulate a 'favourite' remedy, because different disorders require different therapies. However, a general approach, which always achieves results, involves a three-day fast once a month. Cleansing enemas are effective during the fasting period, as are raw food and plenty of good quality water.

Graeme: I have a brain-injured daughter and we have recently started her on an Indian herb called Brahmi. This herb wasn't covered in 'Nutritional Healing'. Does it live up to the memory enhancement claims?

Phyllis: Actually, Brahmi is covered in my new book. It is an Ayurvedic remedy, which increases circulation in the brain and improves long and short-term memory. It enhances attention spans, which can help students, particularly those with learning disabilities. Ayurvedic practitioners claim that it lives up to the memory enhancement claims, but now that it is gaining more mainstream popularity, we should soon be in a position for large-scale evaluation. Only time will tell.

Graeme: I always think of herbal remedies as subtle, slow-acting remedies. Recently, there have been companies advertising a herbal equivalent of Viagra, which they claim to be as effective. In your opinion, is there any validity to their claims?

Phyllis: Yes, there is some validity to their claims. The most effective herbal equivalents appear to be daminia, which is for women, and the appropriately named Aloe Vera for both men and women. The Horny Goat Weed is touted as the best, but there are also other proven stimulants like Yohimbi and Sarsparilla.

Graeme: From a personal point of view, I'd like to ask you about Aloe Vera. We do the agronomy for the largest Australian producers of this herb, and we are considering becoming involved in the marketing of this material as a health supplement. The list of benefits seems almost too good to be true, but I'm aware of how effective it is with burns and sunburn. Does it really reduce cholesterol, counter the effects of ageing, stimulate blood vessel regeneration, reduce indigestion, etc or are the claims a little exaggerated?

Phyllis: The claims may be a little exaggerated, but in general it is fair to say that, if there is such a thing as a single magic bullet, then Aloe Vera would qualify. It is beneficial for many disorders. I know without doubt, from my own patients, that it improves colon function and alleviates skin problems. People are often aware of aloe's potential for topical applications for infections, insect bites or sunburn, but they don't often understand the gains associated with drinking a little aloe. There is research supporting all of the benefits you listed and several more. New HIV studies have shown it to be a very valuable input in that area.

Graeme: Another personal question - We have a five-year old son and, after reviewing the literature and after much soul searching, we decided against vaccination. What is your opinion about vaccination?

Phyllis: I don't believe in vaccinations, except in certain circumstances. It all comes down to the immune system. If your immune system is working well, then the vaccination is counterproductive. The vaccinations give you a touch of what they are 'protecting' you from, and that weakens the immune system. During outbreaks of polio, small pox or pneumonia, they may be required or perhaps to protect the elderly against flu. Beyond these circumstances, they should never be compulsory and really should be avoided. I believe that the mainstream vaccination hype is just another example of the 'system' doing what it does best - drumming up business based on emotion rather than reason.

Graeme: There are a couple of other public health issues I'd like you to comment on. What are your feelings about the risks associated with fluoridation and amalgam fillings?

Phyllis: Well, there is no argument here. Fluoride is a toxic substance and it should never have been forced upon entire populations. Amalgam fillings leach the heavy metal mercury into your body, where it accumulates in the organs, particularly the brain. In my opinion, both should be banned.

Graeme: I assume that you manage your own health with supplements. If you were forced to live on a deserted island for a year and were allowed to take just four supplements, what would they be?

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Phyllis: This is a tough one, because every nutrient is needed. However, B-complex vitamins would come first, followed by Vitamin C, Vitamin E and a colloidal mineral supplement. If I could assume I would have access to nuts, seeds, fish, berries and other fresh foods, I would not require supplements.

Graeme: Thanks for your time, Phyllis. I wish you all the success you deserve with your new book and I thank you again for all the guidance I've derived from the old one.

Phyllis: It's been a pleasure.

DR JOEL WALLACH

Interview recorded December 1999



*It is disconcerting to witness a speed-reader in action. The guide-finger flashes across the page. The riveted eyes scan the text quicker than a computer counterpart, and the 3,000-word article is read and remembered within the time that it took to construct the opening paragraph. This was my introduction to **Dr Joel Wallach** at an intimate little vegetarian restaurant called 'Tomatoes' in the Southern Californian town of Chula Vista, just eight miles North of the Mexican border. My wife, Rosa, and I had travelled to the border town in search of the controversial nutrition guru who is responsible for one of the major marketing coups of the last century. I had handed him one of my articles called 'The Remineralising Imperative' to highlight the fact that we are on similar paths. The two-minute scanning, storage and evaluation exercise that followed may have been equivalent to the ultimate in big chair / little chair office upstaging, but it was an appropriate introduction to the mind, memory and method of this new-age, American medicine man. **Dr Joel Wallach**, ex-veterinarian, medical doctor, author, researcher and internationally renowned educator, recorded and produced a cassette tape of one of his three hundred seminars in 1994. The tape, entitled '**Dead Doctors Don't Lie**', has since gone on to sell forty-seven million copies and has been listed amongst the top five, all-time biggest-selling cassette tapes. The 'Dead Doctors Don't Lie' phenomenon has now extended to a syndicated, daily radio show of the same name, with thirty million listeners and an MLM empire that includes 85,000 distributors marketing plant-derived, colloidal minerals. On the eve of the release of his new seminar tape, entitled 'Live Doctors Do Lie', **Dr Wallach** granted an in-depth interview, providing a fascinating insight into a whistle-blowing maverick who has successfully turned outrage into a highly profitable art form.*

Graeme: Thanks for your time. You must have a busy schedule as your sphere of influence grows. An Internet search revealed 4,222 pages containing references to your work. Have you found the Internet a powerful tool in spreading the word?

Joel: Yes, definitely. We actually use around twenty different tools, but the Internet is one of them.

Graeme: And how does it rate as a marketing tool?

Joel: I'd say, it would rank 6 or 7 now.

Graeme: What is your most effective selling tool?

Joel: Radio - Radio is definitely the leader. I have a syndicated radio program that's live Monday through Friday. I give a ten-minute monologue, usually drawn from my impressions of the daily news, and then the balance of the hour is made up of a

talk-back question and answer format. There are now 153 stations involved, totaling 30 million listeners a day. The program is called 'Dead Doctors Don't Lie'.

Graeme: Do you have any idea how many people around the world have heard your 'Dead Doctors Don't Lie' tape? There are so many Australians familiar with it - It really seems to have struck a cord.

Joel: Well, there have been 47 million of those tapes sold legally and I figure that at least as many have been pirated. That's 90 million tapes, and if ten people on average listen to each tape, then we are looking at reaching 900 million people. It's funny, we get people coming back from the Middle East, and they say that they were going to the pyramids on a camel, and the camel guy said, "*Have you heard some of this tape - Dead Doctors Don't Lie?*" It's everywhere. And, as far as tapes go, it ranks fifth in the world, behind the Beatles, who sold 109 million. Next is Garth Brooks, who sold 89 million, the next is Barbara Streisand, who sold 82 million, then Elvis sold 79 million, and the 'Dead Doctors Don't Lie' tape sold 47 million, and the sixth is Eagles who sold 26 million, and Michael Jackson is number seven at 25 million.

Graeme: That is an incredible achievement. I notice in your book, 'Rare Earth's Forbidden Cures', that you chose a quote from William Albrecht on the cover to illustrate inherent nutrition problems associated with soil demineralisation. We are also heavily influenced by Albrecht's work - How has his legacy influenced your work?

Joel: Well, he was my soils professor when I went to the University of Missouri. I was privileged to study under him. My first degree was in agriculture, with a major in animal husbandry and nutrition, and my minor was in field crops and soil. Albrecht was the main man during those four years and certainly had a great influence on my life.

Graeme: I didn't realise that you had a soils background...

Joel: It's a small world.

Graeme: It's a sobering thought to realise that Albrecht's work would have passed into obscurity if it hadn't been for Charles Walters and his revivalist skills.

Joel: Oh, absolutely. Charles has definitely picked up the cudgel, as they say, and fought on with it. We all have a lot to thank him for. The fact is that, if we are to survive, then we have to think in his terms.

Graeme: Your approach toward the conventional medical establishment has been very much a confrontational one. I agree that it's way past the time for some straight talking, but have you ever found that the antagonism has been counterproductive? - That you may have alienated potential allies?

Joel: No - I tried for twenty-five years. I wrote scientific articles that were published in medical journals and veterinary journals. I wrote textbooks that are still available in the medical libraries, with 1000 pages, 2000 illustrations, published by the biggest medical publishing houses. I lectured to doctors for twenty-five years, and they found the concept of having to nourish the soil and nourish people, like we did animals, to be a very boring subject and not worth their while. That's why I went back to school to become a physician myself and then started using veterinary and agricultural techniques on my human patients. The average life span of doctors in America is 58 to 62, depend-

ing on whose statistics you look at. America is ranked 17th in the world in longevity and 19th in health, despite the fact that we have the most expensive and most technologically advanced health care system in the world. Realistically there is nothing in the score cards that says that anyone should listen to doctors when it comes to health and longevity. They're simply not any kind of positive source whatsoever. In fact, when you combine all the statistics from the Center for Disease Control - Harvard Medical School, and Ralph Nader, who's a consumer advocate, then you'll find that doctors kill somewhere between 150,000 and 300,000 Americans each year in hospitals alone as a result of medical negligence. They injure 1.3 million each year in hospitals and infect another two million. In this morning's issue of 'USA Today' you'll read the headline - *"Doctor's mistakes in hospitals in America is now rated as the number eight killer of Americans."* I don't have any apologies for beating on them, because they deserve it.

Graeme: You mention in the preface of 'Rare Earth's Forbidden Cures' that US jails now house more than one million prisoners...

Joel: It's actually two million now.

"... doctors kill somewhere between 150,000 and 300,000 Americans each year in hospitals alone as a result of medical negligence. They injure 1.3 million each year in hospitals and infect another two million."

Graeme: ... and that remineralising is the key to a reduction in criminal behaviour. There are numerous examples of violent crimes listed in the book to highlight this concept, but do you have the facts to support this premise - either anecdotal or statistical? A jail would actually be a good closed system to validate a concept like this. Has anyone done any work?

Joel: There's been a little bit of work on specific mineral deficiencies and excesses, primarily copper and lithium. There's no doubt about it - There's a wonderful study done by Gerhard Schrauzer in Texas. It was written up in the book 'Rare Earth's Forbidden Cures'. The study involved a number of counties in Texas, where there is basically no lithium in the drinking water (naturally occurring), and they had an enormous amount of aggression, drugs, drunken driving, armed crimes, murder, rape and armed robberies. Then they looked at the equivalent counties that had significant amounts of lithium in the drinking water - They had almost none of those crimes!

Graeme: There was that much difference? I briefly reviewed that study and noted the statistical significance, but I wasn't aware of a big difference.

Joel: There was a huge difference! I would far rather see lithium in the drinking water than fluorine!

Graeme: I share your feelings about fluorine, but what about chlorine? Just looking at the level of pollution in this country, it's hard to envisage a world without chlorinated water.

Joel: Well, you can use ozone, but it's not as cost-effective. Chlorine kills bugs, and it has been one of the major contributors to extended life spans in this country. Doctors, being Clintonesque, like to claim credit for the average life span of Americans going

from 45 years of age in 1895 to 75.5 years now, but it was the bug killers that should take the credit! Chlorinated water, soap, washing hands, personal hygiene, disinfectants, food storage - these are the things that ended food poisoning, cholera, salmonella and shigella. These are the sorts of things that have extended people's lives, not doctors' loving care or heart transplants. Heart transplants haven't extended average life spans at all!

Graeme: You have a history as a veterinarian, which appears to have equipped you more thoroughly in terms of an understanding of nutritional deficiencies than conventional medical training. I recently interviewed Dan Skow - a veterinarian agronomist who has pioneered an alternative approach in sustainable agriculture. How important a role has the vet training been in the development of your approach to human nutrition?

Joel: It's been everything. We learned in veterinary medicine that we had to have a herd health system, because we couldn't afford to constantly treat individual animals for specific diseases, otherwise there would be a 'sticker shock' for you. Your ground meat would cost you \$275 a pound.

Graeme: I'm not familiar with the term 'sticker shock'.

Joel: That's when you like a consumer item, thinking that it should be worth around \$50 and it turns out to be worth \$50,000 - That's sticker shock. It's an American term. As I said, the price of meat would be outrageous if we used human-type health care systems for livestock. In 1936 there was a Senate document, US Senate Document 264, which stated very clearly that there are no longer many nutritional minerals left in our farm and range soils. Sixty-three years ago, they stated that crops were mineral deficient, and animals and people that ate these crops suffered from mineral deficiencies. They suggested that the only way to handle the associated diseases was either to supplement animals and humans or to fertilise our soil properly. The veterinary industry responded very quickly to this information and began to supplement animals with vitamins and minerals to prevent and cure diseases. It was an economical way to do it on a herd basis. Unfortunately for humans, we got wonder drugs around this time. We got sulfur drugs in 1936, Penicillin in 1938 and Cortisone in 1942. It was very easy for the medical trade to calm the American public and say "*Look, give us enough money for medical research, and we'll find a wonder drug for everything!*" People bought into that then. They chose to have symptoms treated rather than addressing causes, and today they are buying into it again. They are looking at genetic engineering as a 'cure-all'. There will never be a genetically engineered protein or a wonder drug. There will never be a wonder drug that will ever take the place of the minerals and vitamins that we need to develop properly and maintain our health. We are hooked by an umbilical cord to the soil, and we have to give thanks to plants, because they are literally able to turn stones into bread.

Graeme: Hydroponics is a huge growth industry. How does a growing medium independent of the soil fit into this paradigm?

Joel: There are serious limitations with hydroponics. Plants can manufacture carbonaceous materials - cellulose, wood, fibre, sugar, starch, vitamins, amino acids and fatty acids - by taking carbon dioxide out of the soil and using the sun's energy in a process which we all know as photosynthesis. But plants cannot manufacture minerals. If you can find me a plant that can manufacture minerals, you and I will be millionaires.

People have been falsely advised that ‘you can get all of your nutrition from the four basic food groups.’ That little sentence has killed more Americans than all of the wars that we have been involved in during the 221 years we have been a nation. Plants can’t make minerals. If they are not in the soil, they can’t be accessed. Nutritional minerals are like gold and silver. They aren’t uniformly distributed around the crust of the earth. They occur in veins like chocolate ripple ice-cream, and that’s why you have to test the soil for their presence. Often there is variety within a single field.

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Graeme: I took exception to one of your statements in your book, that it is a forlorn hope to try and remineralise our soils. You suggested that supplementation is the only alternative. Our company practices an approach involving precision nutrition. We balance and biologically activate the soil to maximise mineral availability, and then we use minerally rich materials like kelp, fish and humates, in conjunction with absorption-enhancers like fulvic acid, to ensure full mineral uptake. It is not a forlorn hope. We are currently achieving this goal very successfully with thousands of growers on a daily basis.

Joel: Believe me - you’re preaching to the converted. The soil is the key, if it is feasible, but in many cases it is not economically viable, particularly in the production of staple foods like cereals.

Graeme: Yes, I agree - that is the most difficult arena in which to build fertility, because of very limited budgets. Just continuing with the scheduled questions - A recent Time Magazine cover story focused on the incredible growth in the alternative health market, to the extent that there is now a higher percentage of the health dollar directed towards vitamin and mineral supplements and natural therapies than towards conventional medicine. Have you personally witnessed this upsurge of consumer interest, and what has it meant to you?

Joel: Well, thirty-five years ago, when I started lecturing to doctors, there was very little interest. In 1978 I started lecturing to the general public on alternative health and nutritional approaches to preventing and curing diseases. There was quite a bit of interest from the public, but today there is overwhelming interest. I used to get 50 people at a lecture - now I get 1200. I give 300 lectures a year, and it’s quite moving to witness the level of interest. I predict that, within the next ten years, the medical profession will do an about turn and claim that they have discovered the mineral link to disease.

Graeme: I suspect that you may be right. It strikes me that the decline in confidence in conventional medical practitioners, which may well have a sound basis considering their total lack of training in nutrition, also opens the door to anyone who calls them-

selves a 'naturopath'. The public assumes that these experts will have a more complete understanding, but the six-month certificate associated with some of these diplomas simply doesn't provide enough training to guarantee good advice. Do you see this inadequate training problem contributing to a future credibility problem in the natural health fraternity?

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Joel: There are several states here which require a comprehensive four-year degree to register as a naturopath physician. In the other states all you have to do is register for \$25 and you can hang a license on your wall. The nice thing about these people, even the untrained ones, is that they very rarely kill anyone. When you visit these people, at least you are not taking your life in your hands.

Graeme: I agree with you totally that health is the 'ultimate individual responsibility', but I still believe that consumers should have some guarantee of qualified advice to help them become more discerning in their personal choices. This is becoming an example of classic 'culture shock', where a foreign technology is thrust upon an inexperienced community who have no established criteria with which to judge. It becomes a case of the best sales people profiting, and this is not the way to establish a new health philosophy.

Joel: Well, the direction won't come from the Government - They depend on the medical community for advice. Change will have to come from a ground swell of individuals - a grassroots movement. People will need to educate themselves to become more discerning. Salesmanship aside, the bottom line will be that the successful companies will be those with products that work.

Graeme: The power of marketing is so pervasive. One would assume that sales of food like Coca-Cola and McDonald's would decrease as nutritional awareness increased, but it's not the case.

Joel: The fastest growing food group in the world is Coca-Cola. Their growth rate is around 5% per month, while most other foods are tripping along at half a percent per year.

Graeme: It amazes me that China has embraced the junk food chains so passionately. Do you have an insight into why they are rushing so blindly to degrade their diet?

Joel: My wife, Ma Lan, is from Mainland China, and I've spent quite a bit of time there. Essentially we have sold them the concept that the West has the best of everything. It's marketing once again, but although we are all obviously heavily influenced by advertising, the Chinese are new at the game and they are less sophisticated. They are definitely more easily manipulated. Their traditional diet is not perfect, but they live on average five years longer than we do, and they have half the cancer rate that we

do. They are also happier and less stressed than we are. There is no hunger and zero unemployment.

Graeme: In your book, you implicated a mineral link to recent third world atrocities. Do you have any evidence to suggest that the holocausts in Rwanda, Haiti and Somalia were linked to mineral malnutrition, as you've suggested? Are these particular countries actually any more deficient than the majority of the third world countries?

Joel: Sure. If you look at the soils in these third world countries, they are not the same. If you look at Serbia, for example, in terms of mineralisation and fertility, you will find very poor soils. The happiest, most content areas are always those with the most fertile soils. Look at the soils of Northern Ireland in comparison to Sussex, England, for example. I mean, physical development and cultural development of people is dependent on the soil. Look at the Amazon rainforest. Those soils are completely leached from constant rain. The rainforest simply wouldn't survive if it weren't for the dust that blows over from West Africa. The people in that area have not developed in parallel with other cultures. The people are a lot shorter, and many have low IQs. They simply haven't developed because of the lack of nutrition in their soils. Relative rainfall plays a huge role in the amount of minerals you will find in any soil. There are clear demarcations of mineral distribution related to rainfall. In New Zealand, for example, half of the country suffers severe selenium deficiency in the soils, and the other half is rich in selenium. People are affected the same way. In these situations, unless you are aware and are fertilising properly, you will suffer health problems through the inadequate minerals. You will end up a victim of a greedy medical doctor treating symptoms but never addressing the cause of your disease.

Graeme: You have a lot of detractors on the Internet and elsewhere. I'd like to run some of their arguments past you. There appears to be a debate, for example, about the absorbability of colloidal minerals...

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Joel: Invariably you will find that the detractors are selling a competing product, but in this case it should be made clear that there are two types of colloidal minerals on the market. There are the rock mineral-based products - those made from limestone, clays or seabed materials, and I would agree that these are not very absorbable. They make good fertiliser, but they don't make good nutrition for animals and people. Plant-derived minerals are a completely different proposition. They make up only half a percent of the total liquid minerals on the market. A lot of the negatives people are talking about are actually related to the 99.5% of liquid minerals that are not plant-derived. We are designed to get our minerals from plants. They are the only living things that can efficiently convert inorganic materials into a bio-available form. If you eat foods that are grown on soils that don't contain all 60 of the minerals required for human health, then you have to supplement. You have to be educated to eat well enough to ensure that you get all 90 essential nutrients that ensure health - all of the vitamins, minerals, trace min-

erals, amino acids and fatty acids. Supplementation is the easy way. If everyone supplemented with 90 essential nutrients, there would be no 100 billion-dollar snack food industry in this country. The minerals remove the need for salt and sugar, which fuels the snack food market.

Graeme: I have to agree that junk food reigns in this country. I've travelled on public transport where 90% of the passenger were eating snack foods at one time.

Joel: It's part of why we have two million prison inmates.

Graeme: It's common over here to see babies in a pram with a can of coke in one hand and a candy-covered doughnut in the other.

Joel: Just breeding up the serial killers! [Laughing]

Graeme: Returning to the detractors. You claim 98% bio-availability for plant-derived, colloidal minerals, but it is often contended that the colloidal particle size is still much larger than chelated, soluble mineral ions, and absorbability is compromised accordingly. It must be confusing for consumers to be presented with so many conflicting viewpoints.

Joel: For thirty-five years I was an academic working for the National Science Foundation and others, writing my books and scientific papers, and everyone took my information and bastardised it for their own commercial gain. Most times they were doing everything wrong, and people were attacking the concept. It was a bit like William Albrecht. He was constantly chastised by the fertiliser companies. In the end I decided to market my own range of minerals. You have to be aware that there are three types of colloidal minerals; inorganic minerals, which are finely ground rock minerals; chelated colloids, which are about ten times more absorbable; and plant-derived, colloidal minerals. My product is derived from humic shale - ancient plant material from a time millions of years ago, when plants contained much higher percentages of all minerals. A main difference here is that these colloids are also naturally chelated. They are organically combined with lipo-proteins. These lipo-proteins make the colloidal mineral particle very, very absorbable. The debate about particle size you mentioned does not allow for the increase in absorption related to natural chelation. A significant amount of the weight of this material is carbonaceous - it is organically bound. It's not inorganic materials. We get people you have been on standard colloidal minerals forever, with no perceptible benefit, but when they switch to plant-derived minerals, they literally throw away their crutches.

Graeme: [laughs]. It sounds like a good sales line, if nothing else.

Joel: No, seriously - remember, I talk to thirty million people a day on my radio program. There are something like 300,000 people a day who use our products, and it grows at the rate of 200 a day. I hear thousands of anecdotes about the benefits.

Graeme: While I'm playing the devil's advocate, I'm offering one final comment from the detractors. They often question health benefits of the heavy metals like aluminium, lead and arsenic found in your mineral blends, due to their toxicity.

Joel: Well, arsenic and aluminium are well known essential nutrients. The only reason you don't see aluminium deficiencies is because it's the most common mineral in the crust of the earth - 12% of the earth's crust. It's found in everything you eat.

There's more aluminium in a six-ounce glass of wine than there is in a whole quart of our plant-derived, colloidal minerals. We've known since 1947 that arsenic in parts per million is an essential nutrient. It prevents all kinds of diseases in livestock and humans, including Carpal Tunnel Syndrome and Slipped Tendon Disease. Lead in parts per billion is required for DNA and RNA to duplicate. The critical thing is that we are talking parts per million or less. I mean you can kill people with calcium or potassium. Anything is toxic if oversupplied.

Graeme: You link the discovery of penicillin and the drive for patentable drugs as the deathblows of large-scale research into mineral nutrition. If profit motive is the key-factor here, do you see a possible revival of interest on the horizon, simply because there is now such consumer demand for mineral supplements?

Joel: Well, yes definitely, but the research isn't really happening yet. If anything, the limited research funds for nutrition study are being cut back, because everyone is into genetic modification.

Graeme: It is a source of amazement to Australians that GMO-technology appears to have been so readily accepted by American consumers. There are millions of hectares of this freak food being produced here. Where is the public outcry? Where are the labelling laws? How do you explain the difference in public perception here compared to Europe and Australia?

Joel: It's called marketing. When you spend billions of dollars on marketing, you can make anybody believe anything. I think the companies involved have concentrated on the US first to gain acceptance, with the hope that they can export that inherent acceptance elsewhere. They really didn't allow for the scale of the European backlash.

Graeme: The intensity and frequency of TV advertising has amazed me here. Advertising seems to account for two thirds of the airtime. The ads are often so schmaltzy - it's hard to believe that anyone would fall for them.

Joel: Fifth grade reading level is all it takes. People living on french fries and Pepsi become a lot more gullible.

Graeme: Do you think there is a place for the promotion of the home vegetable garden to ensure mineral nutrition? One hundred square meters of garden - soil-tested, balanced and remineralised - would feed most families at a lower cost than daily mineral supplementation with expensive MLM products.

Joel: Yes, it's theoretically possible, but it comes down to the time factor. People don't have that kind of time.

Graeme: I still think that, if people paid a retired person to maintain their vegetable garden, it would still be more cost-effective than constant supplementing. The retiree would also enjoy the sense of purpose and job satisfaction.

Joel: It's not going to happen, not unless there's a massive catastrophe. It happened during World War II with the victory gardens, but these days people would rather sit on their butt and watch hockey.

Graeme: If they paid a pensioner, they could still sit on their butts downing beer, but they may feel less inclined to when they are pumped up with plant minerals.

Joel: It would be such an expensive exercise to conduct a mass education campaign on that scale, with no financial return to offset that cost, that it could never happen. There is a huge train with 300 million people rolling along. There is massive industry involved in snack food, with vested interest in maintaining the status quo.

Graeme: I guess you're right. It's just that good supplementation usually involves what I call 'elite nutrition' - Only the yuppies or the wealthier sector can afford to do it. I really want to see good nutrition available for the average family. The rural people, who I like so much, often don't have a disposable income.

Joel: The problem is that these products cost money to produce. You would have to be in a position where you could move millions of quarts at a time. It takes seventy-eight pounds of dry humic shale to derive the mineral component of one quart.

Graeme: I understand that the minerals are leached from the humic shale by soaking. What happens to the rest of the material after soaking?

Joel: Only 20% of the minerals can be removed through leaching. The other 80% remain in the humic material, and this is sold as mineral fertiliser.

Graeme: That sounds like an interesting material. It's a pity about the US exchange rate, or we might look at using something like that. Returning to my questions, I was hoping to interview Patrick Flanagan during this visit. What is your opinion of his findings with Hunza Water and his new, hydrogen-based antioxidant based on those findings?

Joel: I admire Patrick, but he has a totally different theory that doesn't knit at all with my approach. I have no doubt that the secret to the longevity of the Hunzas is based on the rich mineral content of their water supply. The 'glacial milk', which is used to grow their crops, produces mineral-rich plants that in turn influences human health. Patrick believes that the secret lies in the energetics of that water. He has a silicon-based product on the market called Mycrohydrin. In my opinion, you have to be pretty far out in the ozone to think that you can make sixty essential minerals from hydrogen and silica.

Graeme: He is not promoting a mineral supplement. His concept involves the antioxidant value of hydrogen.

Joel: Yes, but to market it as the secret of the Hunza Water is not realistic. Patrick has a lot of science behind him, but his concepts are a little eccentric. If you want hydrogen, then drink water.

Graeme: He's talking about the negatively charged hydrogen ion - perhaps you should look more closely at his research. Incidentally, have you read the book 'Your Body's Many Cries for Water'?

Joel: Yes, I agree with the central premise that most people are dehydrated. They simply don't drink enough water. I would like to spend some time, though, with Patrick Flanagan and perhaps bring him under my wing. He has to decide whether he wants to be an academic that only he can understand or if he wants to reach large numbers of people by becoming more accessible.

Graeme: I'd like to ask you about social responsibility. If we fully understand the GMO debate, for example, and are aware of the potential for disaster, shouldn't we all be more actively campaigning to halt this abomination?

Joel: The American situation is unique because of the power of lobbying. s can go to a senator or US representative with a million dollars and say *“Here, put this in your pack committee for re-election if you vote for Frankenstein foods”* - They don’t know anything about it, they don’t care, they’ve got their million dollars in their pack committee. These are the forces you are fighting. The military analogy is appropriate. You have to decide what battles you can win, where to fight and where the pressure points are. You can be Don Quixote and expend your life and your family and your wealth fighting against irresistible odds or you pick the battles you can win, and you go around the ones that you can’t and you deal with them later. Sometimes they just die on the vine through lack of attention.

Graeme: I doubt very much that the GMO issue will die on the vine if we ignore it. I believe that consumers are the power base in these cases. GMO food would literally die on the vine if consumers refused to buy it. That’s why labeling is so important, but I’m getting off track. Returning to mineral nutrition - you suggest that the craving for salt and sugar in the form of fast food and snack foods is a form of pica - a craving based on mineral malnourishment. Is there an obvious reduction in desire for these foods when the body’s mineral needs have been satisfied? Is a mineral-rich diet actually the best way to lose weight?

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Joel: Absolutely! There is no doubt about it. The single bottom-line root cause of people being overweight is mineral deficiency. People overeat not through hunger but from a compulsion to satisfy a need. They just haven’t realised, in many cases, that the itch they can’t scratch is, in fact, a mineral craving. When people eat chocolate and Coca-Cola and salty snack foods, the body temporarily translates the salt and sugar intake as satisfaction. This is because, before we changed the rules, minerals always came hand-in-hand with natural sea salt or rock salt and sweet fruit and vegetables. Junk food is the salt and sugar without the minerals. The satisfaction is temporary, and very soon the body decides *“No, this wasn’t it”* and you begin looking again. The whole snack food industry would collapse overnight, if everybody were to supplement with the right kind of minerals.

Graeme: You also argue that alcoholism and drug addiction are pica-like responses to nutrition problems. It seems like it would be fairly easy to research the benefits of mineralisation when treating addicts. Again, theoretically they should have a reduced compulsion when minerally satisfied. Are you familiar with any research in this area?

Joel: How do you get people off alcohol? You move them to sugar. How do you get them off sugar? You move them to minerals. We get thousands of people off alcohol and drugs.

Graeme: Surely someone like the Betty Ford Clinic could run with this concept, or at least do some in-depth research?

Joel: They could, but they wouldn't. If people were to discover that they could rid themselves of their addictions in ten days, then these sorts of institutions would no longer be required. Always remember, they are in the business of business, they are not in the business of truth.

“Absolutely! There is no doubt about it. The single bottom-line root cause of people being overweight is mineral deficiency. People overeat not through hunger but from a compulsion to satisfy a need. They just haven't realised, in many cases, that the itch they can't scratch is, in fact, a mineral craving.”

Graeme: There are so many paradigm-shaking contentions in your books, and yet they do make such good sense and appear to fit the facts. There is such a parallel with plant nutrition vs. genetics, where many of the changes the Biotech companies are trying to extract with gene tampering, can actually be achieved more successfully with nutrition. You comment on Down Syndrome, for example, where the disease is always associated with older mothers. You argue that the reason older mothers are more susceptible is because they are more minerally deficient after having already produced several other children. The upsurge in teenage births has also created high rates of Down Syndrome in their children, due to their notoriously poor diets. Zinc deficiency has been shown to damage foetal chromosomes. It is a genetic defect, brought about through a mineral shortage. Has conventional medicine embraced any of these concepts?

Joel: No, they haven't. I'll tell you how stupid it is. They have been arguing, for I don't know how many years, about putting folic acid in grain products to help prevent Spina Bifida. Now they say, *“Well, you can prevent up to 50% of Spina Bifida with folic acid supplementation.”* What about the other 50%? That 50% is a simple zinc deficiency. Why not give all 90 essential nutrients and not have to worry about any possibility of those diseases? There are books, four inches thick, which cover every nutritional deficiency during pregnancy and the related diseases you can expect to find. All pregnant women should supplement with the full nutritional spectrum. Are doctors interested in these facts? No, they are not! Are governments interested? Rarely! It's not like the information is not available.

Graeme: It's hard to accept that a profession, which has taken the Hippocratic oath, could be this neglectful. I know for a fact that there are many doctors who are sincere and who are trying to do their best by their fellow man.

Joel: But they all get offended when you come to them with the truth. When my tape 'Dead Doctors Don't Lie' came out, there was a universal response by doctors who said, *“Just the title offends me. I'm not going to listen to that tape - it infers that live doctors lie.”* Well, I know that. I've never lied, and the staff in my clinic have certainly never lied, and yet the insurance companies say that 78% of insurance fraud is perpetuated by medical doctors and 58% of the medical doctors, last week at their meeting in LA, admitted that they had lied to get paid by insurance. My next tape is to be called

‘Live Doctors Do Lie’, because they have finally admitted it. They are offended by the truth when it’s going to cost them money. That’s where the rubber meets the road. If there was a lot of money in using nutrition, then they would do it.

Graeme: In the TIME Magazine cover story I mentioned earlier, the AMA reported that they had been swamped by doctors seeking more information about nutrition. They apparently recognise the fact that they are losing increasing amounts of business to the natural health industry. I’m told that an Australian medical degree includes just 40 minutes of nutrition education in five years!

Joel: In the US, doctors get thirty seconds in fourteen years, so you guys are a lot better off. Doctors will often say to me, *“Before I listen to the tape, is there any way I can make money at this?”* I always say, *“Well, aren’t you interested in your patients’ welfare?”* - and they always go quiet.

Graeme: But there is money to be made if it has to get that mercenary. I’ve looked at the margins in the supplement industry, and they are pretty healthy. Do you think it is perhaps more a case of a fear of the unknown? They literally know so little about nutritional medicine, they are afraid to consider it.

Joel: Well, we don’t have enough doctors hurting yet. When doctors’ surgeries are closing, when their wives are leaving them, you know the old story: *“When the money goes, the love goes.”* - when they can’t keep up with the alimony, then they will get interested [laughs].

Graeme: I think that’s a little harsh.

Joel: It’s harsh, but it’s reality. I mean, I know these guys, I’ve dealt with them for thirty-five years.

“In the US, doctors get thirty seconds in fourteen years, so you guys are a lot better off. Doctors will often say to me, “Before I listen to the tape, is there any way I can make money at this?” I always say, “Well, aren’t you interested in your patients’ welfare?” - and they always go quiet.”

Graeme: It was horrifying to be confronted with animal health parallels, where diseases comparable to muscular dystrophy have been virtually eradicated by selenium supplementation during and before pregnancy. Your own work with selenium and cystic fibrosis had you nominated for a Nobel Prize. Has conventional medicine accepted this breakthrough, or do they still continue to blindly treat symptoms?

Joel: They continue to blindly treat symptoms. There are only two doctors even interested, and they are academics. The rest of them have actually virtually declared war on me. They’ve sent dossiers to doctors with my photograph, saying that I shouldn’t be permitted to talk to any of their patients. Every one of the Cystic Fibrosis and Muscular Dystrophy Centres has done that.

Graeme: Are you serious? They can so easily write you off as a quack?

Joel: Well, again, it's the same situation. If you solve the problem, then they no longer exist. It's a self-preservation thing. You seem to assume that the medical industry is interested in truth. You give them too much credit.

Graeme: You are without a doubt the most outspoken, anti-establishment researcher that I've ever encountered. Do you get any flack from the AMA, FDA or drug companies?

Joel: Well, it's not just mainstream medicine. I get a lot of flack from competing companies in nutrition, because my approach conflicts with theirs. They are trying to protect their product lines, which are often doomed, when people discover how much better plant-derived, colloidal minerals work. Doctors get offended because their lack of education is so pitifully obvious, and their egos get bent out of shape. Instead of keeping an open mind and trialling some of my products on their patients, they immediately attack me personally. I've been on many televised debates with doctors. They always attempt to demonise me personally to prevent me from interrupting their cash flow.

Graeme: In your section on mineral links to longevity, you claim that adequate daily intake of the 90 essential nutrients - 60 minerals, 16 vitamins, 12 amino acids and three essential fatty acids - can enable the human being to reach his or her genetic potential of 140 years. The Hunzas and four other long-living races are cited as proof of this contention. Do you believe that in our polluted, high-stress environment these supplements alone are capable of counteracting the toxins and psycho/physical pressures to significantly lengthen our lives?

Joel: Yes, and if you don't supplement, you are doomed to a shorter, more unhealthy life. Even in our modern environment the right supplements can provide a 30% increase in longevity. There is no doubt about it. All of the animal studies show that, by tripling the density of nutrients per mouthful, you can double the life span. Now, if it's true in every laboratory animal and farm animal and family pet, then, as sure as God made little green apples, it is true in people, too.

Graeme: Do you supplement heavily yourself?

Joel: I take 120 nutrients twice a day, ninety of which are known to be essential, the other thirty will probably eventually be recognised to be of value. Statistically, based on animal science, I can prevent nine hundred diseases and reverse eight hundred. I'm sixty years old and I can still lift my own weight. I don't have any aches or pains. I have all my own teeth, no blood pressure problems or diabetes, no low blood sugar and no cancer or heart disease. I can still shoot a sparrow's head off at 300 yards, with an open sight rifle!

Graeme: [laughs]. I suppose that's a desirable thing to be able to do?

Joel: I work twelve hours a day, seven days a week, and I've been doing it for thirty-five years. I'll match my strength, endurance and memory with anybody.

Graeme: I understand that you market your products using multi-level marketing. As I mentioned earlier, the downside to this approach is the high final price to consumers, because so many people have had a bite at the cherry. I don't see it as an encouragement for large-scale change.

Joel: Well, I think some people have to make sacrifices to attain a longer, healthier life. \$2 a day will do it.

Graeme: Yes, but US\$2 per person per day for a family of five in Australia is around \$120 per week. I believe we have to cut that figure by two thirds.

“Yes, and if you don’t supplement, you are doomed to a shorter, more unhealthy life. Even in our modern environment the right supplements can provide a 30% increase in longevity. There is no doubt about it. All of the animal studies show that, by tripling the density of nutrients per mouthful, you can double the life span.”

Joel: The other side of the network marketing is that we have 85,000 distributors making a good living from home. We have people making \$30,000 per week. From a capitalistic viewpoint, this is a significant contribution to the economy. I had a preacher who took three days collecting cans to make the six bucks investment needed to become a distributor in our company. One year later he is making \$8,000 per month.

Graeme: In agriculture we have pioneered an in-depth fertility analysis called Soil Therapy. Are there cost-effective and reliable tests available that could provide similar personalised analysis for human nutrition? Is hair analysis, for example, reliable enough?

Joel: Yes, it’s very similar to what you are doing with the soil. Like everything else, you need to understand how to interpret the raw data.

Graeme: Does hair analysis just cover the seventeen recognised minerals?

Joel: No, depending on the company, you can measure thirty-two to fifty different minerals.

Graeme: We have established ‘ideal levels’ of each nutrient relevant to specific soil types. Is this same sort of precision possible with human nutrition? Have you, for example, identified levels of all sixty minerals in ppm or ppb for the human body in given situations?

Joel: Sure, that’s possible, but it’s not usually cost-effective. We usually settle for broad-spectrum supplementation, based on the US Ag Department’s findings that 95% of Americans are minerally deficient. That’s the most economical way to approach it.

Graeme: I’m personally interested in the potential for mercury toxicity from amalgam fillings. I’ve got a whole mouthful of the things. My dentist has always argued that a potential risk has never been established. Should all fillings be removed, or can mineral substitution keep the toxins under control?

Joel: Get a new dentist - you need those things to be taken out. You need to find someone with the right equipment to remove them, though, because there is a risk of off-gassing more mercury. You need a vacuum system and a rubber dam and other stuff necessary for removal, or you may have a toxicity problem.

Graeme: In your seafood diet, at the end of ‘Rare Earth’s Forbidden Cures’, your short list of exclusions included extra virgin olive oil - Why exclude this one, particularly if it’s cold-pressed?

Joel: Because, to get enough of the essential fatty acids by drinking olive oil, you would need to drink a quart a day, and that’s not possible. The Greeks and Italians, who use the most olive oil, have an average life span of 75.5. There is no link to longevity. The cultures that live beyond 120 don’t use olive oil at all. They cook with water and butter. My daddy always said, *“If you want to get to the truth, you look at people who have successfully achieved something.”*

Graeme: Other exclusions included all forms of sugar, as sugar loads increase the normal rate of mineral loss in sweat and urine by 300% in a twelve-hour period. Successful remineralising is seen as impossible if sugar is not removed from the diet. Is there any room for compromise here? Is it not possible to cut back by 50% and gain benefits?

Joel: In 1895, according to the US Ag Department, Americans were eating half a pound of sugar per person per year. Today, we are consuming 152 pounds of sugar per person per year! My suggestion to people is that, if you want to live to 120 years and not be sick and miserable for the last twelve to fifteen years of your life, you have to begin toward developing zero tolerance for these things. All of the long-living cultures are relatively poor. They don’t have access to sugar. We have become an increasingly unhealthy society as sugar consumption has increased. It has become our most destructive poison. Secondly, we know that when you crave sugar, you are minerally deficient.

Graeme: I must admit that I didn’t do too well on your quiz to determine a possible pica problem. I rated 89 on the pica scale in the book.

Joel: Well, there you go. You now know your problem [laughs]. In one chapter of my book, I analysed the diets of different religious groups. The success of religions to keep people on diets is very high. It lifts the diet out of the realm of self-control into the area of institutionalised management. I looked at religious dietary laws in relation to increased longevity. There were two religions that jumped out of the pile.

Graeme: Which were they?

Joel: They were, the Seventh Day Adventists and the Mormons. They both average ten years longer life than the rest of the religions. They both exclude sugar, caffeine, alcohol and cigarettes. It strikes me that this is not too big of a sacrifice to gain a decade.

Graeme: But, if you decide that you want to enjoy some of these luxuries in moderation, can you counteract by taking extra minerals?

Joel: Yes, you definitely can. If you want to enjoy sugar-based treats from time to time, then you have to over-supplement to compensate. A 30% increase in minerals is usually enough. There is no nutritional requirement at all for carbohydrates. You can make carbohydrates; you can make blood glucose out of fat and out of protein. If you crave carbohydrates, it’s a signal that you are minerally deficient. White flour and pasta are as bad as sugar. You need to work toward removing them from your diet.

Graeme: I read that a copper deficiency is the primary cause of grey hair. I notice that you have reached sixty without any greying. Is it minerals or hair dye? [Laughing].

Joel: No, there is no dye. It's just a case of supplying sufficient copper in your diet.

Graeme: Can you revert grey hair with copper supplements? I've had grey hair since I was twenty-five.

Joel: It's definitely a copper deficiency, and you could revert to your former hair colour if you addressed the problem. I see it every day with my clients. It can be quite humorous when a seventy-year old grey-haired man returns to his former redheaded glory.

Graeme: I'll certainly give that a try. Thank you very much for your time. I'll post you a copy of Australian Acres when the interview is published. If you ever make it to Australia, you're welcome to stay with us.

Joel: It was a pleasure. It's a pity you didn't have more time - you could have come out to my farm. We have 168 acres. We use a byproduct of the colloidal mineral manufacture out there - it's a great soil conditioner and fertiliser. There are good yields and great taste in the fruit and vegetables.

Graeme: We would have liked to have visited. Maybe next time.

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