Section Seven

Supplementary Information

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Rudolf Steiner

Rudolf Steiner (February 25, 1861 – March 30, 1925) was an Austrian philosopher, literary scholar, architect, educator, artist, playwright, social thinker, and esotericist.

He was born in Kraljevica, Croatia, then part of the Austrian Empire. He is the founder of anthroposophy[1], a movement based on the notion that there is a spiritual world accessible to pure thought through a path of self-development, and many of its practical applications, including Waldorf education, biodynamic agriculture, anthroposophical medicine and new artistic expressions, especially eurythmy.

Steiner advocated a form of ethical individualism, to which he later brought a more explicitly spiritual component. In his epistemological works, he advocated the Goethean view that thinking itself is a perceptive instrument for ideas, just as the eye is a perceptive instrument for light.

He characterized anthroposophy as follows:
Anthroposophy is a path of knowledge, to guide the spiritual in the human being to the spiritual in the universe... Anthroposophists are those who experience, as an essential need of life, certain questions on the nature of the human being and the universe, just as one experiences hunger and thirst

Childhood and Education

Steiner's father was a huntsman in the service of Count Hoyos in Geras, and later became a telegraph operator and stationmaster on the Southern Austrian Railway.
When he was born, his father was stationed in Murakirály in the Muraköz region, then part of Hungary (present-day Donji Kraljevec, Međimurje region, northernmost Croatia). When he was two years old, the family moved into Burgenland, Austria, in the foothills of the eastern Alps.

In his childhood, Steiner was interested in mathematics and philosophy. From 1879 to 1883 he attended the Technische Hochschule (Technical University) in Vienna, where he studied mathematics, physics, and chemistry. In 1882, one of Steiner's teachers at the university in Vienna, Karl Julius Schroer, suggested Steiner's name to Professor Joseph Kurschner, editor of a new edition of Goethe's works. Steiner was then asked to become the edition's scientific editor.

In his autobiography, Steiner related that at 21, on the train between his home village and Vienna, he met a simple herb gatherer, Felix Kogutski, who spoke about the spiritual world "as someone who had his own experiences of it...." This herb gatherer introduced Steiner to a person that Steiner only identified as a "master", and who had a great influence on Steiner's subsequent development, in particular directing him to study Fichte's philosophy.

In 1891 Steiner earned a doctorate in philosophy at the University of Rostock in Germany with his thesis, later published in expanded form as Truth and Science.

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[1] For more information on anthroposophy go to www.anthroposophy.net

Writer and Philosopher

In 1888, as a result of his work for the Kurschner edition, Steiner was invited to come to the Goethe archives in Weimar to become an editor for the official complete edition of Goethe's works. Steiner remained with the archive until 1896. As well as the introductions for and commentaries to the resulting four volumes of Goethe's scientific writings, Steiner wrote two books about Goethe's philosophy: The Theory of Knowledge implicit in Goethe's World-Conception (1886) and Goethe's Conception of the World (1897). During this time he also collaborated in complete editions of Arthur Schopenhauer's work and that of the writer Jean Paul and wrote articles for various journals.

During his time at the archives, Steiner wrote what he considered his most important philosophical work, Die Philosophie der Freiheit (The Philosophy of Freedom) (1894), an exploration of epistemology and ethics that suggested a path upon which humans can become spiritually free beings.

In 1896, Friedrich Nietzsche's sister, Elisabeth Forster-Nietzsche, asked Steiner to set the Nietzsche archive in Naumburg in order. Her brother by that time was no longer compos mentis. Forster-Nietzsche introduced Steiner into the presence of the catatonic philosopher and Steiner, deeply moved, subsequently wrote the book Friedrich Nietzsche, Fighter for Freedom.

In 1897, Steiner left the Weimar archives and moved to Berlin. He became the owner and chief editor of as well as an active contributor to the literary journal Magazin für Literatur, where he hoped to find a readership sympathetic to his philosophy. At this time he was also a close friend of the anarchist writer John Henry Mackay. Dissatisfaction with his editorial style led to his departure from the magazine.
Steiner was among many (including Emile Zola) who wrote in defense of Alfred Dreyfus, a Jewish Captain in the French army falsely accused of treason.

Rudolf Steiner 1900

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Spiritual Research

Beginning around 1900 and until his death in 1925, Steiner articulated an ongoing stream of "experiences of the spiritual world" — experiences he said had touched him from an early age on. Steiner aimed to apply his training in mathematics, science, and philosophy to produce rigorous, verifiable presentations of those experiences.

Steiner believed that non-physical beings existed everywhere and that through freely chosen ethical disciplines and meditative training, anyone could develop the ability to experience these beings, as well as the higher nature of oneself and others. Steiner believed that such discipline and training would help a person to become a more creative and loving individual.

Steiner's goal for his work was for it to be a development of the philosophical work of Franz Brentano - with whom he had studied - and Wilhelm Dilthey, founders of the phenomenological movement in European philosophy. Steiner was also influenced by Goethe's phenomenological approach to science.

Steiner set forth his spiritual research in a vast number of texts and lectures; notable are: *Theosophy: An Introduction* (1904), in which he sets forth his ideas of the body-soul-spirit constitution of the human being, reincarnation, and the unity of the spiritual and sense-perceptible ("as two sides of a single coin").

Knowledge of Higher Worlds (1904/5), in which he describes his conception of a path of spiritual development, detailing many principles of life (openness, positivity, respect for others), spiritual exercises (control of thought and will, directed imaginations) and experiences likely to arise on this path (trials and spiritual perceptions).

An Outline of Esoteric Science (1910), in which he describes a vast panorama of cosmic evolution, the spiritual hierarchies that guided and guide this evolution, and the path of spiritual development that leads to such perceptions.

Steiner led the following esoteric schools:

His independent Esoteric School of the Theosophical Society, founded in 1904. This school continued after the break with theosophy and eventually led into the School of Spiritual Science of the Anthroposophical Society, founded in 1923. This was intended to have three "grades", but Steiner only developed the first one of these. Unlike most esoteric schools, all of the texts relating to the "School of Spiritual Science" have been published (in the full edition of Steiner's works).

In 1906 Steiner became leader of a lodge called Mystica Aeterna within the masonic Order of Memphis and Mizraim, an affiliation that ended around 1914. Steiner added to the masonic rite a number of Rosicrucian references. (The figure of Christian Rosenkreutz also plays an important role in several of his later lectures.)

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Steiner and the Theosophical Society

A turning point in Steiner's life came in 1899, when he published an article titled "Goethe's Secret Revelation" on the esoteric nature of Goethe's fairy tale, The Green Snake and the Beautiful Lily. This article led to an invitation by the Count and Countess Brockdorff to speak to a gathering of Theosophists on the subject of Nietzsche. Steiner continued speaking regularly to the members of the Theosophical Society, becoming the head of its newly constituted German section in 1902. (It was also within this society that Steiner met Marie von Sievers, who was to become his second wife.) In 1904 Steiner was appointed by Annie Besant to be leader of the Esoteric Society for Germany and Austria, having made it clear that this school would teach a Western spiritual path harmonious with, but differing fundamentally in approach from, mainstream Theosophical paths.

The German Section of the Theosophical Society grew rapidly as Steiner lectured throughout much of Europe on his new spiritual science. Initially, there was a harmonious relationship of mutual appreciation between Besant and Steiner despite the divergences in their spiritual paths and teachings. Beginning in 1907, however, tensions began to grow between the main society and the German section over a variety of issues. These came to a head over the question of Jiddu Krishnamurti, a young Indian boy to whom Besant and Leadbeater attributed messianic status. The vast majority of German-speaking theosophists broke away to found a new Anthroposophical Society at the end of 1912. Shortly thereafter, Besant revoked the German section's membership in the Theosophical Society on the grounds of the national section's refusal to allow admission to adherents of the Krishnamurti cult Star of the East.

The Anthroposophical Society and its Cultural Activities

The Anthroposophical Society grew rapidly. Fueled by a need to find a home for their yearly conferences, which included performances of plays written by Eduard Schuré as well as Steiner himself, the decision was made to build a theater and organizational center. In 1913, construction began on the first Goetheanum building, in Dornach, Switzerland. The building, designed by Steiner, was built to significant part by volunteers who offered craftsmanship or simply a will to learn new skills.

Once World War I started in 1914, the Goetheanum volunteers could hear the sound of cannon fire beyond the Swiss border, but despite the war, people from all over Europe worked peaceably side by side on the building's construction. In 1919, the Goetheanum staged the world premiere of a complete production of Goethe's Faust. In this same year, the first Waldorf school was founded in Stuttgart, Germany.

Beginning in 1919, Steiner was called upon to assist with numerous practical activities. His lecture activity expanded enormously. At the same time, the Goetheanum developed as a wide-ranging cultural centre. On New Year's Eve, 1922/1923, it was burned down by arson; only his massive sculpture depicting the spiritual forces active in the world and the human being, the Representative of Humanity, was saved. Steiner immediately began work designing a second Goetheanum building – made of concrete instead of wood – which was completed in 1928, three years after his death.

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During the Anthroposophical Society's Christmas conference in 1923, Steiner founded the School of Spiritual Science, intended as an open university for research and study. This university, which has various sections or faculties, has grown steadily; it is particularly active today in the fields of education, medicine, agriculture, art, natural science, literature, philosophy, sociology and economics. Steiner spoke of laying the foundation stone of the new society in the hearts of his listeners, while the First Goetheanum's foundation stone had been laid in the earth. He gave a Foundation Stone meditation to anchor this.

Attacks, Illness and Death

The arson had a context. Threats had been made publicly against the Goetheanum, and against Steiner himself. Reacting to the catastrophic situation in post-war Germany, Steiner had gone on extensive lecture tours promoting his social ideas of the Threefold Social Order, entailing a fundamentally different political structure; he suggested that only through independence of the cultural, political and economic realms could such catastrophes as the World War be avoided. He also promoted a radical solution in the disputed area of Upper Silesia - claimed by both Poland and Germany -; his suggestion that this area be granted at least provisional independence led to his being publicly accused of being a traitor to Germany.

In 1919, the political theorist of the National Socialist movement in Germany, Dietrich Eckart, attacked Steiner and suggested that he was a Jew. In 1921, Adolf Hitler attacked Steiner in an article in the right-wing "Völkischen Beobachter" newspaper and other nationalist extremists in Germany were calling up a "war against Steiner".

The 1923 Beer Hall Putsch in Munich led Steiner to give up his residence in Berlin, saying that if those responsible for the attempted coup [Hitler and others] came to power in Germany, it would no longer be possible for him to enter the country; he also warned against the disastrous effects it would have for Central Europe if the National Socialists came to power.

The loss of the Goetheanum affected Steiner's health seriously. From 1923 on, he showed signs of increasing frailness and illness. He continued to lecture widely, and even to travel; especially towards the end of this time, he was often giving two, three or even four lectures daily for courses taking place concurrently. On the one hand, many of these were for practical areas of life: education, curative eurythmy, speech and drama. On the other hand, Steiner began a new, extensive series of lectures presenting his research on the successive lives of various individuals, and on the technique of karma research generally. The theme of karma, he once said, was his true life mission; though he had attempted to treat it before, it had never met with sufficient interest. Finally, he had an interested listenership.

By autumn, 1924, however, he was too weak to continue; his last lecture was held in September of that year. He died on March 30, 1925.

Biodynamic Farming

Biodynamic agriculture, or biodynamics comprises an ecological and sustainable farming system, that includes many of the ideas of organic farming (but predates the term). In 1924, a group of farmers concerned about the future of agriculture requested Steiner's help; Steiner responded with a lecture series on agriculture. This was the origin of biodynamic agriculture, which is now practiced throughout much of Europe, North America, and Australasia. A central concept of these lectures was to "individualize" the farm by not bringing outside materials onto the farm, but producing all needed materials such as manure and animal feed from within what he called the "farm organism".

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Other aspects of Biodynamic farming inspired by Steiner's lectures include timing activities such as planting in relation to the movement patterns of the moon and planets and applying "preparations", which consist of natural materials which have been processed in specific ways, to soil, compost piles, and plants with the intention of engaging non-physical beings and elemental forces. Steiner, in his lectures, encouraged his listeners to verify his suggestions scientifically, as he had not yet done.

The early decades of the twentieth-century saw new methods of agriculture being proposed and used Steiner believed that the introduction of chemical farming was a major problem. Steiner was convinced that the quality of food in his time was degraded, and he believed the source of the problem were artificial fertilizers and pesticides, however he did not believe this was only because of the chemical or biological properties relating to the substances involved, but also due to spiritual shortcomings in the whole chemical approach to farming. Steiner considered the world and everything in it as simultaneously spiritual and material in nature, an approach termed monism. He also believed that living matter was different from dead matter. In other words, Steiner believed synthetic nutrients were not the same as their more living counterparts.

The name "biologically dynamic" or "biodynamic" was coined by Steiner's adherents. A central aspect of biodynamics is that the farm as a whole is seen as an organism, and therefore should be a closed self-nourishing system, which the preparations nourish. Disease of organisms is not to be tackled in isolation but is a symptom of problems in the whole organism.

Sourced from *http://en.wikipedia.org/wiki/Rudolf_Steiner*

Further information on Rudolf Steiner can be found at: *http://www.anthroposophy.org.uk/book/*

Rudolf Steiner

Rudolf Steiner (1861-1925) was born in Austria. He found his life's work in the realms of consciousness and cognition.

His techniques for the development of awareness to nature's cycles, daily meditation and concentration practices, and clear critical thinking can lead individuals to reach spiritual levels of consciousness safely. He believed working along with the spiritual worlds enriches the life of the individual and the world.

A university student of mathematics, science and philosophy in Vienna, he later earned a doctorate from the University of Rostock. He edited the scientific writings of Goethe, whose approach, based on intensified, selfless observation of nature, became a source of inspiration for his own work. Steiner's doctoral dissertation dealing with Fichte's theory of knowledge was later expanded and published as Truth and Science. In 1894, he published The Philosophy of Freedom, which he felt to be his most important philosophical work.

Steiner brought forth out of his spiritual experiences an abundance of scientific, medicinal, agricultural, social, educational, architectural, and artistic renewal. Steiner called this science of spirit, Anthroposophy, meaning "wisdom of the human being." Anthroposophy is non-religious, and enhances many Buddhist, Christian, Muslim, and other traditional practitioners endeavors.

Author of almost thirty books, Steiner also gave approximately 6,000 lectures on a wide range of subjects. He initiated Waldorf education, biodynamic farming and gardening, an approach to the care and education of the handicapped, anthroposophical medical work, and an art of movement called eurythmy

Sourced from *http://www.steinercollege.org/rs.html*

Importance of Farming

Karl Kaltenbach on Farming and Farmers

From a speech by Karl Kaltenbach at the opening of the Mansfield Rudolf Steiner School Victoria September 1997. Contributed by Mark Patton.

"I believe that the farming community is the foundation of any culture. It is the basis for all other aspects of life and for the strength and well-being of our whole nation. Everybody is dependent on primary industry. When farmers no longer produce healthy food, then everyone's health suffers, and when the farming community is depressed, because of national disregard for their economic needs, then the whole nation feels these depressing vibrations. Thus I believe a Steiner School in Mansfield will need to relate its curriculum especially to the rural aspects of life. It can equip its pupils with inner values which will help them in the future renewal of the spirit of the healthy farming community.

"Farmers are therefore the mainstay of any culture of any nation. Nations which neglect farmers are also doomed to social destruction. this is what happened in the old Soviet Union. Agriculture was industrialised and thus destroyed from within, through so called theoretical-rationalism. Now, as a result, the country can no longer produce sufficient food. Their soils are depleted and indirectly the situation has now affected the whole of present Russia, which is in chaos.

"Farmers have a most important responsibility for the whole population of the world. Farmers grow food and it must be healthy. Farmers tend to the land and it must be tended in a healthy way so that the next generation still has soil left to grow their wheat. Farmers need to appreciate the spirituality in nature, and work with it in a practical and thoughtful manner. Farmers provide the foundation of the economy and culture and we all must see that they can properly take up this important work: Thus a society should base all values of life on what it takes to grow agricultural products.

"Agriculture can only grow in a responsible way, when it can maintain and restore, where necessary, the health of the soil. his can only be achieved when the city people, the industrialised people, take up spiritual - human-natural values in their own lives. In other words, when they protect farmers from the all-powerful industrial groups, which all too often propose development simply for the sake of quick and easy financial benefits. We must not keep feeding the egoism of consumers with high tech equipment. The environment can no longer sustain these desires. We must learn now to value rice and wheat more than the television set, and pay realistic prices to the farmers which will allow them to use sustainable methods in growing food. Only this approach will give back to the farmers their long-lost dignity and respect.

"All these thoughts have to do with your school. The previous generation of farmers often sent their children away to city schools. Maybe now it is time for a reversal. In the future, people will perhaps send their children to country schools and the most modern educational system will in future be placed in rural areas. They will recognise I hope, that country schools which are surrounded by living nature, in which one can feel the spirit of renewal for this land, have a major role in recreating a realistic system of spiritual values. This will foster an appreciation for the living organism of the earth, for the living water, for the living air, for the living light. This new appreciation will then turn back the tide of industrial economic destruction, and encourage a caring for the earth and for the health of everyone in society."

Essentials of the Biodynamic Farm

Steiner's approach can be called *qualitative-ecological* in contrast to the *analytical-quantitative approach* of conventional science. "Ecological" is here meant to embrace all the earthly and cosmic forces that form life. Biodynamics puts qualitative-ecological principles into practice in the following ways:

Biodynamic farms are formed in the image of an organism. They have a site-adapted and balanced combination of plant and animal husbandry. Biodynamic farms attempt to be self-sufficient with respect to manures and feed-stuffs. Within the totality of the farm, human capabilities and needs and marketing potential get due attention.

Production is sustainable because it is based on cropping and manuring systems that preserve and improve the productivity of the soil. Farm-produced manures are carefully collected and handled to recycle nutrients. If necessary, slowly soluble minerals are used.

Disease and pest control are primarily based on the preventative potential of the system, i.e. a combination of enterprises, and also on inoffensive substances. Weed control is achieved by rotating crops and by cultivation. Specific dynamic measures to regulate weeds and pests are being developed and are to some extent already in use.

Feed for livestock is mostly produced on the farm, and the production of seedstocks is adapted to the system and to the site.

The life processes in the soil, plants and manure are regulated and stimulated by dynamic measures. This is achieved by using small quantities of preparations made from herbs and other substances.

Consideration is given to subtle processes and interactions. These interactions include those of plant and animal communities, insect and bird life, moist biotypes, wooded and agricultural land, hedges, and other ecological niches. The general life of nature and plant life in particular are considered to be immersed in a wider environment including the cosmic realm surrounding the earth. The solar year rhythm and other bio-chronological rhythms are considered important for the growth and quality of produce.

Stable and satisfactory economic returns can be provided by biodynamic systems. From the standpoint of the national economy, the biodynamic farm produces optimum results while wisely managing resources and energy. The biodynamic farm does not pollute because it avoids using a host of questionable agricultural chemicals.

The macro-ecological effects of the layout and management of biodynamic farms are the maximum possible conservation of soils, the quality of water bodies, the enhanced health of wildlife, and the improved quality of the rural environment.

Human values and a unity between a world view and motivation are furthered by a caring approach based on giving and taking.

A longing in the hearts and minds of many people living in our technically and economically orientated society has made itself heard since the 1960s. Many are looking for a way of life that unties and heals rather than for one that tends to isolate people or split them into interest groups. Many of these people are also interested in alternative agriculture. However, such longings may create their own restraints unless a modern, scientifically sound, spiritual knowledge of man and nature forms a firm basis for a sensitive and ethical approach. Biodynamics is based on such an approach.

Dr Herbert Koepf, *The Biodynamic Farm,* Anthroposophic Press, 1989

The Living Planet

Michael Dowd in a monograph, The Big Picture.

"Earth is not a planet with life on it; rather it is a living planet. The physical structure of the planet – its core, mantle, and mountain ranges – acts as the skeleton or frame of its existence. The soil that covers its grasslands and forests is like a mammoth digestive system. In it all things are broken down, absorbed and recycled into new growth. The oceans, waterways, and rain function as a circulatory system that moves life-giving "blood", purifying and revitalizing the body. The bacteria, algae, plants, and trees provide the planet's lungs, constantly regenerating the entire atmosphere. The animal kingdom provides the functions of a nervous system, a finely tuned and diversified series of organisms sensitized to environmental change.

"Each species is a unique expression of life, with its own unique consciousness and its own unique gifts to the body. Humanity allows the planet to exercise self-conscious awareness, or reflective thought. That is, the human enables Earth to reflect on itself and on the divine mystery out of which it has come and in which it exists. We are a means by which nature can appreciate its own beauty and feel its own splendour; or destroy itself.

"This shift, from seeing ourselves as separate beings placed on Earth ("the world was made for us") to seeing ourselves as a self-reflective expression of Earth ("we were made for the world"), is a major shift in our understanding of who and what we are. It is a shift at the deepest possible level: our identify, or sense of self."

Man is What he Eats

By Viktor Schauberger

A free people can only arise from a free earth. A people who violate Mother Earth have no right to own a home…Man is what he eats and remains an animal so long as the build-up of products of quality is stifled. So a cycle is completed: infected water cannot produce healthy food. Infested water and poisoned nutrients cannot produce healthy blood. One is only superficially aware that the spiritual functions have not been developed and that the decreasing quality of grain production has an effect on future generations…

The modern farmer violates the earth, which reacts by opposing her sungod. He strips yearly the skin of the earth and applies poison as artificial manure and then wonders why this wretched process demands more work and yields less and less each year.

The old farmer was, for the clod of the earth, both its priest and its doctor. The modern farmer, on the other hand, is personally and collectively harassed politically and is concerned about government subsidies. He believes that he can, to a massive extent, defy nature.

The modern doctor is similarly quite helpless in combating the increasing speed of cancer. He is unable to stimulate the internal strength of the body, which has been weakened through digesting foodstuffs produced by artificial fertilisers. In certain glands, symptoms of putrefaction can be detected. In the same way, the modern impatient farmer driving his machines in the fields, is required to put in more work with a corresponding reduction in the rate of yield, which is governed internally by the earth (not by what is added).

Olof Alexandersson, *Living Water,* Viktor Schauberger, Gateway Books, 1976, pg110

Formative Forces in Nature

The Etheric, Astral and Ego

"We need to approach an all-encompassing wisdom once again, and not be content merely to rattle off the words; 'The human being consists of physical body, etheric body,' and so forth, which can then be memorised like a recipe. This is not the point at all. What is important is that the knowledge of these things be introduced
everywhere, that we recognise these things in everything we meet. If we become clairsentient in the manner I explained, we will be guided to recognise the way things in nature really are."
Rudolf Steiner

"The physical body can only be maintained in a shape and form suitable for a human being by means of a human ether body, which must in turn receive the appropriate forces from an astral body. The ether body is the sculptor or architect of the physical body. However, it can only shape the body in the right way if it receives the stimulus to do so from the astral body. The astral body contains the prototypes according to which the ether body gives the physical body its form."

Rudolf, Steiner, *An Outline of Esoteric Science*, p65, Anthroposophic Press, 1997.

Astral Forces

Astrality is embodied by the animal kingdom, recognised by the forces of digestion. The cow; with its four chambered stomach, has an extremely well developed digestive system. The resulting manure is permeated by both the etheric forces; which have come from the plant kingdom and astral forces; which have come from a thorough digestive process.

"These etheric and astral forces are inherent in the manure; all we have to do is to preserve them so that they have an enlivening and astralising effect on the soil, and not only on the watery part of the soil, but also on the earthly mineral component."

Steiner, R., *Agriculture*, p72

Forces in Nature

"What I chiefly wish to indicate is that we must treat the whole of agricultural life with the conviction that we need to pour vitality, nay even astrality, in all directions, so as to make it work as a totality."

"We are giving to the earth something ethereal and astral which exists by rights inside the belly of the animal and there engenders forces of a plant-like nature. For the forces we engender in our digestive tract are of a plant like nature.

"In the dung, therefore, we have…something ethereal and astral. The astral and ethereal adheres to it. We have only to preserve it and use it in the proper way…It has a life-giving and also astralising influence upon the soil, …in the earth-element itself not only in the watery; but notably in the earth element. It has the forces to over come what is inorganic in the earthly element."

"To manure the earth is to make it alive, so that the plant may not (be in) a dead earth and find it difficult, out of its own vitality, to achieve all that is necessary up to the fruiting process. The plant will more easily achieve…the fruiting process, if it is immersed from the outset in an element of life."

Quotations from Rudolf Steiner

The Farm as an Individuality

The farm individuality has four bodily aspects which are:

- The ego, "I am" or "self" is the governor or regulator who sets the program.
- The astral body, soul or psyche that expresses thinking, feeling and will under governance of the ego.
- The etheric body that expresses the movement of fluids within the organism.
- The physical body which contains the mineral elements.

The farmer is the ego function and puts his or her stamp on the farm by making decisions on how and when things happen.

The astral body is represented by the birds, bees, insect life in general both above and within the soil and the animals. In fact it encompasses all living things that live and move in the farm environment.

The etheric body is represented by all that flows within the farm environment like rain and soil water, the sap that runs through all plants helping give rise to all manifestations of form. It is in this realm also that we find the divisions of earth, air, fire and water. Roots and the nerve sense system, sap, blood and water in a landscape, the air in the soil, in water, in plants and lungs of animals and humans, and then the manifesting of warmth in soil, water air and blood.

The physical body can be seen in the mineral elements including carbon, calcium, silica and all the other elements of the periodic chart.

In the farm individuality, all the bodily aspects that make up the whole should be in balance with each other and each body should be in balance within itself if a healthy, happy environment is to prosper, in all senses of the word.

Peter Bacchus, Sourced from *Harvests,* Volume 59, No. 1.,
Magazine of the New Zealand Biodynamic Association

A Question of Energy

"To Schauberger, as we have seen, the growth process was above all a question of energy. He understood growth as a balancing process between geospheric energy and atmospheric energy. He saw the plant as the end product of energies meeting each other above the insulating layer of the earth. Thus all his attempts to encourage growth were devoted to increasing the soil's energy, and to encouraging the build-up and preservation of the energy 'skin'. He rejected all activity that removed energy from the ground and damaged the insulation. Consequently he was, for example, a vigorous opponent of Thomas-phosphate, a product of the blast furnace which drains the soil of strength. When it is introduced to the soil it tried to compensate for it by attracting new energy.

"One way to build up the ground energy is by adding stable manure, compost, micro-nutritional elements and catalysts to the soil, which in turn should be well covered and protected from the rays of the sun. Also, iron tools are to be avoided. It is of course important that the whole landscape is healthy, with forests and water living natural lives, as it is from these sources that the ground energy originates. Schauberger stresses, on the other hand, that the ground's energy could be increased by using biological machinery."

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"The whole decline of agriculture, our most important source of nutrition, could, according to Schauberger, be halted if we were to humbly recognise Nature's order and copy its methods. We must acknowledge that growth does not depend on chemical and mechanical inputs, but on the balance of energy relationships of soil and water."

Olof Alexandersson, *Living Water,* Viktor Schauberger, Gateway Books, 1976, pg105

Carbon, Oxygen, Nitrogen, Hydrogen, Sulphur

Steiner states that today's chemistry does not come much further than taking snapshots of people you meet in the street: *"What we understand about these substances through today's chemistry is actually no greater that the knowledge we have of people who we have passed in the street, people we have photographed perhaps, and whose external appearance we recall with the help of the photographs"...*

On the contrary, to come to a full understanding of the life of plants one of the first things to find out is the deeper nature of these five elements and the role they play in the household of nature where cosmic and earthly forces can only work through the substances of the earth.

We have to learn to see these substances as carriers (mediators) of certain higher spiritual principles. So which higher aspects do "arrive on earth" through these 5 substances?

Carbon

Carbon is described as the *"Bearer of all structuring processes in nature".* Through those structured frameworks the great images of the universe (which are the source of all forms in the natural world) can be revealed in plants, animals and human beings; where plants "stiffen up" through this working of carbon, human beings dissolve the solidified carbon again and again in ever changing forms.

Oxygen

Oxygen carries the life principle out of the wide periphery of the universe and through it those unceasing, life generating forces are able to flow into the earthly matter on the waves of oxygen activity. Without oxygen all matter would be dead and would appear as "frozen", rigid forms only. Chemistry comes about through the actions and reactions of oxygen. Without oxygen there would be no chemistry.

Nitrogen

Without the help of nitrogen oxygen would not be able to reach the carbon frame work, where life needs to meet the great images of the universe: nitrogen has the role of the soul between body and spirit; nitrogen like the antipathy and sympathy forces of the soul wants to escape the earthly as much as it wants to connect itself with it. The life principle stays in the periphery or becomes active in the carbon frame work with the help of nitrogen.

Hydrogen

But where spirit, life and sensitivity have lived in a physical form there is also this principle that enables those forces to vanish from the earth again. Hydrogen carries this process of dissolving and dispersal into the expanses of the universe, in order to undergo a king of cleansing, purification.

Sulphur

Sulphur is described as the mediator between the structuring ability of the spiritual and physical sphere. Sulphur means "sun-like forces". It is the bearer if light and its working with the four other elements can be compared to the water the potter uses to wet his fingers and shape the clay.

Sourced from Richard Swann, editor Star and Farrow, U.K.

Metamorphosis in Plants

Goethe was the first to understand the metamorphosis in plants, a study of the different stages of plant development. Each stage has a period of expansion and contraction.

Goethe saw the alternating stage like this:

Contracted form	Expanded form
Seed	Cotyledons
Bud	Leaves
Calyx	Petals
Pistils, stamen	Fruit

Each node of the plant shows this alternating pattern. First, the concave cup side of the leaf node expands outward. It supports the convex growth bud, which is contracted into an upward reaching from. The bud generates a new node and the pattern repeats. At the topmost node, the bud is still generating new growth. We see here the repetition of the contracted-centre to outward-seeking centre.

Steiner explained this alternation as connected to the two poles of life force. There is an earthly forces associated with water, the moon and the element calcium. This force is evident in lush, rounded plants forms, the vegetative part of reproduction and the quantity of plant stuff. This growth pattern originates in the centre-seeking polarity.

Its complement is a maturing forces associated with light, warmth, the sun and the element silicon. This force hardens the plant, develops vertical form, assists with bringing the outside or cosmic pattern into the plant. The cosmic nature shows up as quality of the plant, through nutrition, aroma, fruiting and flowering. AS we will discuss later, Steiner proposed two special preparations which enhance these polar forces. The earthly force is enhanced with a preparation made from cow manure and the maturation force with a preparation made from crystalline silica.

Elementals, BD Tasmania, No.72 December 2003,
Expansion and Contraction in Plants, David Robison

Elemental Beings

A report by the agronomist and farm advisor Immanuel Voegele of a conversation between Rudolf Steiner and Kurt Walther at the Guldesmuhle on Aug 12, 1920. Immanuel Voegele could not be present for the actual conversation, but upon his return he converted Kurt Walther's notes into the following report:

The beings of the elemental kingdom – the gnomes, undines, sylphs, salamanders – help build up and form the plants. These beings were led and influenced by higher beings who are now withdrawing from this activity, just as at certain times these higher being withdraw their influence within human beings and apply themselves to higher tasks. The elemental spirits are thus left to themselves, and other spirits (Lucifer, Ahriman) seize them and draw them away from their work in forming the plants. The result will be a diminution of the spiritual forces of the plants and a gradual general atrophy, against which even artificial fertilisers will not help.

What must now be striven for is that human beings familiarise themselves with the elemental kingdom, that they attempt to come in connection with these elemental spirits. In a sense, human beings must take over and prevent other powers from using the elemental kingdom, and must strive to influence these spirits in such a way that they continue to assist the growth of plants.

If human beings are able to cultivate these kinds of forces in themselves, they will become priests as farmers. If it is not possible to bring about such a connection, then in a few decades human beings will have to experience that the yield and quality of the products of the fields are diminishing and that no remedy can be found.

The undines take part in the formation of dew. These spirits too are on the verge of being drawn away from their previous activities by other beings. In time this could have the consequence that the formation of dew would gradually cease. Here too human beings must strive to bring their influence to bear.

A further task for human beings is to live consciously with the rhythm of the seasons (namely, to experience nature in spring through the physical body, in summer through the etheric body, in autumn through the astral body, and in winter through the ego). With such an attitude a spring planting, for example, will have a completely different mood then that of an autumn planting.

In order to gain a spiritual relationship to the animal kingdom, the human being must penetrate to the group souls of the animal genera. One can already perceive – and this will increase significantly – that the instincts will no longer avoid poisonous plants in their fodder, but will rather eat them along with the rest.

When human beings penetrate to the group souls, they can then compensate, for example, for the weakening of the animal' instincts; the animals can thereby be helped.

Elementals, BD Tasmania, Issue No. 52 October 1998

A Healing Approach to Forestry

By Pieter Tideman

Polarity is a working principle with which we can examine nature to learn more about the inherent laws which are active in it. Through spiritual science, as elaborated by Rudolf Steiner, we receive much aid in the process. In this article we shall turn our attention to the trees, building up our understanding of the various polarities at work within and around them. We shall see that this approach to science leads to insights which can bring healing to the dying forests.

In the first lecture of Rudolf Steiner's course on agriculture he shows how nature exists within the fundamental polarity between cosmic and earthly forces. How are the forests involved in this polarity, and how does this work out in the landscape?

We can see the trunk of the tree and the wooden branches as an upheaval of the earth, and upon this uplifted earth an annual growth of plants sprouts every year anew as the foliage of the crown. Every plant attracts cosmic forces which surround it as a more or less dense cloud. So around these numerous plants which form the crowns of trees, cosmic forces are accumulating to such an extent and density that you can nearly "smell" it in close forests. Rudolf Steiner indicates that the insects have the task of stabilizing the cosmic forces around the plants. To do so in the forests would overtask them, so this work has been shared by the birds.

We might expect that the polarity between cosmic and earthly forces would be visible in the interaction of the natural environment and the living physical body of the tree. As we are within the realm of life, we are speaking of qualities which can no longer be observed merely by chemical analysis. The overall form of the tree gives us a long-term impression of it, and the annual leaves may demonstrate this polarity in the shape of their leaves. Each tree species expresses it in its own way.

We will try to distinguish between four main form-tendencies of the tree as a whole. Next we will try to find some relation between these four tendencies and the four elemental qualities.

-A tree with superficial roots and a tall sharp-topped shape shows affinity to the quality of warmth: Spruce, Beech.
-A tree with heavy bole and branches indicates earth: Oaks.
-Deep-rooted trees with a broad crown and spreading branches, point to water: Linden.
-Shallow-rooting trees with a graceful crown consisting of an abundance of fine twigs that sweep in the air indicate air and light: Elm and Birch.

Gradually we perceive the polarity of these qualities in the tree: warmth and light are taking the cosmic side, water and earth the terrestrial one.

In the leaves according to Bockemuhl[2], we have to distinguish four form-tendencies that can be chacterised as follows:

-Long leaf-stalks and strong protruding veins ending at the leaf borders: earth-quality.
-Broad leaves with spreading veins: water-quality.
-Incisions in the leaf border up to divided leaf: light-quality.
-Sharp-pointed, small, contracted leaves inclined to withdraw along the leaf stalk into the stem: warmth-quality.

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[2] *In Partnership With Nature*, By Jochen Bockemuhl, Bio-Dynamic Literature, Wyoming, 1981

Here also the polarity of the first two qualities and the last ones may become evident. We may say that the dominance of coniferous forests will sustain the warmth-quality of a landscape. This may include more light (Hemlock) or less (Spruce). Pine forests may bring in some of the earth and water element.

Deciduous forests have more affinity with the earth and watery life within a landscape, e.g. Oak, Linden, Maple, Poplar, Willow. But always all four qualities are functioning together with different accents.

Plants, shrubs and trees, especially as hedges, form the bridge, the connection and mediation between the cosmic and terrestrial forces in nature. Our landscapes show the dynamic character of the balance between them. The proportion of cultivated fields and woodland dictates the quality of this balance. An open agricultural landscape, in the corn belt, for instance, can be characterized as young and vital, with an emphasis on production qualities. On the other side, a forest gives us the impression of an old and matured landscape of significant quality. However, it has less vitality and also less resistance against environmental influences. The virgin forests in the tropics illustrate this clearly. They have a worldwide ecological influence on the climatic conditions, on water supply and erosion. But they regenerate very slowly from human intervention. Now they are vanishing rapidly under human influence, leaving us with increasing ecological problems. In the temperate zones there is a rhythmical balance between agriculture and forests. In European history you can trace periods of denudation and afforestation, e.g. the severe denudation in the Mediterranean area during Roman times, and the recent reforestations of abandoned fields in northern countries. In the Atlantic region vast areas of hedge landscapes have developed more or less spontaneously during the 17th and 18th centuries. So the tress in the landscape gives us a good impression of the vitality and the quality of it.

Also the condition of the trees and especially of the forests indicates clearly the balance or imbalance of the environment. Air pollution diminishes vitality. This is an increasing ecological problem. Expensive research projects have been started on it both in western and eastern countries of Europe. They point to industrial, agricultural and urban causes of the problem. But this is only one side of the story. Moreover, there is no ultimate solution in the near future in this direction.

Another approach has been cultivates amongst bio-dynamic researchers. They recognise that imbalance in the forest can be remedied by healing measures from two sides: through diversity on the one hand, and strengthening the cosmic influences on the other. This diversity consists of mixing different species and ages of trees in the same plantation. And cosmic influences are strengthened through timing of tree sowing according to optimal planetary configurations. Individual tree species are related to particular planets, e.g. Ash – Sun; Elm – Mercury; Oak – Mars, Cherry – Moon, Conifers – Saturn. Experiments over 16 years made by Georg and Stephen Schmid in Germany have shown extremely favourable results among trees sown when the related planet is in opposition to the Moon. Improved germination, stronger root, trunk, and crown formation, greater resistance to fungus, pests and frost damage, have been shown. Even in polluted areas where other trees were failing, they could create islands of health and regeneration. Georg Schmidt and his son have planted large nurseries of trees to provide counter-force to the devastation of European forests. Those who live in areas where the effects of pollution have not yet shown themselves so strongly would do well to consider these measures to support the trees before being faced with a crisis.

The Vortex

The vortex with its different speeds, is closely akin to the great movements of the planetary system. A given planet circles round the Sun as though in a vortex, in as much as it moves faster when near the Sun and slowly when further away. The vortex in its law of movement is thus a miniature image of the solar system and its planets.

Also, if a very small floating object with a fixed pointer is allowed to circle in a vortex, the pointer always points in the direction in which it was originally placed, that is it always remains parallel to itself! ... it is always directed to the same point at infinity. This illustrates how a vortex is oriented, as though by invisible threads, with respect to the entire firmament of fixed stars.

Schwenk, Theodor., *Sensitive Chaos*, Rudolf Steiner Press, pp.44-45, 1965

Vortex and Chaos

The Vortex, Nature's Magic

In the Chinese scroll painting called "Nine Dragons", the Chinese dragon of creativity is depicted coming out of a vortex in the sky. This painting is symbolic for the theory of chaos. The scientific term "chaos" refers to an underlying interconnectedness that exists in apparently random events. By appreciating chaos, we begin to envision the world as a flux of patterns enlivened with sudden turns, strange mirrors, subtle and surprising relationships, and the continual fascination of the unknown. To sacrifice control and live creatively requires attention to the subtle nuances and irregular orders going on around us. By paying attention to subtlety, we open ourselves to creative dimensions that make our lives deeper and more harmonious. According to the early Greek philosopher Hesiod, "First of all things was Chaos."

A good example of the broad spectrum of chaotic systems is a river. In the heat of summer, a river runs slowly. Its surface appears calm and serene. Where it encounters a rock, the water parts and flows smoothly past. But in the spring, after heavy rains, the river has a different character. In this circumstance, one part of the river runs slightly faster than a neighboring region and acts to speed up the stream around it, which, in turn, exerts a drag on the faster flow. Each part of the river acts as a perturbing effect on all the other parts. In turn, the effects of these perturbations are constantly being fed back into each other. The result is turbulence, a chaotic motion in which different regions are moving at differing speeds.

As the fast-flowing river approaches the rock, it swirls and turns back on itself. Behind the rock, a vortex is born and persists as a highly stable form. The river is demonstrating all the characteristics of chaos. Its behaviour is highly complex, including random, unpredictable flows, eddies, and stable vortices. Vortices are superlative – one is tempted to say almost miraculous – examples of the way the zigzag and random traffic of the natural world give birth to structured forms. The vortex of a tornado emerges out of intense thunderstorm activities and turbulent air. The well-known vortex of Jupiter's Red Spot, first noticed in 1664, seems like a permanent feature, but it's actually a vast eddy rolling between giant air streams that travel around the planet in opposite directions.

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Complexity theorists refer to the red spot as tornadoes and other such phenomena as "self-organisation out of chaos" or "order for free". To see how this ordering out of chaos comes about let's examine the formation of vortices in a pan of water.

Turn on the heat beneath the pan and the expected happens. Because hot water is lighter than cold water, water at the bottom of the pan pushes its way upward. Meanwhile, the heavier, cooler water at the top settles down. This rising and falling creates a chaotic competition. Chaos scientists say this system (the heated cylinder of water) is exercising its maximum "degrees of freedom," the maximum range of behaviours available to the system. In short, the water is boiling.

Chaos scientists discovered that if water is heated in just the right conditions below the actual boiling point, a transformation takes place and the water self-orders into a pattern of geometric vortices. For this to happen, first what is called a "bifurcation point" (point of departure) is reached; then the system transforms itself.

The bifurcation point marks the moment when one of the random fluctuations in the water becomes "amplified" by creating what is called a feedback loop. This loop begins to link with other fluctuations until many interconnected feedback loops create a series of stable hexagonal vortices, or "cells" like a honeycomb, inside the pan.

This linking involves two quite different kinds of feedback. One kind, called negative feedback, damps and regulates activity to keep it within a certain range. A second kind of feedback, called positive feedback, amplifies effects. Systems like the chaotic river, which are dominated by positive feedback loops, are turbulent and disorderly, but when negative and positive feedback loops are coupled together, they can create a new dynamic balance – a bifurcation point where chaotic activity suddenly branches off into order.

In the example of the water in the pan, at the bifurcation point, cellular vortices form with hot liquid rising through their centres and colder liquid descending along the outside (a large negative feedback loop). As one vortex butts up against another, stable hexagonal flowing cell walls are created between the descending cascades of falling cooler water.

This self-organised system of heated water creates its structure by giving up some of the degrees of freedom it would have had if it boiled. Systems that self-organise out of chaos survive only by staying open to a constant flow-through of energy and material. Vortices in rivers and streams typically emerge out of the swirls of turbulence produced downstream from obstructions in a fast, deep current. Each vortex has a definite shape, but is in reality composed of the material flowing through it.

Many of the structures we see in nature are examples of self-organised chaos. The cupped, hexagonal patterns on the surface of sand dunes, snow fields, and cloud layers result from chaotically organised vortices of warm air rising into the atmosphere, similar to the pan of water. These vortices remain stable as long as the conditions out of which they were created are kept within certain limits.

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Watch a flock of birds taking off from the trees and you'll see another type of self-organisation in action. The birds jockey frantically, trying to get free of the maelstrom of their fellows and up into the air, wanting to be part of the group, yet at the same time trying to avoid individual's attempt to keep minimum and maximum distances from others causes flight paths to couple into feedback loops of attraction and repulsion. Positive and negative feedback balance so that the individual birds appear transformed into a single organism. In a similar way, a flock of sandpipers on a beach can turn as a unit faster than individual reaction times would allow.

Random, highly energetic gases in interstellar space self organise into galaxies and star systems. During the Earth's geological history, self-organisation occurred as water ran across the great erosion channels left by melting glaciers. For one reason or another, some paths of water became amplified – more deeply grooved – and linked into one another, eventually forming the vast dendritic patterns of the relatively stable river systems draining the continents.

Some scientists believe that the complex DNA molecule which contains rules that help guide our own unfolding bodies (rules that are themselves subject to the bubbling transformations of chaos) emerged out of a chemical flux in the early days of the Earth, much as the cellular vortices emerge in the pan of water.

So it turns out that chaos is nature's creativity. Our bodies are pervaded by chaotic, open systems that allow a constantly creative response to a changing environment. For example, our brain self-organises by changing its subtle connectivity with every act of perception. The list of ways that nature puts the principle of self-organised chaos to use is virtually endless.

John Briggs and F. David Peat,
Seven life lessons of Chaos; timeless wisdom from the science of change,

Moon Planting

By Brian Keats

When I first began a study of Moon planting I gained the impression that all the answers were already know and it was just a matter of accessing the information and putting it into practise. I was soon to wake up, and besides, if it was that easy everyone would be doing it.

One thing that became obvious early on was that there were two streams of opinion from the earlier B.D. researches. Koliskos' work (written up in "Agriculture of Tomorrow") gives one the impression that the lunar phases are paramount and the period two days before full moon and two days before new moon are the best planting times. Thun on the other hand suggests that if you are getting noticeable effects from the lunar phases, other than then in the watery element, there is something wrong in your fertilizing or composting techniques. Thun seems to be able to consistently show that by planting seeds when the moon is in front of particular constellation of the Zodiac the root, leaf, flower or fruit nature of a plant can be influenced (please refer to the planting calendar for specific information).

The work of these researchers has been invaluable and books like "Agriculture of Tomorrow" and "Work on the Land and the Constellations" (Thun) are always worth rereading and contemplating. Please bear in mind the era that the Koliskos' book was written, and that research work is much more refined since their pioneering days.

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The amazing Maria Thun is still going in here researches. She is a systematic doer and 40+ years of planting trials and 29 years publishing calendars are wonderful gift for us. Thun's finding are not always repeatable and there could be any number of reasons why that could be so. It is even said that her farm is in the midst of a very special area with 12 hills surrounding it, each of which is a sacred site. To keep it in a context, anyone's trails with researches of this nature are hard to repeat. There are so many variables which cannot be isolated and controlled. Apart from the vagaries of the weather one cannot freeze the influences of the Sun and planets whilst just considering the lunar influence. Every day is unique. When the Moon is in the same constellation a month later all the accompanying dancers are in different positions.

I had launched euphorically into Moon Planting and had to wake up. It was obvious that things were not cut and dried as I initially thought, there was not going to be quick or easy journey finding solutions and, perhaps it was all wrong anyway.

After some consolidation, reflection, observation and time I came to the conclusion that both streams were right but they had only just touched on what needed to be researched. I do not say this to devalue their work but out of realising that we have generations of research still to do. I feel that I have comprehension of the magnitude and degree of difficulty of the task at hand, rather then the solutions. We are beginners and this beginning work is very important, without a simple solution and hand. Life IS complicated and we cannot expect the rhythms of Nature to be simple. We cannot expect plant growth to be regulated by one lunar or any other rhythm. There are a multitude of lunar, solar and planetary rhythms that weave together in forming the plant amidst stellar forces. Of course we have to consider many other factors too such as soil type and moisture levels.

It is very tempting to despair and think that this is all too difficult, I will not have it right anyway, and leave it for the future.

I believe, however, that it is imperative that we consciously bring rhythm more into our lives – especially in the agriculture sphere. Publishing the "Astro calendar" we have received a lot of feedback over the years and I am continually surprised how the calendar is used and what rhythms are working with. It would seem that one can have a measure of success with any rhythm. Perhaps one needs some faith that a particular rhythm will work for you and the beings behind that rhythm support you?! Would a human created rhythm work too?

We cannot have the complete picture now but we can begin the painting starting off as well as we are able, even if it is only an elementary brush stroke. Start and other stokes will develop as will an ever richer palette. Observe your subject carefully. A study of the celestial wonders and nature will give you great joy, healing and an inner satisfaction.

Newsleaf, Journal of BDAA, p15, No.19, 1994

Planetary Movement

What Kepler found broke with all tradition, with all that the Greeks and every subsequent astronomer had taken fro granted. He conclusively showed not only that Mars orbited the Sun but also, and much more significantly, that it did so in an ellipse. Gone was the circular orbit of the Greeks and gone, too, was the belief in uniform planetary motion, for the planet Mars varied in its orbital velocity as it moved along its elliptical path, moving faster nearer the Sun (perihelion) and slower when far away (aphelion).

In 1609 Kepler could only prove this for Mars. Looking for evidence of divine design he also discovered that there is a relationship which shows that the ratio between the time each planet takes to complete one elliptical orbit and its average distance from the Sun is the same for them all.

The difference between a circular orbit and the true orbit could be distinguished only by precise measurement and a courageous acceptance of the facts: "The universe is stamped with the adornment or harmonic proportions, but harmonies must accommodate experience." Kepler was shaken at being completed to abandon a circular orbit and to question his faith in the Divine Geometer. Having cleared the stable of astronomy of circles and spirals, he was left, he said, with "only a single cartful of dung," a stretched-out circle something like an oval.

Eventually Kepler came to feel that his fascination with the circle had been a delusion. The earth was a planet, as Copernicus had said, and it was entirely obvious to Kepler that the Earth, wracked by wars and pestilence, famine and unhappiness, fell short of perfection. Kepler was one of the first people since antiquity to propose that the planets were material objects made of imperfect stuff like the earth. And if planets were 'imperfect,' why not their orbits as well? He tried various oval-like curves, calculated away, made some arithmetical mistakes and months later in some desperation tried the formula for an ellipse, first codified in the Alexandrian Library by Apollonius of Perga. He found that it matched Tycho's observations beautifully.

Ronan, C., *Cambridge Illustrated History of the World's Sciences*,
Cambridge University Press, Newnes Books, 1983

Planetary Influences on Plants

The Roman scholar Pliny the Elder, in his *Natural History*, examined the influences of the moon's phases on vegetal and animal life.

Virgil, born just after the death of Pliny, told in a discourse on agriculture how husbandmen took clues from the heavenly spheres and constellations to tell them when to sow their crops, certain seeds being best put into the ground when 'glittering Taurus opens the year with his golden horns'. Paracelsus – a healer and one of the last of the true alchemists – made much of the connections in astronomy and astrology for perceiving the 'signature' of plants and to use remedies much more effectively, as did Nicholas Culpeper who saw that each planet was linked to a particular plant species, in turn connected to a particular organ of the body. From the seventeenth century onwards people following such traditional wisdom have been systematically marginalized, so we have lost link to the cosmos.

Biodynamic farmer Alan Brockman adds:

> Each planet has its own force field; thus each planet can, at some time or other, be seen in every part of the zodiac. The earth can be pictured as being surrounded by seven spheres of force, of which each physically visible planet is marking out its own particular boundary. These spheres were known as 'crystal spheres' (a description attributed to Ptolemy). Steiner indicated that the various leaf spirals and their positioning around the stem, or 'phyllotaxis', indicates which particular force field the plant is reacting to. So clearly plants and planets have correspondences, as healers such as Paracelsus and Culpeper knew.

Cook, Wendy., What is Biodynamic Farming?, extracted from *The Biodynamic Food Cookbook*, Clairview Books, 2006

Water

"Three chacteristic features of water, forming together a complete picture, emerge from our considerations. Two of these are clear for all to see, the third is almost unknown, requiring very sensitive methods of observation. The first is the activity of water in all metabolic processes in the great organism of the earth and in each separate living creature. The second is its close connection with all rhythmical processes in time and space. The third comes to light in our observation of the sensitivity of boundary surfaces, indicating that water is a cosmic sense organ of the earth. All three functions – functions which are well known to us in the world of living organisms – form a whole.

"Is it not as though water were itself an organism? Do we not see in water the threefold organisms of man – an archetypal picture, though purely functional, of the metabolic, nerve-sense and rhythmic organisations? Perhaps these three chacteristics of water form the basis of all living organisms, whose specialisation goes in the direction of one or other of the three?

"A stream, bubbling merrily over the stones, forms countless inner surfaces and tiny vortices, which are all sense organs, open to the cosmos, and which perceive the course of events in the heavens. Water passes on the "impressions" it has received whenever it is absorbed by the earth and the plants, by the animals and man. In moving water the earthly world thus allows the ever changing life in the universe of the stars to flow into the course of its own life."

Theodore Schwenk, *Sensitive Chaos*, Rudolf Steiner Press, UK, 1965, pg 67

"When rain falls, like distilled water, it is without life. It trickles down in spiraling motions around rocks beneath the ground, where it gradually meets a rising temperature, and begins at some point to percolate upwards, again in a spiraling motion, gathering mineral ions and life force until it meets light. There is a story that Schauberger once asked a farmer why there was a little structure of rocks over the mouth of a stream. It was explained to him that if its shade was removed and the light let in the flow would stop. Schauberger had his men draw a diagram of the structure and dismantled it. The water flow did stop. The structure was replaced and the flow recommenced. This helped us to quickly understand why rivers and streams disappear so quickly during deforestation, when the ground cover is removed."

Olof Alexandersson, *Living Water,* Viktor Schauberger, Gateway Books,
Appendix 1, by Christopher Seebach, 1976, pg 110

"The 'heart' function of water in the wider landscape depends upon the healthy state of the river which in turn indicates a great deal about the condition of the total surrounding environment.

"It is becoming increasing evident – through the work of many investigators – that we must think of the watery body of the earth as maintaining a mediating function which conveys the 'information' of the total environment to all living things. It is this embedding of everything living into the totality that is of paramount importance to the continued existence of life on the planet.

"Consequences follow for living organisms from the character of movement of the water with which they are associated. It is not just incidental that water flows as it does in mountain streambeds, with all the turbulence, rhythm, light and air surrounding it. When these natural processes and movements are removed, there is a consequent loss of life-supporting quality."

John Wilkes, *Flowforms, The Rhythmic Power of Water*, Floris Books, 2003, p89.

The Qualities of Different Waters

Distilled Water
Considered physically and chemically to be the purest form of water. Its nature is to extract or attract to itself all the substances it needs to become mature itself, and therefore absorbs everything within reach. Such water is really quite dangerous if drunk continuously long-term. The 'Kniepp cure' used distilled water for its short-term therapeutic effect, where it acts to purge the body of excessive deposits of particular substances.

Rainwater
If it has not been affected by industrial pollution (acid rain), rainwater is the purest naturally available water. Slightly richer through the absorption of atmospheric gases, it is still unsuitable for drinking in the long term. When drunk as melted snow-water, it also gives rise to certain deficiencies and if no other water is available it can on occasion result in goitre, the enlargement of the thyroid gland.

Juvenile Water
Juvenile water is immature water from deep underground sources, like geysers. It has not mellowed sufficiently on its passage though the ground. It has not developed a mature structure and contains some minerals (geospheric elements), but few gases (atmospheric elements), so as drinking water it is not very high grade (*cf* most spa waters which arise from mineral rich depths).

Surface Water
Water from dams and reservoirs contain some minerals and salts absorbed through contact with the soil and the atmosphere. Its quality deteriorates through exposure to the Sun, to excessive warming and to chemicals and other pollutants. Although most urban communities now depend on this source, generally speaking it is not good quality water.

Groundwater
Groundwater has a higher quality due to a larger amount of dissolved carbons and other trace salts. This is water emanating from lower levels; seeping out at the surface after passage along an impervious rock surface. Often this is now polluted by the chemicals of industrial agriculture.

Spring Water
True spring water has a large amount of dissolved carbons and minerals. Its high quality is often shown by its shimmering, vibrant bluish colour. The product of infiltrating rainwater (full complement of atmospheric gases) and geospheric water (full complement of minerals, slats and trace elements), this is the best water for drinking, and it often retains this quality in the upper reaches of a mountain stream. Commercially bottled 'springwater' is unfortunately not always of the best quality – many are not from true springs – even if it is bottled in glass rather than the plastic which impairs its quality.

Other Groundwater
Artesian water is obtained from boreholes and is of unpredictable quality. It may be saline, brackish, or fresh. Water from wells can vary from good to poor, depending on how deep is the well and what stratum of water is tapped, and they can be polluted by nitrates and herbicides.

Bartholomew, Alick., *Hidden Nature, The startling insights of Victor Schauberger*, Floris Books, 2003, pp111, 112.

Maintaining Healthy Water Systems

Water is the medium through which the life processes of all living organisms is sustained. The capacity of water to fulfill its role is dependant upon its health and vitality. We need living, vitalised water to sustain all life within the farm or garden.

Healthy water systems depend upon aeration, movement and shade from direct sunlight to maintain their vitality. You can enhance the etheric life and health of water through;

- providing shade for exposed bodies of water
- strategic placing of rocks and/or logs to create turbulence and movement in the water
- use of flowforms
- creating movement within a body of water (i.e. dams)
- addressing causes of pollution.

Water and its Dynamic Relationship to Consciousness

Written by Matthew Hutchinson

Water – we all know it so well, and pretty much take it for granted – but what exactly is it that makes water so essential for all life? Perhaps it has properties that are less well known to most of us. Could it be that water relates to the rest of creation in ways that, once discovered, shed light on some of life's great mysteries? Are there unifying principles that correlate water to the higher orderliness of the universe? We will explore some of the areas that link water to universal intelligence.

The all pervasive substance throughout the physical realm is water. It is in the air, in all matter, it forms the vast oceans, and it constitutes the major part of the human body. Life cannot survive on Earth without water. It is certainly more than a wetting agent. Put anything else into a dormant seed and see if the interaction will sprout life. The meta-code for all life information seems to be carried through water.

Water has two hydrogen molecules and one oxygen molecule. A chemical analysis of any arbitrary substance will not necessarily reveal the inherent information within it. In fact, any reductionist view of life will only lead to a materialistic conception of what is a much broader subject, in which our physical plane is only one component.

Observe the way water moves – pull the plug out of the bath and watch it. Does that water flow down the drain like so much sand? No, it spins inwards on itself in an implosive activity, creating a vortex. There are two types of energy in the universe, implosive and explosive. These are also recognised as yin and yang, in-breath and out-breath, masculine and feminine – one balances the other. Unfortunately for us, all western technology is based on explosion activity, obtaining energy through heating, burning, consuming. Implosion technology provides energy; life force itself, through the ability of the universe to constantly create.

Viktor Schauberger, the Austrian scientist commonly known as "the father of implosion technology" demonstrated with Professor Popel at the Institute of Technology in Stuttgart in 1952 that by spinning water in a vortexian motion in special pipes "negative friction" (Popel's term) was achieved. The Second law of Thermodynamics was overturned. Alas, the Austrian Academy of Science (AAS), which commissioned the trail, would not publish the findings as Schauberger had no academic formal qualifications!

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When a flowing stream hits a stick in the water, a vortex will form. Dissolved oxygen is woven into the water, enriching it. If one were to take a cross-section of a flowing stream, one would see that water flows in a laminar fashion – various rings make up its structure, becoming denser as it moves to the centre (much like the rings on a tree stump). The central shaft or column of water is at a lower temperature than those laminations closer to the riverbank. The laminations have an interesting ratio. They mimic the same ratio as the rings in a cut tree trunk. This ratio gives us a clue to the overarching order running through all of Nature, and carried in water.

The 12th century Italian mathematician, Leonardo Pisano Fibonacci, identified a ratio, known as the Fibonacci numbers, wherein 1+1=2, 2+1=3, 3+2=5, and so on. Each number has its preceding number added to it. What results is 2, 3, 5, 8, 13, 21, 34, and so on. This ratio is the lamination set we observe in the cut tree trunk and in the water stream cross-section.

If we plot the distances out on a line and join them up in a spiral fashion, we get the exact ratio of our inner ear, a palm frond unfurling, a foetus curled up in the womb, in the face of a sunflower seed, in the spiral pattern of a pine cone, the cross-section of a nautilus shell, the coil of a galaxy, the layout of the pyramids from the Sphinx, and so on – the universal geometric constant. Even as this constant applies to all "solid" matter, so it is an inimical element of the way water chooses to travel and to structure itself.

When we observe water forming a vortex, we are watching a representation of the Fibonacci sequence in the distance between spirals. Of course, water can be damaged in its ability to function as intended. Push water through straight pipes under pressure, as in municipal tap water, and it will result in turbidity, as the vortex action is destroyed and water applies a braking action. Water's low surface tension is lost. Its load-carrying capacity is diminished and its life-sustaining attributes also become diminished. The inherent electrical charge is compromised — a low redox potential is no longer inherent, therefore its ability to permeate cellular walls is reduced (hydration is compromised). Water could well be described as a liquid crystal. It responds to outside stimuli and stores the information. This has been well documented by anthropologist Theodore Schwenk and, lately, by Japanese researcher Dr. Masaru Emoto.

Dr. Emoto has been known to place a phial of distilled water in front of loudspeakers and play music. The water in the frozen crystal structure can be viewed under a microscope. Distilled water shows no crystal pattern at all – lifeless, so to speak. Yet the vibratory information in the music transforms the distilled water into beautiful complex hexagonal crystalline structures. Heavy metal music, however, produces an image that could be best described as an abyss with no crystal structure. A piece of paper with a typed phase placed in contact with the phial will transform the distilled water. A phase conveying gratitude will produce the most wonderful crystal jewels – a phase expressing hate creates an image akin to a festering cancerous sore.

It is not a vast leap to understand the relationship between spoken words or thoughts, and their impact on the water closest to them – our own cellular water, within our own bodies. Disruptive frequencies or vibrations create chaotic activity. Electro-smog is the outcome of radar, radio waves, microwaves, digital phones and satellite information; all of these scramble the consciousness of water. A photograph of the photon field (an insight into the underlying molecular field) will show that complex cohesive clustering will be disrupted by exposure to electro-smog. Water's ability to retain information is of critical importance for us to understand.

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If one views an electrocardiogram (ECG) monitor showing a person's heart activity, spikes and troughs are generally seen. Ask the person to meditate on someone dear to them and a sine wave will form. The relationship between the depth and the width of each wave is the Golden Mean – Phi. By using computer graphics the sine waves can be braided, as one would strands of hair. The outcome is the exact mathematical structure of the perfect DNA spiral.

Both the spiral and the braid when viewed from above may look like a spiral. They may be elegant examples of maximum orderliness in flowing form. Looking at the exceptionally ordered structure of water in living cells may be a good clue to what Nature requires of her water in order to contain life. Scientists like Albert Szent Gyorgi ('Electronic Biology and Cancer' and other Nobel Prize-winning works from Woods Hole Marine Biological Labs) have long known that it is the orderliness in water which makes efficient cell life possible.

The same intelligence that created all of Nature and her perfect self-sustaining system used the geometry of Phi (the wave form of compassion) to provide a method of identifying sound through symbols. These sounds are combined in various permutations to form words – they elicit responses right down to the deoxyribose nucleic acid (DNA). Water holds the information and retains it. This critical information store-house of the cells shapes our reality – upwards spiraling thoughts influence cells that are constantly reverberating, with resonances that harmonise with the symphony that is Nature at work through the universe. Conversely, fear-based thoughts (anger, jealously, pride, grief and despair) all produce discord within the cells – the water becomes acidic, the rotation at the sub-atomic level gets disturbed, and oxidation takes place. Our ability to take in and integrate higher resonance information becomes compromised.

Water holds the position within our bodies of being an "awareness" that contains information that shapes how we feel, how we respond to stimuli and how our health itself is determined. Its dynamic properties, when maintained in accordance with Nature's governing principles, ensure that we operate in harmony with our environment – it holds without judgement all of the vibrations that we expose it to. It literally reflects what it receives; and leaves the choice of input to us.

PHI – Magic in Numbers

The ratio of Phi (.618) and 1 is intriguing. The integer 1 divided by .618 gives a magic number, one that has no end. Computers have run for years trying to obtain a finite value for the ratio (1.618122977346278317152103559870 55...). It is a representation of the infinite. The ratio is also present in all of Nature. The human anatomy shows it – from chin to eyebrow is .618 of the distance from chin to top of forehead. Fingertip to elbow is .618 of the distance from fingertip to shoulder. The King's Chamber in the Great Pyramid is built on the Phi ratio. The Golden Mean of classical architecture (Parthenon, Acropolis) is derived from Phi. The Phi point between the freezing temperature (32 degrees Fahrenheit) and the boiling temperature (212 degrees Fahrenheit) of water is 100.8 degrees Fahrenheit, or 32.8 degrees Centigrade. This is the upper level limit for human health in the human body.

Living Now, July 2002, Issue 75.

Heat – More than a Caloric Measurement

Written by Frances Porter

One of the many demands placed on someone wishing to apply effective Bio-Dynamics to their property is that a natural heat source is used to warm the water used for stirring 500, prepared 500, 501 and Valerian.

So long as heat remains no more than a question of the number of calories applied to an object to get the technical effect desired, there will be little consciousness of the quality of the warmth that penetrates the water.

Many years ago, Alex Podolinsky and Andrew Sargood did chromatography tests to see the effect of different heat sources on quality of cooked vegetables. These tests were done on a number of types of vegetables, with the same result. Wood heat outperformed coke, which outperformed gas, which outperformed electricity as far as the quality of the cooked end product result.

Below are the results of a test preformed by Hauschka, and published in his book 'Nutrition'. From this book I quote:

"In these experiments, distilled water was brought to boiling point in a reflux condenser using various kinds of fuel; gas, electricity, coal, wood and straw, and kept on the boil for 20 minutes. The water was then cooled down to 170C and used as a growing medium for wheat plants. The various test waters heated on the above fuels were then poured into porcelain saucers and wheat seeds were allowed to germinate in these media. The interweaving roots gradually formed a mat that held the developing leafy shoots. Growth was halted on the tenth day to measure root and leaf dimensions, and these were averaged and entered on the chart. The figure shows the average leaf-measurement in the upper curve, the root averages in the lower. We see that the various warmth qualities were transmitted to the seedlings as growth-furthering or growth retarding forces.

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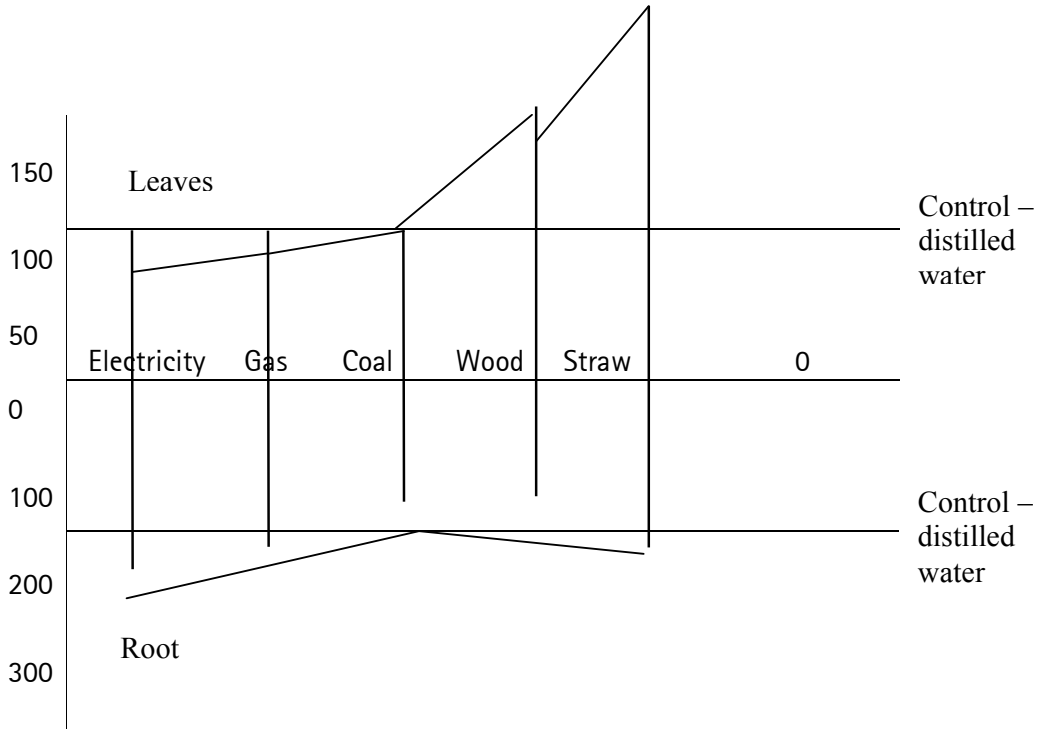
"The chart shows that electricity had the least favourable effect, wood and straw the most favourable. To one who has made a study of the nature of electricity this comes as no surprise, for electricity always plays the role of a condensing agent. It makes a candle flame turn outside in making for solidification where formerly there was just the opposite: etherealisation. This builds up visibly in a carbon skeleton that forms on the wires connecting the two poles. It makes ozone of oxygen by densification.

"To show this does not signify disapproval or an attempt to turn the wheels of progress backward. We are merely stating the facts."

These results should demonstrate to you why we are insistent that the warming of water used for the biodynamic application is not from electricity, but either gas or wood. It is also essential that no part of the water being warmed is allowed to overheat. Addition of cold water to over-hot water does not achieve the desired effect. While the overall temperature may read 350C, what you have effectively done is 'killed' part of the water (overheating). This water is no longer receptive to the forces active during the stirring process.



Biodynamic Growing, Journal of Bio-dynamic Agriculture Association Australia, No. 5, Pg8.

Converting to Sustainable Agriculture

By Phil Wheeler

Location Factors
"The location of your farm is a major factor. Some areas of the country have deep topsoil with reasonable organic matter and few mineral shortages. Other areas have thin soils with low organic matter, or high or low pH, or high salt levels, or low phosphates. Some of these factors could preclude you from the 'stop all inputs' and the 'balance all the minerals' paradigms.

"Two of the generally agreed upon principles among the different paradigms are remineralisation and increased carbon content. What sources of materials are available nearby or what materials can be shipped in at a reasonable rate that can work on those two principles?

"Let's consider remineralisation first. The size of your operation can make a big difference in the costs per acre of inputs for remineralisation.

"Basic commodities such as lime, gypsum, soft or hard rock phosphates, sulphates of potash, sol-po-mag, paramagnetic rock, green sand, kiln dusts, mineralised clay deposits, humates, compost or trace minerals may be difficult to find and quite expensive per unit when purchased in bags, as compared to the cost by the truckload.

"Blended products containing the basics have additional markups to cover costs of the convenience factor.

"Farm operations in the 100 - 200 acre plus range can consider purchasing direct truckloads of commodity inputs at good prices. This method can usually supply you with calcium, phosphorus, potassium, magnesium and sulphur, five of the six majors.
You will be able to get a broad spectrum of trace elements and/or paramagnetism when dealing with basic rock deposits. The deposits may not have enough of the traces recognised as significant to agriculture, so you may still have a need for separate sources of iron, copper, manganese, zinc, boron, cobalt and molybdenum.

Do-It-Yourself Nitrogen
"The sixth major element is nitrogen, which is not really a mineral element. It is quite expensive to buy and offers the least alternatives of sources for the organic grower. This behooves all growers to grow or capture their own. The most obvious grow-your-own source is legumes (clovers, beans, alfalfa). This sometimes presents a problem if the legume must take up a crop season and has limited market value. It can also be a problem when sufficient molybdenum is lacking in the soil to enable the legume to fix nitrogen in its nodules. Capturing your own nitrogen could also involve the use of azobactor, which can fix atmospheric nitrogen into the soil without a legume.

"My consulting in Mexico has shown that a working azobacter system combined with small amounts of protein nitrogen can remove the need for the typical soluble nitrates and ammonia. The sources of protein nitrogen are limited and some are quite expensive. Soy meal and alfalfa can be used, but the cost may be prohibitive. Blood meal is expensive and may have lead contaminates and cottonseed meal may have pesticide and herbicide problems.

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"Liquid hydrolised fish appears to be one of the best sources, as it has reasonable costs, contains other nutrients and growth factors and can be used on both soil and foliage. Sustainable growers can use non-protein sources of nitrogen such as ammonium sulphate, ammonium nitrate, 28-32 per cent liquid nitrogen, as transitional products until they are able to produce their own. These products, when combined with carbohydrates (sugar/molasses) have continued to demonstrate that they increase bacterial activity and raise plant quality when used in appropriate amounts.

"It is wise to include some protein nitrogen with the manufactured nitrogen, because the crop will selectively pick up the protein nitrogen when it is stressed. Sustainable growers may also use urea as a foliar, because the plant doesn't need to expend energy to utilise the urea the way it would if fed a nitrate or ammonia source. The most obvious sources of nitrogen are animal manure and compost. Again relatively large amounts may be required to achieve an adequate supply for high nitrogen crops.

"Now we are getting to the second major agreement point of having increased active carbon in the form of humus, which is a sink of reservoir of nitrogen. We can start to solve the nitrogen problem when we start working on the humus problem. Creating large amounts of humus without, or in addition to, adding compost or manure is possible.

"The missing factor in conventional agriculture for making use of the natural systems is the presence or availability of carbohydrate (sugars) as energy sources for the bacteria. After all, even conventional growers plough down corn stover and green manure but do they get good humus for their efforts? Research shows otherwise. Their residue does not get digested properly for a variety of reasons, but two reasons we can deal with quite readily are the absence of the right bacteria and a supply of energy that will encourage them to digest the residue.

"The addition of carbohydrates and a touch of nitrogen to green or brown crop residue (use more N on the brown stuff) sets the banquet table for the bacteria to have a balanced diet of meat (the N and protein) and potatoes (the carbohydrates / sugars).

"New inoculations of live or dormant bacterial cultures may be appropriate. The bacteria will gorge themselves, reproduce rapidly in the presence of ideal conditions and turn your crop residue into real humus. The humus will contain the nitrogen and other nutrients in a non-leachable, but available form for your plants to feed for the entire season.

Take It Slowly

"Growers are always advised to do a year or two of sustainable transition before they begin the certification process if possible. This allows them to reasonably balance their soils as per Albrecht, biologically activate their soils according to Reams, increase paramagnetism according to Callahan and start to have the natural processes help them prevent/control weed, insect and disease problems.

"By not seeking certification for the first year or two, the grower can have full access to the marketplace to accomplish the balancing activation he desires. This approach assumes that all fertility inputs are bio-enhancing, even though they may not meet certain manmade standards.

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"It also allows the grower to continue to use reduced chemical rescue, if natural processes aren't working or natural products are not available to solve the problem. In my humble opinion, too many growers have lost too much money by attempting to go directly from conventional agriculture to organic or biodynamic. I perceive this to be true because I frequently get calls that go something like this: "I went organic two years ago on my soybeans, and of course I had reduced yield." Since soys are considered scavengers, the grower was not supplying enough nutrients or energy for the crop to scavenge, or he wasn't foliar feeding to supplement the soil supply. Why would you change paradigms without preparation if you 'knew' you were going to have a major yield reduction?

Multiple Possibilities

"So what is the 'best' approach to making a change or transition? There is no best approach. There are only multiple possibilities. You have to go back to the first paragraph and the question of goals and costs. There is little doubt that if you don't know where you are starting from or what you are starting with, the chances of success and return on investment are not great. That is why most consultants and sales companies ask for, or insist on, soil tests. The question of interpretation then rears its ugly head. Again, there are no right answers, only multiple possibilities.

"However, there are some wrong answers. Even in the realm of testing, there are multiple possibilities. The one test most agreed upon is for CEC (cation exchange capacity). The majority of commercial labs serving standard agriculture use this kind of test. One of the problems is that CEC test procedures may vary from lab to lab, and some labs make the claim that their method is the only correct way.

"Any reputable CEC lab should give you a reasonable idea of what you need to know and a well-versed agronomist should be able to read it and advise you accordingly. Be cautious of computed generated recommendations that tell you down to the last kilo what is going to solve all your problems. Applying huge amounts of materials just to match computer programs may cost more than the return on investment in the first few years. Activating what you have is usually less expensive in the short term and allows you to work on balancing on a more gradual (less account draining) basis.

"The second test being used extensively is called a LaMotte test, done by a certain procedure or water-soluble test done by similar methods. These tests tell you the likelihood of your crop being able to use the minerals identified in the CEC test. Again, if the lab provides interpretive ranges for their readings, a well-rounded consultant can help you interpret your results.

"Leaf tissue analysis is also valuable in pinpointing just what the plant is doing with all your attempts at helping out. Radionic scanners can also be used to show energy relationships. These are very important, as general health and vigor of all organisms is dependent on resonance of the energy coming from within and without.

"Using the data obtained from one or more of the above sources should allow you to begin the transition to the new paradigm you have chosen."

Acres Australia, Newspaper, June 2000

Sustainable Farming Systems

By Maarten Stapper, Soil Fertility Management in Australian Agriculture

A sustainable farming system is a complex ecosystem with non-linear dynamics that exist in alternate stable states, each state having their own threshold. When a critical threshold is breached, recovery to a sustainable system will become difficult or impossible. For unstable farming systems to again become sustainable, we have to understand ecosystems before we can take care of them.

Benefits of Developing an Ecosystem

Sustainable ecosystems are resilient, having the capacity to absorb disturbance and re-organise over a wide range of conditions before ever reaching a critical threshold. They are characterized by many interactive components within and between scales. Adaptability and transformability are two other characteristics of ecosystem response to change. Adaptability is the capacity of actors in the system to manage its resilience and transformability is the capacity to become a fundamentally different system when existing system remains unsustainable (Resilience Alliance 2006).

Holistic Approach

Knowledge of interactions between groups.

Understanding functioning of ecosystems requires a 'big picture' holistic approach. The knowledge of different groups in the living world and how they interact with other groups is here more important than in-depth knowledge of individual species.

Studying the latter, however, and single issues in general, seems to be more popular and advanced. Then again, we can't understand a system by combining available knowledge of component single issues. That is, the holistic 'whole' is not the sum of reductionist 'detail'. This also needs to be realised in simulation modelling of systems.

Symbiosis – the balanced, mutual interdependence of different species – is a protective mechanism in nature which develops in response to compatible needs. Self-organisation keeps natural biological systems in balance. Interactions between organisms are powerful evolutionary forces. Increased complexity and diversity of species and interactions within the soil foodweb promote balance and higher plant productivity. The whole should be considered as an integrated system being resistant and resilient to change through an abundant diversity of organisms. Plants depend on beneficial soil organisms to protect them from pathogens, to help them obtain nutrients from the soil, and to break down toxic compounds that could inhibit growth.

Soil organisms create a living, dynamic system that needs to be understood and managed properly for best plant growth. If the balance of micro-organisms is wrong, fertilisers and pesticides can't help recover plant vigour. Understanding soil health requires knowing which organisms occur, which ones are working, how many are present and whether they are the right kinds for the desired plants (Ingham 2000, 2006).

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Soil health thus requires improvement of biodiversity in paddocks and catchment to enhance natural predation in a functional soil foodweb (FAO 2006). This may be achieved by doubling soil organic carbon (the foundation for a living soil) minimising use of chemicals and the establishment of shelterbelts for improvement of soil surface microclimate and home to an important part of the soil foodweb. That paddock soil then becomes resistant to change and, being resilient, is able to recover from disturbances caused by extremes in weather or management. Such soils will remain more productive with climate change as living soil organisms can adapt. It will also help slow climate change by sequestering carbon (Leu this proceedings, Carbon 2006).

Conversion of a Home Garden to Biodynamics

By Peter Proctor

"To begin a biodynamic system in the home garden requires quite a new approach, quite a lot of knowledge and some courage. There are many gardeners and horticulturalists in New Zealand that have taken the first steps and now have a successful organic garden run on biodynamic lines. One must sustain the fertility of the garden not just for one year but for the future, which means short term manuring using water soluble fertilisers for quick growth is discontinued. This practice not only damages soil structure but produces plants that are nutritionally unbalanced. Stop any chemical weed control – as the chemicals used leave undesirable residues in the soil that inhibit the development of an active soil life including earthworms, and could pollute the ground water.

"First of all the biodynamic gardener must be able to make a good balanced compost. This is a technique that can be learnt and notes on making compost are available. The most important aspect of compost making on a small property is the availability of the materials which can supply adequate plant nutrients. Most small home gardeners will have to bring material in to make compost, and it is imperative that the quality of this material is checked for undesirable residues. In home gardens there are three great fertility tools that the gardener has at his disposal. First there is the compost, secondly legumes – clovers, beans etc. and the third – the farmers and gardener's greatest friend – the earthworm.

"Encourage legume growth, earthworm activity and other soil micro-organisms. These can be greatly enhanced by the actions and workings of the biodynamic preparations – the field sprays 500 and 501, and compost preparations 502 to 507.

"The biodynamic gardener should equip himself with a good barrel or bucket, and suitable stick to stir the preparation 500 and 501 by hand, and an adequate supply of rain water. The first spray of preparation 500 should be in the autumn – at the end of March or early April when the soil is moist, with a second application in May. Both these applications should be carried out during a descending moon phase. Another spray of 500 should be applied in the spring – September / October. It is probably best to wait until the second year to spray preparation 501.

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"As well as compost, liquid manure of some kind should be made as soon as possible, using either fish or seaweed as the base. It is also possible to use any dominate weeds you may have growing in your garden. Preparations 502 to 507 are added to this brew to stimulate and balance a breakdown of solids during the fermentation process.

"Preparations 502 to 507 are also introduced to the garden by applying the compost.

"These preparations will work together with field sprays 500 and 501, to bring a wide variety of micro-biological life to the soil, and exert a balancing effect on the available minerals. They also influence a build-up of the vital permanent humus in the soil.

"Compost should be applied once a year preferably in the autumn when there is less chance of it being dried out on the soil surface. Liquid seaweed or fish should be applied four times a year if it is possible during spring and autumn. Stinging Nettle fertiliser is also very good.

"A green manuring program should be part of soil fertility management. In the autumn, after summer crops have been taken out; sow oats or rye corn together with hairy vetch, tick beans or blue lupins. In the spring, when the winter crop has come out, sow barley, rye or wheat together with tick beans, broad beans and blue lupins. Both of these should be dug in just before flowering.

"The benefits derived from planting trees and hedges to enhance the environment are very obvious, particularly to bird life and bees. Other benefits are conservation of moisture and protection from the wind and the elements for the plants.

"Attention to the most favourable environments both on land surface and below the soil will encourage a health and quality of plant that will be a true reward in the initial step of courage."

Stages of Conversion to a Biodynamic System

Success in the biodynamic system depends upon establishing and maintaining soil conditions upon which the biodynamic system can be established. The biodynamic system is founded on soil conditions which have the following characteristics:

- aerated, well-drained soils
- soil pH above 5.0
- no major nutrient deficiencies.

First Stage
Testing and Observation

Identify soil structure.

- Biodynamic soils should be aerobic and well drained.

Test soil pH.

- A soil pH reading of 5.0 or above provides a good foundation to establishing the biodynamic system. A soil with a reading below pH 5.0 requires remedial action to initially to raise soil pH.

Identify any mineral deficiencies.

- Nutrient deficiencies can be identified through:
  - observations of plant and animal health
  - plants and weeds which indicate soil conditions
  - chemical analysis of the soil.

Identify any chemical residues in the soil.

- Chemical residues can be identified through:
  - laboratory testing
  - site history.

Second Stage
Remedy Conditions as Required

Address soil structure problems.

- Action which can be taken to improve soil structure:
  - using soil cultivation to open the soil and improve structure
  - increasing soil organic matter levels
  - changing or ceasing current soil cultivation practices
  - changing animal management
  - allowing good growth of plants to encourage root development.

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Balance soil pH.

- Soil pH can be raised through the use of the following inputs:
  - lime (applied at 1/3 recommended rate)
  - dolomite (only use if there is a known magnesium deficiency)
  - basalt rock dust.

Address mineral deficiencies.

- Action to address nutrient deficiencies could include:
  - remineralising the soil using liquid seaweed or rock dust
  - using liquid manures made from plant and weed species
  - balancing soil pH
  - establishing good soil structure
  - increasing organic matter in the soil.

Manage chemical residues.

- Strategies for managing chemical residues in the soil include:
  - use of green manure crops
  - using practices to increase soil humus
  - using practices to increase biological activity of the soil
  - using liquid seaweed
  - quarantine of the affected area in conjunction with the above practices.

Suitable inputs for use during transition period include:

- minerals and trace elements for natural sources such as:
  - calcium (dolomite, gypsum, lime)
  - clay (bentonite, kaolin, Attapulgite)
  - magnesium
  - phosphate (rock phosphate, phosphatic guano)
  - potash (rock & sulphur potash)
  - elemental sulphur.
- microbial, biological and botanical preparations
- trace elements and natural chelates.

Third Stage
Maintain Using Biodynamic Practices

- Use biodynamic practices to maintain soil processes.
- Maintain observations of soil conditions.

Sustainable World – A Global Initiative

www.i-sis.org.uk/SustainableWorldInitiativeF.php

True cost of industrial food production system

- 1,000 tonnes of water are consumed to produce on tonne of grain
- 10 energy units are spent for every energy unit of food on our dinner table
- 1,00 energy units are used for every energy unit of processed food
- 17% of the total energy use in the United States goes into food production & distribution, accounting for more than 20% of all transport within the country; this excludes energy used in import & export.
- 12.5 energy units are wasted for every energy unit for food transport per thousand air miles.
- 20% of all greenhouse gases in the world come from current agriculture.
- US $318 billion of taxpayer's money was spent to subsidize agriculture in OECD countries in 2002, while more then 2 billion subsistence farmer in developing countries tried to survive on $2 a day.
- 90% of the agricultural subsidies benefit corporations and big farmers growing food for export; while 500 family farmers close down every week in the United States.
- Subsidized surplus food dumped on developing countries poverty, hunger and homelessness on a massive scale.

Getting our food production sustainable is the most urgent task for humanity; it is also the key to delivering health, ameliorating the worst effects of climate change and saving the planet from destructive exploitation.

Some benefit of sustainable food production systems:

- 2-to 10-fold energy saving on switching to low-input/organic agriculture.
- 5 to 15% global fossil fuel emissions offset by sequestration of carbon in organically managed soil.
- 50 to 92% reduction in carbon dioxide emission from the soil on switching from conventional tillage to no-till agriculture.
- 5 tonnes of carbon dioxide emission disappear with every tonne of nitrogen fertilizer phased out.
- 2 – 3- fold increase in crop yield using compost in Ethiopia, outperforming chemical fertilizers.
- Organic farming performs as well or slightly better then conventional industrial farming in the US.
- Small farms are 2 to 10 times more productive than larger farms.
- Organic farms support significantly more bird, bats, invertebrates and wild plants than conventional farms in Europe.
- Organic foods contain more vitamins, minerals and other micronutrients than conventionally produced foods.
- 1,000 or more community–supported farms across US and Canada bring $36million income per year directly to the farms.
- £50 - $70m go directly into the pocket of farmers trading in some 200 established local farmers' markets in the UK.
- Buying food in local farmers' market generates twice as much for the local economy than buying food in supermarkets chains.
- Money spent with a local supplier is worth four times as much as money spent with non-local supplier.

Farms Stand to Gain from Carbon Crop

By Carrie La Frenz, Dec 2007

Managed farmland could help mop up much of the carbon emitted into the atmosphere, converting a hazard into a productive opportunity, farmers and scientist say. The scientists say Australia has the largest greenhouse gas emissions per capita in the world and carbon storage in the soil has been overlooked as a solution.

According to Biological Farmers of Australia (BFA), soil managed under organic and other regenerative farming systems may be the key. "Carbon can be stored in the soil in the form of stable humus fractions, which can last for more than a thousand years," BFA spokesman Greg Paynter said.

The Australian Society of Soil Science says about 1500 gigatonnes (1500 billion tonnes) of carbon is stored in soils worldwide; twice the amount stored in plants, and double that in the atmosphere.

The director of consulting group Organic Knowledge, Alasdair Smithson, said the potential benefits from soil carbon capture and storage had not received sufficient attention. "Well-managed soil is a highly effective method of storing carbon from the atmosphere. It happens in real time – not like planting a tree, which can take 25 years to mature."

Some forecasters have suggested that carbon is poised to become the world's largest commodity market.

Ecologist Christine Jones said that in a healthy ecosystem soils were a dynamic part of the carbon cycle. "When people think carbon they usually think trees, but in reality 82% of carbon in the terrestrial biosphere is in the soil," she said. "A 1% increase in soil carbon in just 10% of Australia's farmland could remove 10 years' worth of Australia's CO2 emissions, while 4% increase in soil carbon could remove 40 years' worth. Dr Jones said putting carbon back in soil required the adoption of regenerative farming and grazing methods that resulted in the formation of new topsoil. She said ground cover, which needed topsoil and included plants and crop stubble, provided the channel between the atmosphere and the soil, providing carbon with a way in.

"Carbon cannot be sequestered in soils if we continue with the same forms of land management that cause the carbon losses in the first place," she said. "People cannot function without a skin, soil cannot function without cover."

Agriculture accounts for 30% of the world's carbon emissions and 17% of Australia's total carbon emissions, according the Australian Bureau of Agricultural and Resource Economics.

AAP

Carbon Sequestration and Soils

- The terrestrial biosphere currently sequesters 2 billion metric tons of carbon annually. (US Department of Agriculture).
- Soils contain 82% of terrestrial carbon.
- "Enhancing the natural processes that remove CO^2 from the atmosphere is thought to be the most cost-effective means of reducing atmospheric levels of CO^2." (US Department of Energy).
- "Soil organic carbon is the largest reservoir in interaction with the atmosphere." (United Nations Food & Agriculture Organisation) - Vegetation 650 gigatons, atmosphere 750 gigatons, soil 1500 gigatons.
- The carbon sink capacity of the world's agricultural and degraded soils is 50% to 66% of the historic carbon loss of 42 to 78 gigatons of carbon.
- Grazing land comprises more than half the total land surface.
- An acre of pasture can sequester more carbon than an acre of forest.
- "Soil represents the largest carbon sink over which we have control. Improvements in soil carbon levels could be made in all rural areas, whereas the regions suited to carbon sequestration in plantation timber are limited." (Dr Christine Jones)

Research for Biodynamic Systems

Research on Biodynamic Agriculture (Swiss Study)

A long term (21 years) Swiss study has been published in Science comparing biodynamic (BD), organic and two variations of conventional farming systems. As expected, the high input of mineral fertilisers in the conventionally farmed plots led to greater yields than in the BD/organic plots, though these varied markedly from crop to crop. (On average BD/organic crops yielded 20% less.) However, as smaller amounts (one third to a half) of nutrients were added to the BD/organic crops, the nutrient utilisation was found to be much more effective. They also used less fossil fuels (36-63% less) per unit of land area. In the conventional plots the soil itself did not increase in vital activity. The soils in the BD/organic plots changed markedly and fertility increased: the soils had a greater stability, a slightly higher pH, greater microbial, earthworm and arthropod activity and diversity and the root length colonised by symbiotic fungi was 40% higher.

The soils harboured some specialised and endangered species that were not found in the conventionally farmed soils. While the conventional systems have largely soluble nutrients (that easily leach out of the soil) the BD/.organic soil nutrients are continually being released via the activity of the soil itself. The biodynamic farmed soil stood out in its microbial activity. The greater activity of bacteria gives the soils a higher capacity to break down proteins and organic phosphorus, making nutrients available to plants. There was better utilisation of organic substances, not only for maintenance but also for growth, which is related to the greater and more complete decomposition of plant matter in BD soil. In light of such results from a mainstream science journal, promoters of the view that high-input conventional farming is the only way to feed humanity will have a more difficult time making their arguments appear credible.

Hunter Organics, Summer/Autumn, 2003, p26

Comparative Study of BD and Conventional Macadamia Farms

A recently completed study of University of New England – Northern Rivers (UNE-NR) student Colleen Schneider could be the first in a series of scientific investigations into NSW North Coast organic agriculture carried out by the university. Ms Schneider, a final year student in the Conservation Technology course at the university made a comparative study of the chemical and physical properties of soils on neighbouring Bio-Dynamic and conventional macadamia plantations in the Lismore area.

The Two Farms

The BD plantation has NASAA level A grading and has been managed according to those standards for roughly four years (although conversion commenced six years ago). Bio-Dynamic 500 has been applied during this time and the trees are fed mainly with compost made from nut husks, chook manure, sawdust and mulched barner grass. B D compost preparations are included in the heaps. The only other fertiliser in the past four years have been one-off applications of 2kg rock phosphate per tree and one tonne per acre of basalt dust and lime.

The conventional plantation uses the departmental fertiliser recommendation of superphosphate, borax, sulphur and magnesium (1.9kg per tree). Ten kg of gypsum is applied to each tree in February, and Dynamic Lifter and Super are applied in September.

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The conventional farm uses Endosulfan to control caterpillar and Lorsban for Black Scale. Its weed management is based around the use of glysophate, diquat and paraquat which are applied four times per year to maintain a bare "herbicide strip" under the trees.

Weed management on the BD plantation revolves around the use of judicious slashing along with matting groundcovers and a pruning regime which tends to shade out troublesome weeds. A sweeper is used to harvest nuts and has been found to work very well with the groundcovers that have been allowed to establish. Prior to the adoption of organic and BD methods this farm was managed conventionally.

The Study

The object of the study was to determine whether the variation in management regime brought about by the change to organic/BD methods has created any variation in physical and chemical soil properties under the tree dripline in the organic plantation. There is an implicit assumption here that prior to conversion soil properties on the two farms were similar.

Soil samples were taken during August 1992 using an auger at six levels in the profile down to 1 metre.

Results

Initial analysis carried out by Ms Schneider in the University lab indicated a lower bulk density in the BD soil indicating better structure and an impressive 20% higher level of organic carbon. While the differences in organic carbon exist right down through the soil profile the most significant difference is in the top 20cm of soil. According to UNE-NR Soils Lecturer Dr Leigh Sullivan this amounts to around 50 tonnes of extra humus per hectare on the BD farm. Moisture content throughout the BD profile was higher at the time of sampling (dry conditions prevailing). This difference was most significant in the 2.5 to 5.0 cm depth range.

Interestingly soil pH was almost identical on both farms and uniform through the profile. Worms were observed to be present in both soils although no attempt was made to quantify and compare levels of worm activity. A major difference in Calcium/Magnesium ratio was found. This was a fairly normal 2.72 in the BD soil but was a massive 13.61 in the conventional. This result no doubt reflects the high levels of gypsum applied in the conventional case.

The conventional farm had significantly higher levels of phosphorus at the time of testing and once again this would be the result of super phosphate applications.

Commenting on the study, Ms Schneider's supervisor Dr Sullivan, a former soils specialist with the Tasmanian Department of Agriculture indicated that the differences in soil properties were obviously due to the variation in management practices. He was however surprised at the extent to which humus levels had increased in the BD orchard.

Newsleaf, Journal of BDAA, Issue No. 15, Jan 1993, pp28 & 29

Comparisons of Conventional and Biodynamic Farming

By Doug Small and John McDonald Department of Agriculture, Kyabram Research institute of Benalla.

Biodynamic Farming is a system of organic farming which has developed from experience and the practical application of the ideas of the Austrian philosopher Rudolf Steiner. It largely excludes the use of synthetic fertilizers, herbicides, pesticides and the routine treatment of animals with commercial veterinary chemicals and drugs.

Until recently serious discussions about biodynamics were seldom held by scientists because the subject aroused such strong emotions, opponents were biased, and derision and ridicule was often the outcome. However the debate is becoming more rational for the following reasons:

1. Many farms using biodynamic methods in Australia have stood the test of time. They are still viable after 25 years.
2. There is a trend towards sustainable agriculture and biodynamic agriculture is being seen as a sustainable system.
3. There is a trend towards cleaner agriculture and biodynamics is being seen as a clean system.
4. Conventional farmers are concerned about further intensification of grazing industries which rely heavily on more inputs like fertilizers, herbicides, pesticides and animal health products. The unit costs of these inputs are beyond their control.
5. The environmental/conservation movement is accusing conventional farming of all sorts of local, regional and global damage. Farmers have some fear that regulations for environment protection may impinge on farm operations and effect their management options and thus their viability and profitability.
6. Farmers care for their soil and some are beginning to suspect that continued high use of fertilisers, herbicides and pesticides may not be good for the long term productivity of soils.
7. A scientific survey of biodynamic dairy farms in the Goulburn Valley by the authors revealed that real differences can be observed and measured. The debate can now be serious amongst the farming and scientific communities.

The trouble with any discussion on biodynamics is the lack of information on the subject. Our scientific survey is one of the few attempts in the world to understand how biodynamic farms differ from conventional farms. The objective was to start to define differences in productivity, management, soil water relations, herd health, clinical biochemistry, parasite levels and mineral balances in the soil, plants and animals.

The survey is preliminary and incomplete and it has raised far more questions than it has answered. It adequately describes the two farming systems and provides insufficient data for an economic analysis. Nevertheless it is the only data available on which biodynamic and conventional dairy farms can be compared.

Survey

Six biodynamic farms were compared with their six conventional neighbours in the Goulburn Valley, a major irrigated dairy area in north-eastern Victoria. In June 1990 data were collected on 60 herd management, productivity and health factors from the twelve farms along with blood and faecal samples, were collected in October 1990 and February 1991.

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Mineral analysis was conducted on pasture and soil samples, blood was analysed for a wide range of clinical biochemical tests and phosphorus and faeces from cows and calves examined for parasitic eggs.

Some important differences between the biodynamic and conventional farms are shown in Table 1. All conventional farms found daily treatment for bloat was necessary for most of the spring but biodynamic farms never had the need to treat for bloat. The incidence of mastitis was similar with an eight percent clinical incidence but with less routine use of teat dips and dry cow therapy in biodynamic herds.

The biodynamic cows were not drenched for worms yet mean strongyle, worm counts were similar in cows and calves except that two groups of biodynamic calves had high counts in June and two groups of conventional calves had high counts in February. Liver fluke egg counts were higher in conventional herds than in biodynamic herds for the June sampling but were similar following routine treatment of conventional cows in July. The less harmful stomach fluke showed higher egg counts in biodynamic cows and calves in both June and October. All conventional calves were routinely drenched four times a year for worms and fluke and conventional cows one or two times a year compared with only a few individual affected calves and cows on biodynamic farms.

Heat synchronization was only used on one conventional farm. Early calf inducement was used on 30 cows from four of the conventional herds with only a few biodynamic cows from one herd being induced.

The soils of one pair of biodynamic and conventional farms with the same soil type were closely examined. The biodynamic soil had a higher proportion of water stable aggregates greater than 2mm which indicates a structurally more stable soil. Soil penetrometer readings showed that the biodynamic soil was softer than the conventional at the same water content. These measurements indicate a better soil structure on the biodynamic farm. The less frequent irrigation by all biodynamic farms circumstantially indicates that all have better soil structure than their conventional neighbours.

Cost Comparison

Inputs on biodynamic farms were reduced considerably. Financial information was not collected but cost differences can be imputed in a general sense from the data collected. The cost advantages of biodynamic farms are assumed from survey averages and 1990-91 prices and are considered on a per cow basis rounded to the nearest ten dollars.

On the income side the only information available is on milk production which shows that biodynamic cows produce on average:- 41kg less butterfat and 25kg less protein per cow. Milk income per cow therefore would average $185 less with milk valued at a butter fat price of $4.50 per kg.

An economic conclusion cannot be made about the two systems of farming but it is clear that the costs of the biodynamic farms in the survey were considerably less than the conventional farms in the survey.

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Fertiliser costs:
Fertilisers are not used on biodynamic farms but on average conventional farms used 345kg of super and 26kg urea per hectare.

- Total: $40

Feed Supplements:
Biodynamic farms used 325kg less supplements per cow

- Total: $40

Older cows:
The average of the biodynamic milkers is two years older which means less calves need rearing.

- Total: $38

Bloat:
Conventional cows need regular treatment for bloat and 1 percent die from bloat.

- Total: $30

Drenches:
Regular drenching of conventional cows and calves herds versus a few biodynamic cows and calves.

- Total: $10

Irrigation:
Less frequent irrigation on biodynamic farms and less weed control necessary because head ditches dry out between irrigations.

- Total: $10

Veterinary:
Less incidence of milk fever, acetonaemia, grass tetany and coccidiosis. Less use of teat dips, dry cow therapy.

- Total: $10

Fertility:
Less not-in-calf cows, less use of artificial insemination, less abortions, less induced calving, less heat synchronization.

- Total: $10

Biodynamics has very small costs disadvantages. The biodynamic spray preparation that is usually used each year costs less than a dollar per cow.
TOTAL: per cow cost advantage for biodynamics

- Total: $180

No account has been taken of managerial skill, capital costs and interest in the above figures. However the cost advantages are high enough to suggest that there are considerable cost savings associated with biodynamics.

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Sustainability

The biodynamic farms maintained a level of production that was surprisingly good despite much less reliance on inputs from off the farm. Five of the six biodynamic farmers have been practicing biodynamics for ten or more years, the oldest being 25 years. They seem to maintain producing cows in the herd for longer and have less animal health problems.

There is some direct evidence that biodynamics improves soil structure from one comparison of soil from a biodynamic and conventional farm. Circumstantial evidence indicated from longer irrigation intervals on biodynamic farms and suggests that soil structure improvement may be a feature of biodynamics. Biodynamics appears to be a sustainable system of dairying which is less sensitive to increases in the costs of inputs.

Conclusion

Biodynamics and conventional farms are such complex systems that a whole farm systems approach is needed for any comparison. Our preliminary survey indicates a number of areas that need closer scrutiny within a whole farm study. The four main areas that need emphasis in further studies are:

1. Economic analysis: The relative economic performance of alternative farming systems like biodynamics need to be closely examined. The most common serious question asked about biodynamic farming is "are they profitable?"
2. Soil/water relationships: One of the most remarkable features of the biodynamic farms in the survey was their ability to irrigate about half as often as their neighbours. There are potentially enormous labour savings and perhaps water table and salinity advantages with less irrigation.
3. Animal health: Biodynamic farm appear to have less problems with metabolic and fertility disorders. They cope well with parasites without routine treatment. The biological and environmental mechanisms and inter-actions that give these advantages need to be understood because there may be applications for other farms.
4. Mineral balances: A surprising finding was the continued supply of phosphorus and perhaps other minerals to maintain milk production despite no inputs of phosphorus for as long as twenty-five years. Biodynamics has shown up in the survey to have a number of advantages over conventional farms. Their costs are much lower, their herds appear healthier and there are indications that their soils may be better. However, butter fat and protein production were down 20% and 16% respectively per cow.

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Table 1

PRODUCTION	*Biodynamic	Conventional
Cows milked (number)	87	113
Stocking rate (cows/ha)	1.8	1.9
Butterfat (kg/cow)	164	205
Protein (kg/cow)	117	152
FEED INPUTS		
Grain fed (kg/cow)	60	385
Superphosphate (kg/ha/year)	0	354
Urea fertiliser (kg/ha/year)	0	26
Irrigation interval (days)	15	7.5
DISEASE HISTORY		
Milk fever (prevalence%)	5.5	9.2
Acetonaemia (prevalence%)	0.3	4
Calf Coccidiosis (prevalence%)	0.05	0.2
Grass Tetany (prevalence%)	0	1
Bloat deaths (prevalence%)	0	1
FERTILITY		
Not-in-calf cows (%)	4.0	5.8
Mean cow age (years)	7.0	5.0
Abortion (%)	0.6	2.4
PHOSPHORUS LEVELS		
Blood (mM)	1.4	1.9
Pasture (%)	0.22	0.35
Soil (Olsen P mg/g	11	23
* Average six farms		

Newsleaf, Journal of BDAA, Issue No. 15, Jan 1993, pp19-*24*

Biodynamic Soils Stand Out in German Experiment

While the benefits or organic and Biodynamic practices show up over time on farms like "Demeter" in factors like steady improvement in soil, crop and animal health it is often difficult to convince members of the agricultural establishment, the policy makers and bureaucrats whose advice influences political decision making, that these approaches are effective and economically viable. Fortunately an increasing number of researchers the world over are conducting controlled experiments on BD systems. At last hard data to support the anecdotal evidence is starting to surface. In this and coming issues News Leaf will be presenting results from scientific tests on BD farming systems around the world.

Here we present a report of a German long term comparative test on three approaches to cropping: conventional, organic and BD. The report by Manfred Klett was extracted from the Goetheanum Naturwissenshaftliche Sektion Circular Letter No 51.

Since 1980 a long-term fertilizer experiment has been carried on at the Darmstadt Institute. A location with marginal yields (a 22 soil count, 80% sand, pH 6.6) has been farmed Bio-Dynamically since 1950.

The research area is divided according to three types of fertilizer treatment:
1= mineral
11= organic (rotted and liquid manure)
111= BD (same as 11 + preparations)

There are three levels of fertilizer application for each of the above regimes corresponding to 60, 100 and 140kg of N per ha respectively giving a total of nine fertilizer treatments. There is a four field crop rotation for each treatment, and four replications In other words the experiment is dealing with 144 single parcels of land.

Already after a short time of testing, an unmistakable darker colouring could be seen with the naked eye on the Bio-Dynamic parcels. The humus values for 1989-90 of 1 = 0.8%, 11 = 0.9%, 111 = 1.03% organic Carbon at a depth of 0-25cm confirms this observation. The initial values of 1980 have been maintained in the BD parcels. The declining values in 1 & 11 must therefore derive from a humus breakdown of different intensities.

The following explanations were discussed:

Qualitative differences in the rotted manures 11 and 111 and the course of their further rotting in the soil: the temperature in the prepared rotted manure (111) was 2-3 degrees C lower throughout. This reduction in temperature favoured the growth of fungi and thereby an accumulation of humus material that tends to decompose.

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Changes in the microbial soil life and soil metabolism: Compost fertilizing leads to an activation of the microbial soil life. Under conditions prevailing in Central Europe, fungi account for 60% of soil life and bacteria 25%. This increases in quantity towards autumn and even into the winter, and decreases towards summer. This has a share in all composition and decomposition processes in the soil, although 95% of the biomass is dormant as a rule. The release of nitrogen is a function of the metabolism of soil microbes. To characterize microbial activity a determination is made of: - dehydrogenase activity (DHA) as a general measure for the enlivened state of the soil, - the microbial biomass, - the protease activity as a measure for the intensity of decomposition. This gave as a result a general rise in the values for DHA and biomass 1 < 11 < 111 in the surface soil and still more marked in the lower layers (111 had a DHA value that was 90% higher). The relation between the activities of composition/decomposition of organic matter is shifted in the BD parcels in favour of composition. The vitalising and stabilising effect of the BD prepared rotted manures was shown in all parameters of these experiments.

Qualitative and quantitative differences in root growth: the humus content in the surface soil when compared with 1 (mineral fertilised) was higher by 25% for 11 (organic treatment) and 51% for 111 (BD treatment). In the subsoil the corresponding increases in humus content were 4% for 11 and 42% for 111. The effect of the preparations therefore shows a significant deepening of the mould; that is an expansion of the space the soil provides for life. The microbial activity and humus enrichment in the sub-soil is the result in 111 of a greater root-mass (37%), a higher concentration of rootage (65%) and thus more root residues and a higher measure of root excretion.

Apart from the winter rye, whose yield was greater in the mineral fertilizer treatment, neither the type nor amount of fertiliser showed significant differences in yield. What stands out as a consequence of using preparations is rather, a long term increase in soil fertility.

Summary of Results

	Conventional	Organic	Bio-Dynamic
% O.M. in top soil	0.8%	0.9%	1.03%
Humus content top soil as % of conventional	100	125	151
Humus content subsoil as % of conventional	100	104	142

Newsleaf, Journal of BDAA, Issue No. 15, Jan 1993, pp14 & 15

The Biodynamic Preparations

By Professor Stuart Hill

Professor Hill is one of the few people who have conducted formal research into the mechanics of biodynamics.

"Biodynamics tends to be presented with a high level of mythology and talk of etheric forces and so on, but if you analyse the preparations you will find they are in fact, if properly made, highly concentrated inoculums containing high levels of trace elements and a variety of micro-organisms," he said.

"The starting point for the preparations – he worked with the compost preps when he did some research some years ago – are the flowers of several plants which Rudolf Steiner specified should be picked on the first day the flowers opened.

"Each of the specified flowers has different characteristics that makes them ideal substrates for specific groups of micro-organisms and picking them on the day they open ensures they contain the most concentrated levels of trace minerals," he said. "Different flowering plants use different trace minerals as catalysts to produce odours that attract insects for successful pollination.

"The plant pumps the minerals, which can be in short supply in some environments, up into the flower on the day it opens to maximize its attraction to pollinators while the receptors are fresh. It then recycles them by translocating them to the next flower that opens and so on; repeatedly reusing the minerals to the plant's maximum benefit."

"So picking fresh flowers ensures maximum trace mineral content in the preparations."

When the mixtures of flowers and other components are buried, as prescribed by Steiner, they are colonized by micro-organisms from the surrounding soil and the microbes continue to multiply and build up on the substrate provided by the flowers until the material is broken down. At that stage they produce spores, so the preparations dug out of the ground are concentrated inoculants of trace minerals and spores of a range of micro-organisms: everything needed to trigger a high level of biological activity in the compost or soil, depending on the particular preparation."

"There are undoubtedly other factors or forces at work, but that is at least the part of the scientific explanation for that element of the process," he said.

Further Research

There is an increasing volume of research reports available on the internet. Most research institutes give resumes of current research projects and lists of publications.

New Zealand
Landcare – www.landcardresearch.co.nz
AgResearch – www.agresearch.cri.nz
Dexcel – www.dexcel.co.nz
Hort Research – www.hortresearch.co.nz

United Kingdom
The Organic Centre, Wales – www.aber.ac.uk

United States
US Appropriate Technology Transfer for Rural area (ATTRA) – http://attra.ncat.org

Germany
The Institute for Biodynamic Research, Germany – www.ibdf.de

Netherlands
Louis Bolk Institute, Netherlands – www.louisbolk.nl

Switzerland
Swiss Research Institute of Organic Agriculture (FiBL) – www.fibl.org

Pesticides

Exposing the Myths of 'Safe' Pesticides

Andre Leu, Chair of the Organic Federation of Australia, investigates.

More then 7,200 biocides and poisons are used in Australian agriculture with the blessing of regulatory authorities. But are they really safe??

Conventional farming is dependent on synthetic biocides (pesticides, fungicides and herbicides). These poisons are used in food production to kill pests, disease and weeds. More then 7,200 registered biocide
products are used in Australian agriculture.

This is similar in the USA and Europe. Regulatory authorities assure us that these poisons have been rigorously tested and are used safely on out foods and in our environment.

The Residue Myth

A major myth is that most modern agricultural chemicals leave few residues. We are misled into believing that they breakdown and do not persisted in our food. A typical claim states: "Organophosphorous pesticides, carbamate pesticides are mostly biodegradable, and therefore do not concentrate in the food chain. Synthetic pyrethroids are generally biodegradable and therefore tend not to persist in the environment." These types of statements give a false impression.

1). Most agricultural and veterinary chemicals leave residues in food. That is the reason why residue tolerances called the Average Daily In-take (ADI) are set for these poisons.

The following are some of the poisons found in Australian foods in 2003: *Acephate , Azinphos-methly, Bifenthrin, Bioresmethrin, Captan, Carbarly, Chlorfenvinphos, Chlorothalonil, Chlorpyrifos, Chlorpyrifos-methyl, DDT, DDE, Dimethoate, Diphenylamine, Endosulfan, Fenitrothion, fenoxycard, Fenthion, Iprodione, Maldison, Metalaxyl, Methamidophos, Methidathion, Methoprene, o-phenylphenol, Parathion-methly, Permethrin, Piperonyl butozide, Pirimicard, Pirimiphosmethly, Procymidone, Proargite, Propiconazole, Pyrimethanil, Tebufenpyrad, Tetradifon, and Vinclozolin.*

Testing in Australia only looks at a small sample of the large number of chemicals used. The majority of agricultural chemicals are not included in residue testing. Some of the most widely used chemicals, including herbicides such as Atrazine, Glyphosate, 2,4-D, Diuron and Paraquat were not included in the testing. Many of the current chemicals, including some of the Synthetic Pyrethroids, Organophosphates, Carbamates and Herbicides are as residual as banned Organochlorines such as Dieldrine, DDT, Chlordane, Heptachlor, Lindane and Aldrin.

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The Breakdown Myth
One of the biggest myths is that once a chemical degrades, it disappears and is harmless. But most agricultural poisons leave residues of breakdown chemicals when they degrade.

1. A substantial number of agricultural pesticides such as organophosphates like Diazinon become even more toxic when they break down.
2. Where research exists, it shows that many of the breakdown chemicals from agricultural poisons cause health and reproductive problems.
3. There is virtually no testing to detect the residues of the breakdown chemicals of agricultural poisons in our food.
4. Very little research has been done to determine safe intake levels for the breakdown chemicals of agricultural poisons. Consequently, there are virtually no safety levels to determine the Average Daily In-take (ADI) for the toxic breakdown chemicals that contaminate our food.

The Rigorously Tested Myth
One of the greatest myths is that agricultural poisons are scientifically tested to ensure their safe use.

Registered Agricultural and Veterinary Products
Most agricultural poisons are mixtures of one or more chemicals called the active ingredient(s) mixed with other mostly toxic products, such as solvents or surfactant that are defined as 'inerts'.

Only the active ingredient is individually tested to determine a safety level for the Average Daily In-take (ADI). The actual registered product, which is the mixture of chemicals used by farmers, is not tested for long-term effects such as cancers, hormone disruption, birth defects, nervous system damage and immune system damage. Testing of Roundup, a mixture of the active ingredient Glyphosate, solvents and surfactants shows that this compound is more toxic than the active ingredient Glyphosate. In fact, Glyphosate barely works as a herbicide without the addition of these 'inert' chemicals.

Most of the 7,200 registered agricultural and veterinary products used in Australian food production are not tested for health and reproductive effects. This applies in most other countries, meaning there is no scientific data to determine safety levels for the actual products used on our food.

Chemical Cocktails in Food and Water
Another important issue is that several different toxic chemical products are applied in the production of most foods. These can be a combination of herbicides, pesticides, fungicides and some of the synthetic fertiliser compounds.

Most foods contain a cocktail of small amounts of these toxic chemicals, which are absorbed when eaten. A study by the U.S. Centre for disease control found a cocktail of many toxic chemicals in the blood and urine of most Americans tested.

Regulatory authorities assume that because each of the active ingredients is below the ADI that the cocktail is also safe. They do not test the safety of these combinations of chemicals – the chemical cocktails that we ingest everyday.

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Recent studies raise serious concerns. The emerging body of science demonstrates that many chemical cocktails act synergistically. This means that instead of 1+1=2, the extra effect of the mixtures can mean 1+1=60 or even 1,000 in toxicity.

A study in the journal Toxicology and Industrial Health showed that combinations of low does of commonly used agricultural chemicals can significantly affects health. In experiments conducted by Warren Porter at the University of Wisconsin-Madison, mice were given drinking water with combinations of pesticide, herbicide and nitrate, at concentration currently found in groundwater in the USA. They exhibited altered immune, endocrine (hormone) and nervous system function. The effects were most noticeable when single herbicide (Atrazine) was combined with nitrate fertilizer.

Atrazine is widely used in many agricultural industries including sugar cane and grain production. Atrazine is also one of the most persistent herbicides polluting much of the drinking water in the Midwestern USA, and in parts of Europe and Australia. It is measurable in corn, milk, beef and other foods in the USA and Europe. Porter showed that the influence of pesticide, herbicide and fertilizer mixtures on the endocrine system may also cause changes in the immune system and affect fetal brain development.

Of particular concern was thyroid destruction in humans. This has multiple consequences including effects on brain development, level of irritability, sensitivity to stimuli, ability or motivation to learn and an altered immune function.

A later experiment by Porter and colleagues found that very low levels of a mixture of the common herbicides 2, 4-D, Mecoprop, Dicamba and inert ingredients caused a decrease in the number of embryos and live births in mice at all doses tested. Very significantly the data showed that low and very low doses caused these problems.

The Very Small Amounts Myth

'The residues are too low to cause any problems'. The current model to toxicology (science if poisons) works on the notion that the lower the dose the less the effect of the poison.

When animal testing shows that a certain dose level of poison causes no observable ill effects, this dose becomes the basis for determining the Average Daily In-take (ADI). Authorities then claim that any residue levels below the ADI are too low to cause health problems. Research shows that the toxicology used by our authorities is inadequate in determining the safety of chemicals compounds.

A significant numbers of studies show that compounds considered to have very little toxicity in parts per million (ppm) have a range of adverse effects in parts per billion (ppb). These compounds disrupt our hormone systems at levels 1,000 times lower than previous research stated was safe.

Agricultural chemicals have been shown to mimic hormones such as estrogen, blocking hormone receptors or stopping hormone activity. These chemicals have been implicated in lower sperm counts, increases in breast, uterine, testicular and prostate cancers and deformities in the genital-urinary tracts.

An example of this is Atrazine – one of the world's most commonly used herbicides. Two peer-reviewed studies conducted by Tyrone Hayes Showed the levels 1,000 times lower than currently permitted in our food causes severe reproductive deformities in frogs.

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Sara Storrs and Joseph Kiesecker of Pennsylvania State University recently confirmed Hayes' research. They exposed tadpoles of four frog species to Atrazine. "Survival was significantly lower for all animals exposed to 3 ppb compared with either 30 or 100 ppb. These survival patterns highlight the importance of investigating the impacts of contaminants with realistic exposures and at various developmental stages."

It is time to dispense with the myths that food from conventional farming is safe to eat. The lack of rigorous testing and blatant disregard for scientific evidence confirm there is a lack of credible science to back claims that the poison residues in food are safe to eat.

The Regulatory Authorities' Myth

The greatest myth is that government regulatory authorities ensure agricultural poisons are used safely and cause no adverse health or environmental problems. History shows a consistent failure of regulatory authorities to prevent the contamination of the environment and human health by products previously said to be safe such as Asbestos, Lead, Mercury, Dioxins, PCBs, DDT, Dieldrin and other Persistent Organic Pollutants. These products were not (and are still not in many cases) withdrawn until decades after good scientific evidence was presented to demonstrate their damage.

Regulatory authorities around the world seem to be ignoring a large body of published science showing that the current methods of determining the safety of the agricultural poisons are grossly inadequate.

Environmental Fate

Pesticides do not just pollute our food; they poison our drinking water and air.
In 1999, Swiss research demonstrated that some of the rain falling on Europe contains such high levels of pesticides that it would be illegal to supply it as drinking water. Rain over Europe is laced with atrazine, alochlor, 2,4-D and other common agricultural chemicals sprayed onto crops.

European regulatory authorities have decided to ban Atrazine in 2006
A 1999 study of rainfall in Greece found one or more pesticides in 90 percent of 205 samples taken. Atrazine was measurable in 30 per cent of the samples. Atrazine interferes with the endocrine system. It causes tumours of the mammary glands, uterus, and ovaries in animals. Studies suggest that it is one of a number of agricultural chemicals that cause cancer in humans.

European regulatory authorities have decided to ban Atrazine in 2006 because of recent evidence showing wide spread contamination at levels that cause serious health problems. Authorities around the world, including the USA and Australia have decided to ignore the overwhelming body of science about the adverse effects of this chemical.

Epidemiology and Scientific Testing

Most of the biocides used in farming are synthetic chemicals that have never existed before. Scientists are continuing to find serious unintended consequences on the environment and human health.

An abundance of published scientific research links commonly used pesticides such as Malathion, Diazinon, Chlorpyrifos and other organophosphates as well as carbamates, synthetic pyrethroids and herbicides to disruptions of the hormone, nervous and immune systems. They are also linked to cancers such as pancreatic, colon, lymphoma, leukemia, breast, uterine and prostate. Autoimmune diseases linked include asthma, arthritis and chronic fatigue syndrome.

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'Safe' Herbicide
This article cannot detail them all; however a few examples of the most common 'safe' herbicides follow:

A case-controlled study published in March 1999 by Swedish scientists Lennart Hardell and Mikael Eriksson showed that non-Hodgkin's lymphoma (NHL) is linked to exposure to a range of pesticides and herbicides. Hardell and Eriksson published an earlier study linking phenoxy herbicides to non-Hodgkin's lymphoma (NHL) in 1981. These herbicides are widely used in 2,4-D – part of the infamous Agent Orange.

Before the 1940's, non-Hodgkin's lymphoma (NHL) was one of the world's rarest cancers. Now it is one of the most common. Between 1973 and 1991, the evidence of non-Hodgkin's lymphoma (NHL) in the U.S. increased at a rate of 3.3 percent per year, to become the third fastest-growing cancer. In Sweden, the incidence of NHL has increased at a rate of 3.6 percent per year in men and 2.9 percent in women since 1958.

Denmark banned Glyphosate in September 2003
One of the biocides linked to NHL by the Hardell study is Glyphosate. A previous study in 1998 had implicated Glyphosate to hairy cell leukemia. Several animal studies have shown that Glyphosate can cause gene mutations and chromosomal aberrations. Denmark banned Glyphosate in September 2003 because it was so persistent that it polluted most of the water table.

The response of many regulatory authorities is to ensure that use of Glyphosate is increased substantially around the world with the approval of "Roundup Ready" genetically modified crops.

Children and the Unborn
The greatest concern about these pesticides in our food and water is for the unborn and children. The 20th Australian Total Diet Survey Found pesticides residues in infant food. The regulatory authorities ignored the data by stating: "These results confirm that although infant foods contain pesticides residues, these are at very low levels."

Children have the greatest biocide exposure in proportion to their size. According to the 20th Australian Total Diet Survey: "In general, the dietary exposure to pesticide residues was highest for the toddler are group. This is due to the high food consumption relative to body weight." However because this dietary exposure is below the ADI, many regulatory authorities continue to state that this exposure does not cause problems.

The research by Porter at the University of Wisconsin-Madison showed that children and developing fetus' are at risk from common agricultural chemical mixtures found at levels below those that authorities regard as safe. The influence of these low dose mixtures on developing neurological, endocrine and immune systems can cause diminished learning ability and increased aggression.

Research conducted independently by Hayes and Storrs showed that exposure to amounts more then 1,000 times lower than previously regarded as safe caused serious health and developmental problems to the fetus and juveniles.

Dan Qiao of the Department of Pharmacology and Cancer Biology, Duke University Medical Centre found that the developing fetus and the newborn are particularly vulnerable to amounts of pesticide far lower than currently permitted by most regulatory authorities around the world.

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Their studies showed that the fetus and the newborn possess lower concentrations of the protective serum proteins than adults. A major consequence is developmental neurotoxicity, where the poison damages the developing nervous system.

The scientist stated: "These results indicate that chlorpyrifos and other organophosphates such as diazinon have immediate, direct effects on neural cell replication. In light of the protective effect of serum proteins, the fact that the fetus and newborn possess lower concentrations of these proteins suggests that greater neurotoxic effects may occur at blood levels of chlorpyrifos that are nontoxic to adults.

Apart from Europe's ban of Atrazine and Denmark's ban of Glyphosate, regulatory authorities have made no effort to remove toxic chemicals from food. They continue to perpetuate the myths safety.

Avoiding Pesticides and Other Biocides

It is time to dispense with the myths that food from conventional farming is safe to eat. The lack of rigorous testing and blatant disregard of current scientific evidence confirm there is a lack of credible science to back claims that the poison residues in food are safe to consume.

The only way to avoid these poisons is to eat certified organically grown food – produced without these toxic compounds. A detailed scientific analysis of organic fruits and vegetables in the USA, published in the peer-reviewed journal Food Additives and Contaminants, shown that organic foods have significantly less pesticides residues than conventionally grown foods.

A similar study in Australia by Ruth McGowan for the Victorian DPI conduction 14,000 tests on 300 samples of certified organic produce. The study concluded that: "The results demonstrate that Victorian organic produce is virtually 'chemical free'." Both of these studies showed that the vast majority of organic foods have no residues.

Where residues were found, these were due to widespread contamination by several pesticides used in conventional farming. Even then, these residues were substantially lower in organic foods than in conventionally produced food. Most importantly scientific studies are beginning to show that eating organic food results in lower levels of these pervasive chemicals in humans, particularly children.

A study published in the peer-reviewed journal, Environmental Health Perspectives, found that children who eat organic foods have lower levels of one class of agricultural pesticides in their bodies.

The University of Washington researchers who conducted the study concluded: "The dose estimates suggest that consumption of organic fruits, vegetables and juice can reduce children's exposure levels from above to below the U.S. "Environmental Protection Agency's Current guidelines, thereby shifting exposures from a range of uncertain risk to a range of negligible risk.

"Consumption of organic produce appears to provide a relatively simple way for parents to reduce their children's exposure to OP (organophosphate) pesticides."

Acres Australia, The National Newspaper of Sustainable Agriculture, Australia, Volume13, No.2
Pgs 22 & 23