

Science Group of the Anthroposophical Society in Great Britain

Newsletter - September 2001

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News

24 October 2001, 400th Anniversary of the death of Tycho Brahe

Many thanks to Henry Goulden for sending in a reminder of this anniversary. He writes, 'the full impact of the genius of this man is only now beginning to be realised'. See for instance V. E. Thoren, *The Lord of Uraniborg*, CUP, 1990 and J. R. Christianson, *On Tycho's Island*, CUP, 2000. Also, this year's *Tycho de Brahe Jahrbuch für Goetheanismus* includes an article by M. Peters titled *Tycho Brahe in seiner gegenwärtigen Aktualität 14.12.1546 – 24.10.1601*. Please see 'Publications' section below for details.

Uric acid and BSE

Judyth Sassoon of the Departement für Chemie und Biochemie of the University of Bern writes that she has managed to find funding to pursue a line of investigation partly suggested by Rudolf Steiner's indication on the consequence of cows eating meat, namely a build up of uric acid.¹ She plans to study 1) Circadian variations in uric acid; 2) Uric acid and vegetarian/meat diet and 3) Uric acid (and antioxidants) in neurological diseases (incl. BSE) and will do so within the context of Rudolf Steiner's work and current biochemical knowledge. If you have anything to communicate which may be helpful with this project you can reach Judyth Sassoon at the address given after her article below. (DH)

1. Lecture to the Goetheanum workers in 'Health and Illness', Volume 2, GA 348, given by Rudolf Steiner on January 13th 1923, Anthroposophic Press ISBN 0880100214 hardback, 0880100216 paperback.

Anthro-Tech

The latest issue of *Anthro-Tech News* has an 8-page article by Paul Emberson on the background of the Anthro-Tech work. Its central theme is 'etheric geography' and an account in this context on the choice of the Isle of Mull for the Anthro-Tech workshop. Emberson adds a shorter article (to be continued) on the future of technology and comments that 'It would be an error to imagine that ... astronomical clocks – mechanical imitations of the planetary system – express a purely mechanistic attitude to the heavenly world. The creators of those 14th century masterpieces were deeply religious men, filled with wonder at the greatness of the universe. To them mechanics was not what it is to us today. It was still a revelation of the divine musical-mathematical laws, not a utilitarian science. The essential aspect of astronomical clocks such as these is motion, movement. They are little temples for the Intelligences who rule the movements of the planets.' The author

develops these observations in the context of an urgent need for humankind to work towards a moral technology. Anthro-Tech can be contacted at CH-1669 Les Sciernes-d'Albeuve, Switzerland. Fax: +41 26 928 2244.

The Schiller-File – an offer to translate it

This supplement to the Collected Edition of the work of Rudolf Steiner (Beiträge Nr 122, Summer 2000, Format; 168 mm x 240 mm, 112 pages, illustrated, some coloured. Paper covers.) covers the appointment of tasks by Rudolf Steiner for scientific research. It is an important publication for all those with an interest in the fundamentals of "Anthroposophical Realism" (G. A. 220).

The Schiller-File describes experiments undertaken at the Research Institute (Stuttgart) until its demise, and further experimental work carried on at the Goetheanum and elsewhere – there are notes and letters as late as 1984.

In this volume experiments are described with observations and suggestions by Steiner. Many were undertaken by Schiller himself or with his assistance. For example Steiner was particularly interested in experiments with electrical discharge in a super-cooled vacuum, and remarked that here was a situation analogous to phenomena in the sun.

Descriptions of the work of other scientists is included, such as: Dr Ehrenfried Pfeiffer, W. Pelikan, Dr von Dechend, Dr O. Schmiedel, Dr von Siemens, J. Bramsch etc etc.

The reports of Schiller are followed by a supplement with extensive notes and comments by Stephan Clerc, which is packed with bibliographical and other references.

The wide range of topics covered in the "File" includes: electricity and geo-magnetism, the four kinds of ether, radio, plant growth and the production of a peat-based textile for protection against radiation.

Altogether this edition of the *Beiträge* is a cornucopia of leitmotifs and germinal ideas for anthroposophical scientific research.

In 1923 Rudolf Steiner said it could take 50 to 75 years to bring all the fragmented areas of research together again. Surely the time is now ripe!

In the opinion of the writer the publication of an English edition is of great importance. The undersigned would therefore be prepared to translate this work for publication. To keep the printing costs to a minimum, say less than £10 per copy, the suggested format for the document would be A4 (210 x 297 mm), spiral bound with acetate front-cover and card back-cover. The funding costs needed to cover translation and preparation of camera-ready copy, would be in the region of £1,000. For further details of this translation and publication project please contact: Henry Goulden, The Chapel, Treligga, Delabole, Cornwall PL33 9EE. Telephone 00 44 (0)1840 212728

A proposal for a conference on Darwinism

Paul Carline and Don Cruse wish to propose a major international conference to discuss the many and various shortcomings of the Darwinian theory of evolution, and the alternatives to it that now exist. The date proposed is Easter 2003, and the location either London or Edinburgh, U.K.

We would like anthroposophy to be fairly represented at such a conference, and, if possible, for the Anthroposophical Societies in the English-speaking world to be among its chief spon-

sors. However, this is not intended to be an 'anthroposophical' conference as such. For the challenge to Darwinism to be effective, it must be seen as deriving primarily from evidence accessible to 'conventional' modes of investigation and from rational argument. The inference of intelligent causation and of the primacy of spirit over matter may be the most reasonable outcome, but it should not be the departure point. We would appreciate feedback on this idea.

Don Cruse: don@inversionmixers.com.

Paul Carline: PaulcarlinePaul@netscape.net.

Comment

Forces of formation and dissolution in protein biochemistry by Judyth Sassoon

When teaching second year undergraduates about biochemistry, I am bound to use the language and metaphors of modern science. Nevertheless, I try not to be limited by their rigidity and endeavour to introduce concepts that are more fluid and therefore more akin to living processes. Rudolf Steiner said that we use our scientific models to “*build explanation on explanation, at the same time abandoning observation*”.¹ and I heed his warning and encourage students to observe and experience their observations as carefully as possible, before drawing on accepted models. Their response to my process oriented teaching is generally very good and occasionally I am privileged to witness the moment when a student grasps the significance of an experimental observation in a broader context. Some students even manage to achieve a level of understanding that resonates with something within their inner being. They appear to respond to the experimental processes under examination by activating similar processes in themselves, albeit on an unconscious level. If they could only be encouraged to become more conscious of the dynamics between their inner worlds and scientific observations, they might increase their awareness of the spiritual realities within the discipline we call biochemistry.

In this article I would like to describe some of the concepts that I use to teach students about processes in proteins. The experiments I mention were originally designed to illustrate the mechanical aspects of protein folding but on closer inspection, demonstrate something more important. I believe they reveal how the delicate balance between formative and dissolutionary forces is a crucial determinant of protein activity.

Proteins are long chains of chemical units called amino acids, strung together in the order specified by DNA and then folded up into active conformations. They are the molecular components that accomplish almost all the essential tasks in living cells. For example, proteins catch other molecules and build them into cellular structures or take them apart and extract their energy. They also carry atoms to precise locations inside or outside the cell. They are able to behave, in the metaphorical sense, as “pumps” or “motors” or form receptors that trap specific molecules. They can even act as “antennae” that conduct electrical charge. In order to perform their particular tasks, proteins must have the correct shape and the way they are folded in space determines whether they are active or not. Most biology textbooks declare that protein folding is due almost entirely to the chemical sequence of its component amino acids, also known as the primary structure. I quote from one of the standard biochemistry texts we use in Switzerland:²

“...a protein's primary structure dictates its three dimensional structure. In general, under the proper conditions, bio-

logical structures are self-assembling so they have no need of external templates to guide their formation.”

This is a very misleading statement because it lays all the emphasis on the protein's intrinsic chemistry and does not stress the importance of the “proper conditions”. Yet every biochemist knows that proteins in different environments behave differently. For example, most water-soluble proteins, which are active in aqueous (watery) environments, quickly lose their activity when transferred into methanol, even though chemically methanol is considered to be the nearest common homologue to water.³ In fact such proteins demonstrate their aversion to methanol not only by losing their activity but also by coming out of solution as white, disordered precipitates. Thus I stress that the chemical nature of proteins *per se* is not sufficient to produce their active forms. External forces clearly play a very significant role in determining correct protein conformation and activity.

Many of my demonstrations are performed using a protein called lysozyme found in chicken egg white. One of the attractive features of this system is that the egg white is not treated in any way, so observations are initially made on the protein in its natural setting. Lysozyme is an enzyme, one of a large group of proteins whose function is to speed up chemical reactions. Its activity was first observed in 1922 by the British bacteriologist Alexander Fleming. There is a charming story that relates how Fleming accidentally sneezed into one of his petri dishes and later noticed that the mucus from the sneeze dissolved his bacteria.⁴ It was Fleming's hope that lysozyme would be a universal antibiotic because the reaction it speeds up is the disruption of chemical links in the cell walls of some bacteria and fungi.⁵ To his disappointment, it was ineffective against disease causing bacteria as they generally do not have the thick cell walls on which the enzyme acts most effectively. Nevertheless, lysozyme occurs widely in nature and is found in many species.

In vertebrates, lysozyme is particularly active in saliva, tears, mucus and also in chicken egg white. It is detectable by its ability to cause bacterial cells to burst and this can be observed directly on petri dishes. A culture of a suitable bacterium, for example *Micrococcus luteus*⁶ is grown on solid medium in a dish and the egg white spotted onto the bacterial lawn. After a while, lysis of bacteria at the spots should be visible. To show that the enzyme is indeed breaking up the walls surrounding the cells, a dried cell wall extract is placed in a cuvette and the enzyme added to it. The breakdown of the cell walls can be read using a spectrophotometer as a decrease in turbidity.⁷

Having established a method for measuring lysozyme activity, the next question to ask is what happens to the enzyme under different conditions. One interesting way of altering lysozyme's environment is to add a “chaotropic agent” such as urea. Urea is a highly soluble excretory product of protein degradation and ammonia detoxification in certain animals and humans. It is chaotropic because it “creates chaos” in proteins by increasing the solubility of certain amino acids in water and thus disrupting the protein structure. Some amino acids are said to be hydrophobic or non-polar and are generally quite insoluble in water but when urea is added, their affinity for water increases and they are able to dissolve. If high concentrations⁸ of urea are added to lysozyme the solution becomes more “runny” and there is a dramatic loss of activity. Removal of the urea by slow dilution or dialysis restores the aqueous environment and the enzyme activity.

Another way of disrupting lysozyme activity is through heat. Most people have observed what happens to an egg when it is boiled in water for ten minutes. Both the yolk and white con-

geal into a characteristic solid mass. What was previously fluid becomes solid and no lysozyme activity can be detected in the solid mass of egg white. On a molecular level, the gelling effect is thought to be due to the proteins unfolding on being disrupted by heat and subsequently sticking together through chemical attraction. When the heat is removed, the molecules are so tightly knotted together that it is not easy to bring them back into a soluble state. Although both chaotropic agents and heat ultimately result in the loss of enzyme activity, observation tells us that the processes of inactivation are quite different. The urea increases the interaction of the protein with water making it hypersoluble, while heat causes the protein molecules to act on one another, leading to precipitation and coagulation. Using the alchemical language of Paracelsus, the former promotes a dispersing sulphur process while the latter, a contracting salt process.⁹ It is still possible to restore the lysozyme activity from the heated mass of egg white but to do so it is necessary to use chemically forceful means. Addition of urea and a reducing agent with vigorous stirring, swings the coagulated egg white back towards the opposite extreme of hypersolubility. When it dissolves completely it is then once more necessary to remove the urea under oxidising conditions.¹⁰ This brings the enzyme back to its original aqueous state and once again restores its activity.

From these observations it is possible to conclude that a water-soluble protein like lysozyme is only active when it exists in a balanced state, somewhere between hypersolubility and precipitation. The aqueous physiological environment provides the optimal conditions for maintaining such an equilibrium, while urea and heat disturb the balance to opposite extremes. Water is therefore essential for lysozyme activity and since activity depends on the protein being in an optimal three-dimensional conformation, it is likely that water is also of fundamental importance in the maintenance of correct protein folding. There is, in fact, a mass of scientific literature indicating that protein structures are dependent upon their relationship with water, but this fundamental detail is rarely stated explicitly enough. The emphasis is invariably on the amino acid sequence as the guiding principle behind protein structure. Yet it is clear that the three dimensional conformation of proteins arises from a delicate, dynamic process taking place between the amino acid sequence and the water that surrounds it. Proteins are moulded into their active forms by the way the amino acids interact with water. There are twenty different amino acids in nature. Some of these are hydrophilic and are able to create intimate relationships with water. Others are hydrophobic and are repelled by water. A section of protein sequence with a high proportion of hydrophobic amino acids experiences repulsion by water. These forces cause the hydrophobic amino acids to fold inwards creating a core where they are shielded against the aqueous environment. In contrast, those amino acids able to interact favourably with water are brought to the outside of the protein by the forces of attraction. Thus it is clear that the forces giving rise to protein structures in nature are, in actuality, external. Biochemists lay so much emphasis on the chemistry of the amino acid sequence because they consider the external environment to be fixed and the sequence to be the only variable between proteins. This way of thinking is totally in accord with the tendency of modern science to limit and simplify nature and completely obscures the essential relationship between biological systems and their surroundings. Although a chemical template may reside in the amino acid sequence, it is the action of external forces on this template that actually produces active protein structures.

Theodor Schwenk¹¹ carried out an extensive study on the properties of water and concluded that it is a mediator between the earth and cosmos. It is well known that a body submerged in water is exposed to forces acting from all sides. This observation inspired him to suggest that water is able to align itself with cosmic forces, which also produce their influences from all sides because they are working inwards from the universal periphery. Any protein in an aqueous environment is exposed to these forces. Water compels part of the protein to turn inwards and to incline towards a precipitated state while allowing the outermost part to retain an intimate relationship with the surroundings. Here we have the balance between the precipitated and soluble states, between the salt and sulphur processes. In this balanced condition, the protein is active because it maintains a direct association with the forces streaming in from the cosmos and at the same time turns itself towards the world of solid matter. Water, the ultimate mercuric substance, is responsible for maintaining this balance. Any process taking the protein away from this delicate state, destroys its activity.

1. Steiner, R. "Warmth Course" Chapter 1. Mercury Press, N.Y. (reprinted 1988)
2. Voet, D. and Voet, J.G. "Biochemistry" 2nd edition. John Wiley and Sons, Inc. N.Y. (1995).
3. Although methanol and water are apparently similar on a molecular level, anyone can see that methanol has quite different macroscopic properties, not the least of which is that methanol is a dangerous poison.
4. Alexander Fleming's search eventually led to the discovery of penicillin in 1928. He noticed that a chance contamination of a bacterial culture plate by the mould *Penicillin notatum* lysed the nearby bacteria. Like lysozyme, penicillin also acts on the cell walls of bacteria by inactivating the enzymes that build them. Since bacterial growth and expansion requires the action of enzymes that degrade cell walls, exposure of growing bacteria to penicillin results in their lysis because the normal balance between cell wall biosynthesis and degradation is disrupted.
5. Lysozyme hydrolyses the $\alpha(1-4)$ linkage between N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) in the alternating NAM-NAG polysaccharide components cell wall peptidoglycan in bacteria. It also hydrolyzes the chitin of fungal cell walls which is made up of $\alpha(1-4)$ -linked poly(NAG) components.
6. *Micrococcus luteus* (synonymous with *Micrococcus lysodeikticus*) is a Gram positive, non-pathogenic, bacterium often isolated from human skin. It grows easily on nutrient agars under aerobic conditions at 37°C and have no specific requirements for growth factors or salt.
7. A spectrophotometer measures the absorption of light over a wide range of frequencies. A turbid solution absorbs a certain amount of light while a clear solution absorbs much less, allowing most of the light to pass straight through. A decrease in turbidity registers as a decrease in light absorption. The measurement is usually made at a suitable wavelength, for example 578 nm.
8. The concentrations of urea used are eight molar (8 M). A 1 M solution contains one mole of urea per litre of solution. A mole is defined as the quantity of a chemical substance having a weight in grams numerically equal to its molecular weight and containing 6.02214×10^{23} atoms or molecules.
9. Paracelsus introduced the idea of the "Tria Principia" or "Tria Prima": the trinity of salt, sulphur and mercury. These are principles and not substances and can be used to symbolize processes in chemistry. A salt process is thus solidifying or substantiating; a sulphur process, combustible, chaotic or dissolutionary and a mercury process, transformative and mediating between salt and sulphur. See also: Steiner, R (1911). Eine okulte Physiologie (GA128). Vortrag vom 27.3.1911. Steiner, R. (1920). Geisteswissenschaft und Medizin (GA 312). Vortrag vom 7.4.1920.
10. Lysozyme, like many other secreted enzymes, contains four disulfide bonds. These form between the sulfhydryl side chains of cys-

teine amino acid residues and give it extra stability. Heat causes the lysozyme chains to stick together into a disordered knotted mass. Untangling this mass is not possible without first breaking the disulfide bonds and a reducing agent, such as dithioerythritol, may be added for that purpose. Once the solid egg white has been re-dissolved, both the urea and reducing agent are removed and an oxidising agent, glutathione, added so that the disulfide bonds can reform.

11. Schwenk, Theodor "Sensitive Chaos: The creation of flowing forms in water and air" Rudolf Steiner Press, London (reprinted 1999).

Detailed descriptions of the experiments are available from:

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Microwave pollution and a reflection on it in the light of Platonic and Aristotelian thinking by Sarah Benson

Getting off the train at Chartres last year on my way to the cathedral, I noticed *The Times* headlines announced the decoding of the human genome: "Opening the book of life". I walked up the hill, musing on the wording: the school of Chartres had been a place where the mysteries of the Book of Life were taught. It seemed a significant confluence of place and event.

The students there studied Man, nature, the cosmos and what it means to be human. They meditated on the forces that exist behind the living, visible world, and the Word. This knowledge of the spiritual realities behind all manifestation radiated out as a positive influence for life on earth. This was the Platonic, or spirit-based approach to knowledge. This spiritual knowledge teaches that the human being is a matrix of forces that stream in from the earth and the cosmos. In the human organism, they ebb and flow in response to source fluctuations and human consciousness, serving to maintain body and soul. The soul as supported by the cosmic ethers: light, warmth and water, and the body as supported by the electro-magnetism of the earth, interweaving with the finer ethers to create and maintain life and consciousness.

The hierarchies have finely tuned this organic microcosm as a vehicle for spiritual consciousness throughout evolution. Any disturbance of this delicately balanced symphony of forces can trigger illness, psychological problems or death.

Nevertheless industrial development in the West has created an almost exclusive dependence on mechanically generated electricity – and increasingly on radiated and pulsed electricity that uses progressively higher frequencies for increasingly sophisticated communications technology.

Rudolf Steiner voiced his concern in a question and answer session with farmers in 1924:

"It is at least comforting that voices are now being heard in America – where, on the whole, a better gift of observation is appearing than in Europe – voices, I mean, to the effect that human beings cannot go on developing in the same way in an atmosphere permeated on all sides by electric currents and radiations. It has an influence on the whole development of man."¹

The wireless revolution has increased electro-smog to the point where there is now nowhere on earth where one can experience consciousness prior to its existence.

What are the consequences – physically, etherically and spiritually? And further, what are the implications of the new digital and pulsed microwave signals for mobile phone infrastructure?

Microwaves are the section of the electromagnetic spectrum used for communications. A large body of scientific research shows that both microwave radiation and electromagnetic radiation generally (EMR) have an adverse effect on the human

being, although it remains a complex and controversial area for mainstream science. This is, firstly, because what is being studied is non-material, and secondly, because the genetic variation and diversity of both humans and research animals creates a similar diversity of research results. Thalidomide is a case in point: when it was undergoing safety trials, two studies conducted on the same animals presented two different results. One showed deformities in mice, and the other showed none. The drug companies acknowledged only the latter, with very serious consequences.²

The Director of the US National Institute for Environmental Health Sciences (NIEHS) recently confirmed that since the decoding of the human genome has been completed, it is now officially acknowledged that genetic differences account for varying levels of sensitivity to environmental stimuli – i.e. chemicals and electricity.

This research, which spans the four decades until now, has shown that there are serious health problems associated with exposure to low level electromagnetic radiation. For example The Ecolog Institute in Hanover in a report for the telecommunications industry, announced recently that:

Experiments on cell cultures yielded clear evidence for geno-toxic effects of these fields, like DNA breaks and damage to chromosomes, so that even a cancer-initiating effect cannot be excluded any longer. The findings that high-frequency electromagnetic fields influence cell transformation, cell promotion and cell communication also point to a carcinogenic potential of the fields used for cellular telephony. Moreover disturbances of other cellular processes, like the synthesis of proteins and the control of cell functions by enzymes, have been demonstrated.

In numerous experiments on humans as on animals influences on the central nervous system were proven, which reach from neuro-chemical effects to modifications of the brain potentials and impairments of certain brain functions. The latter effects for instance have been demonstrated by animal experiments and showed up as deficits in the ability to learn simple tasks when exposed to the fields. From experiments with volunteers, who were exposed to the fields of mobile telephones, there is clear evidence for influences on certain cognitive functions. Possible risks for the brain also arise from an increased permeability of the blood-brain barrier to potentially harmful substances, observed in several experiments on animals exposed to mobile telephone fields.³

This is often reflected in evidence of harm suffered in the community, as shown in this report on health effects from people living around a radio tower in New Zealand:

This resident had enjoyed good health until early 1997 when she began to suffer severe headaches and started finding "hard to cope" with her daily life. June 1997 she was diagnosed with a brain tumour in the pituitary area. She has lost the sight of one eye and partial sight in the other. She was operated on the 4th of July and her health has improved but her memory is poor.

Three weeks after she came out of hospital her 3 year-old terrier had an epileptic fit, by the time they took her to the vet the dog was brain dead. (Vets say it is very unusual for dogs to have epilepsy.) Four months later their 8 year-old Doberman had to be put down as she had several tumours. Their present dog, a Rottweiler, is 6 years old and has arthritis.⁴

Rudolf Steiner: "The first thing will be, that in one way or another the animals will die sooner than they should. Electricity will not at first be recognised as the cause; it will be ascribed to all manner of things."⁵

And in an extract from a Canadian review:

Recently another subjective symptom has been receiving increased attention: headache. Frey (1998) speculated that "headaches can be the canary in the coal mine, warning of biologically significant MW-induced effects" Frey points out that headaches as a consequence of exposure to low intensity MW were reported more than 30 years ago and that recent work on the role of blood-brain barrier and dopamine-opiate systems in headache pathophysiology support

a potential aetiopathogenic involvement of MW to headache. A recent epidemiological study by Hansson and Mild et al (1998) supports headaches as a subjective symptomatic complaint.⁶

I am a 50 year old woman who lived 2 km from the Ouruhia tower from 1973. From January 1998 I moved away from the area.

My health prior to 1995 was good. In late 1995 I began to feel unusual levels of fatigue.

In 1996 I began experiencing an irregular heartbeat, palpitations, tiredness and had difficulty concentrating. Through 1997, I experienced intermittently a "spaced out feeling" where I felt "foggy" and suffered from a general malaise. By September of that year I felt impaired peripheral vision and had a sort of tinnitus whereby I would hear a pulsing hissing sound within my head. I would have times when I felt off balance. My eyes felt scratchy and dry at times. Commencing in the latter half of 1997 I had a sensation which I would describe as "electric ants" crawling on my face.

After I moved from Ouruhia in 1998, I felt ill for about 2 more months then started to improve to the point where I feel as good as prior to 1995.

And in another case at the same location:

He had health symptoms which included insomnia, muscle aches, leg aches, back ache, nausea, lack of concentration, headaches and nervousness. After moving from Ouruhia his health also improved dramatically.⁷

There are many case studies of severe health effects in both humans and animals exposed to various frequencies and in varying situations: power lines, mobile phones, mobile phone towers and domestic housing, where return currents often use water pipes to earth.

Dr Neil Cherry, a physicist and atmospheric scientist in New Zealand, who has done an extensive literature review, says:

"[there is] a massive amount of published scientific research showing that radio-frequency/microwave radiation, including cell-phone-type radiation, is geno-toxic. A substance is geno-toxic if it damages the DNA. Over 25 studies show that RF/MW radiation is geno-toxic by damaging chromosomes and DNA, transforming cells into cancer cells and changing oncogene activity. Cell-phone-type radiation has been shown in multiple independent laboratories to damage chromosomes, break DNA strands and enhance oncogene activity. This means that the safe level of exposure is zero. So far five published studies show that cell-phone use increases cancer in people, including brain tumor and eye cancer."⁸

Dr John Holt, an Australian radiotherapist, has found that tumours are three times as conductive of electricity than healthy tissue.⁹ Dr Holt has also published a paper that showed a significant increase in the incidence of cancer in Queensland, Australia, after the installation of TV towers in the 1950s.¹⁰

In the mainstream scientific community there is controversy regarding a mechanism by which to explain how electromagnetic fields or radiation adversely affect cellular function. However Dr Neil Cherry says cell signalling – 'cells whispering to each other' – is the foundation of biological processes. One of the essential chemicals in this process is calcium. Cells use calcium to facilitate signalling, and this is one of the mechanisms that has been demonstrated by laboratory testing: effects include altering the EEG and hormones and damaging cells, leading to headaches and memory loss, to cancer and leukaemia.¹¹

Recently at the Australian Senate Inquiry it was also revealed that heat-shock proteins are switched on as a result of exposure to mobile phone radiation, and that this mechanism can also act as a trigger to tumour formation.¹²

However, the fundamental challenge for modern thought lies in the fact that matter is inter-acting with a force – and this is not visible under a microscope. This situation provides an unequivocal picture of the dilemma of the scientific community, as humanity proceeds with its traversing of the threshold between matter and spirit. It is a challenge that could lead either to greater heights of knowledge or into the abyss.

The human being, due to the high water content in the body, acts as an antenna to electromagnetic forces both natural and mechanical. Alan Hall in his book "Water, Electricity and Health",¹³ points to water as highly sensitive to the influence of electricity, and some scientists have indicated that Electro-magnetic Radiation (EMR) has an ageing effect on the body.¹⁴ "The dipole movement of clustered water molecules interacts strongly with a microwave field. Irradiation of water by microwaves facilitates the conversion of EMR to kinetic energy."¹⁵ So it is clear that water ether, as the mediating substance between energy and matter, is highly vulnerable to the destructive effects of EMR.

The heart is also affected adversely by EMR.¹⁶ Interestingly, both the heart and the brain have been discovered to resonate at the same frequency as the earth's electromagnetic field, which is about 8 – 14Hz. These vital organs are now exposed to digital frequencies billions of times higher than this 24 hours a day. Research also indicates that studies carried out using a digital signal are more likely to cause cell damage than the old analogue signal. This is because the wave is broken up into mechanical bursts of energy occurring 217 times per second. Each packet of radiation contains fragments of the spoken word, which are then re-constituted, minus some of the sound, to the receiver. This amounts to the brain and heart being subjected to 217 electrical hits per second of mechanical and unvarying EMR. These highly coherent signals are at variance with the human organism that resonates to the subtly shifting patterns of natural cosmic and earthly energies.

Perhaps of even greater significance is the impact on consciousness, such as memory and concentration loss.¹⁷ Other effects on the soul, such as depression, and anxiety,¹⁸ are often associated with ELF exposure, such as power lines or domestic high fields. The spiritual consequences of chronic over-exposure to EMR pollution in the environment appear to be that the forces of the lower pole overwhelm those of the upper. This is apparent in many contemporary phenomena. Rudolf Steiner:

"...electricity has an appallingly unconscious influence;...man's inner life will become different if these things are carried as far as is now intended... This life of men in the midst of electricity, notably radiant electricity, will presently affect them in such a way that they will no longer be able to understand the news which they receive so rapidly. The effect is to damp down their intelligence."

And:

"Now you must not forget that electricity always works on the higher organisation, the head-organisation in both man and animal; and correspondingly, on the root organisation of the plant. It works very strongly there."

And:

"Electricity, once for all, is not intended to work into the realm of the living – it is not meant to help living things especially; it cannot do so. You must know that electricity is at a lower level than that of living things. Whatever is alive – the higher it is, the more it will tend to ward off electricity. It is a definite repulsion. If now you train a living thing to use its means of defence where there is nothing for it to ward off, the living creature will thereby become nervous or fidgety, and eventually sclerotic."¹⁹

Of all the organs in the body, those that are most sensitive to the onslaught of electromagnetic radiation are the pineal and pituitary glands in the brain, and the brain itself. However it is these centres that serve to mediate the consciousness with the cosmos, and form within the body the seat of the upper pole of consciousness. The philosophers of old called this gland the gateway to heaven. On the physical level they regulate the endocrine system for inner harmony.

One of the functions of the pineal gland is the secretion of melatonin, a hormone that induces sleep and protects against

the development of cancer. Research shows that the production of melatonin is inhibited by exposure to EMR.²⁰ Insomnia is possibly the most common and immediate symptom of exposure to EMR – an indication of Ahriman’s fundamental intention to cut humanity off from the spiritual realm. Homing pigeons and migrating birds have a similar organ in their brains, which they use in conjunction with the earth’s electromagnetic field to navigate. Interestingly, over the past few years pigeon racing clubs in Europe, the US and UK have reported thousands of birds missing, way off course, injured or killed by flying into high objects and buildings.

Whales navigate using sonar; and this too has been an issue, with large pods of whales beaching – due, it has been speculated, to under water cables that link countries to the internet, especially in Australia.

The essential characteristic of electromagnetic or microwave pollution is that it is causing the forces of the lower pole of the human being to dominate the upper; an attempt is being made to turn the development of the consciousness soul towards an egoistic end. This process is largely happening in the unconsciousness, the level where electricity operates.

We can observe that over the past 50 years or so there has been very little creation of divinely inspired culture; whether art, music, literature or poetry. Could this be one of the symptoms of such interference?

Light ether carries the Logos, Christ-consciousness and Michaelic forces into the human soul, where its task is to maintain the link between thought and the forces of the sun, which are warm as well as light. Rudolf Steiner: “The origin and sustaining principle of all existence is the realm of archetypal thoughts...if any part of creation were not illumined by this realm, it would be empty and lifeless, it would not partake of the life-beat of the world.”²¹ One of the physical effects of exposure to EMR is on the so-called blood-brain barrier.²² This means that the sheath around the brain that protects it becomes permeable – allowing into the brain harmful toxins. The brain needs to be kept cool in order to operate effectively. Radiofrequency radiation heats tissue at the higher power levels, but also has a heating effect due to the pulsed and digital action of the wave.

Peter Tradowski writes: “Already today a dark Godhead has taken up rulership at the same time as Michael – the God Mammon. For occultism Mammon is not only the God of money; he is also the leader of all low and dark forces; and his army attacks not only the human soul but also the physical bodies of human beings to corrupt and destroy them.”²³

The effect of electricity is to create bodily vehicles that reflect the nature of Ahriman and the laws of the lower world. The ‘Word’ of Ahriman is the cosmic counterpart to the original creative Word of the Elohim. It is the Word of materialism that attempts to create in its own image a travesty of the humanity envisaged by the Gods.

In this realm, the healing power of music and the word is an effective way of remaining attuned to the source frequencies of our being. A story was reported some years ago of monks who decided to cut their daily chanting of Gregorian hymns from their curriculum. They consequently became ill and depressed, but on resuming their singing they all recovered. The students at Chartres were taught music and singing as a way of understanding the power of Tone and the Word.

The healing power of the Word is also well demonstrated by the excerpt in Goethe’s famous story ‘The Green Snake and the Beautiful Lily’, where the snake discovers that conversation is more precious than both light and gold.

Science is only at the very beginning of its understanding of electricity. The current problems can be seen as an opportunity to focus on the fact that the area under study is of a non-material nature, and that this could be a pointer to the existence of non-material realms, as is already being done in quantum physics. It also points towards the possibility of there being an alternative source to power wireless technology as suggested by Rudolf Steiner.

The School of Chartres was witness to the wisdom of the Platonists but they were superseded by the Aristotelians who were active subsequently at the University of Paris. The Platonists embodied cosmic wisdom as represented by the Divine Sophia, and the Aristotelians sought to find the meaning of creation from within matter itself. However the work of Rudolf Steiner seeks to unite these two streams in anthroposophy. Spiritual and natural science must work together in order that a true picture of the world, the cosmos and the human being can emerge. This can be seen as a picture of the working together of head and heart under the guidance of Michael.

It is this knowledge, and the working towards it for the benefit of humanity out of anthroposophical inspiration, that will provide a counter-force to such environmental onslaughts: ego-activity that has its origin in the Sun/Logos. As the saying of Christ from the Gospel of Thomas puts it: “If you bring forth what is within you, what you bring forth will save you. If you do not bring forth what is within you, what you do not bring forth will destroy you.”

1. Rudolf Steiner, Agriculture Lectures, 16th June, 1924.
2. Inquiry into Electromagnetic Radiation: Report of the Senate Environment, Communications, Information Technology and the Arts References Committee, May 2001.
3. Ecolog Institute: Cellular telephones and Health, May 2001
4. The Ouruhia Health Effects Report – 2000.
5. Op.cit, Steiner
6. ‘Report of the Potential Health Risks of Radiofrequency Fields from Wireless Telecommunication Devices.’ – Society of Canada, March 1999.
7. Op cit – Ouruhia
8. Personal email from Dr Cherry.
9. Inquiry into Electromagnetic Radiation: Report of the Senate Environment, Communications, Information s Technology and the Arts Committee, Parliament of the Commonwealth of Australia.
10. Dr John Holt, ‘Changing Epidemiology of Malignant Melanoma in Queensland’, The Medical Journal of Australia, 1980.
11. Evidence that Electromagnetic Radiation is Genotoxic: The Implications for the Epidemiology of cancer, cardiac, neurological and reproductive effects, Dr Neil Cherry, June 2000.
12. Op cit, Australian Senate Inquiry, (Dr Peter French, St Vincent’s Hospital, Sydney)
13. Water, Electricity and Health, Alan Hall, Hawthorn Press, 1997
14. Depressed growth of chickens and baby rats at 14 – 500 microwatts/cm² (Giarola et al, 1971); Depressed growth of rats at 100 μW/cm² (Gabovitch et al, 1979;), Depressed growth of rats at 600μW/cm² (Ray and Bahari, 1991); Decreased thickness of growth rings in trees (Balodis et al, 1996), Accelerated resin production and premature ageing of pine trees at 0.00024μW/cm² (Selga and Selga, 1996), Shorter life span and impaired reproduction of duckweed plants (Magone, 1996).
15. Clifford Maurer: Comment regarding basis for adverse long-term health effects associated with use of cellular phone handsets, 2001
16. Orlova, 1960; Bachurin, 1979; Zmyslony, 1996; etc
17. Sadchikova, 1960, 1974; Frey, A.H., Feld, S.R.,1995: “Neural function and behaviour: defining the relationship in biological effects of non-ionising radiation.”

18. Mann and Roschke, 1996; Sikorski and Bielski, 1996; Baranski and Edelweg, 1975; Klimkova-Dreutschova, 1974.
19. Op cit, Steiner
20. Birch, Reif, Yost, Keefe, and Pittratt, 1997: "Cellular telephone use and excretion of a urinary melatonin metabolite". Annual review of Research in Biological Effects of electric and magnetic fields from the generation, delivery and use of electricity, San Diego, CA.
21. Op cit, Steiner.
22. Salford et al., 1994: "Permeability of the Blood-Brain Barrier induced by 915MHz electromagnetic radiation, continuous wave and modulated at 8, 16, 50 and 200Hz.
23. 'Ere the Century Closes, Peter Tradowski, Camphill Press, 1995.

Sarah Benson has no scientific qualifications, but has been a researcher and activist in this area with the Australian Democrats for 6 years. Email: sarah.benson@aph.gov.au

Meeting Reports

The Intrinsic Value and Integrity of Plants in the Context of Genetic Engineering

Summary of the Proceedings of an Ifgene workshop on 9 - 11 May 2001 at the Goetheanum, Dornach, Switzerland

Some forty people from various occupations including law, moral philosophy, molecular and holistic biology, plant breeding, horticulture, food manufacturing, environmental activism, overseas aid and political science met for two days in May 2001 to work on this theme. The following is a selection by the editors of their own impressions of the key points which arose during the proceedings.

It emerged from this multi-disciplinary workshop that, for the time being at least, the meaning of the concepts intrinsic value and integrity of plants remains fuzzy. Indeed their novelty in the public mind is reflected in the lack of uniformity with which the term 'dignity of creatures' is presented in the Swiss constitution in its three official languages and in its authorised English translation.

Unlike the observations and facts of quantitative science, which are obtained by well defined criteria and which gain a status of depersonalised, 'objective' truth, e.g. plant height, dry weight etc., the concepts intrinsic value and integrity must be developed on the basis of the personal perception of signs. But plants are more than the sum of a myriad isolated characteristics. Thus the content of these concepts is strongly dependent on both our individual inner view of plants and the fundamental man-nature relationship. However, this fact should not be interpreted as a reason for attributing merely subjective qualities to intrinsic value and integrity. On the contrary, the papers presented show beyond doubt that the justification for ascribing integrity or dignity to plants is rooted in qualities which must be elucidated by human consciousness yet reside essentially in the plants themselves. Hence, we recognise dignity as well as bestow it.

It is relatively easy to attribute a moral status to sentient animals (zoocentric approach) on the basis of their similarity to man, because they can feel pain or they exhibit a comparable neural organisation. But attributing an equally valid moral status to plants (biocentric approach) is possible only by acknowledging their otherness. It remains an open question whether this otherness or autonomy of plants is inaccessible to man and thus locked in the eternal black box of their essence or whether it is open to human knowledge. Obviously, ascribing intrinsic value and dignity depends on a deepened and conscious relationship to plants.

In contrast to animals, which exhibit what we may call a 'centre of being', plants are much more inclined to mirror their environmental conditions and context (ecocentric approach). Thus, any approach towards a moral status of plants has to take into consideration these 'peripheral qualities'. As a consequence, a thorough evaluation of intrinsic value and integrity of plants must respect this interdependence. Breeding and cultivation practices have always dealt with such mutualisms. Genetically engineered plants in general require standardised conditions of cultivation, which basically can be created and applied on a global scale. On the other hand, cultivation of crop plants in systems which acknowledge ecological, geographic and cultural differences, requires a spectrum of locally adapted varieties. As a consequence, one could argue that any restriction of crop plant diversity and concomitant reduction of production system diversity interferes with intrinsic values and integrity. Plants without context are mental abstractions.

Weighing intrinsic value and integrity of plants must include some form of scaling process. It would be counterintuitive to judge these properties on the same level regardless of whether man, animals or plants are under consideration. However, there is good reason to ask at what point in legislative processes such discrimination should take place. Implementation of these concepts in juridical frameworks and laws is very limited and where approaches have been undertaken to protect intrinsic values and integrity in the constitution and the law – as in Switzerland – the consequences remain obscure and ineffective.

Practices of breeding and production should fulfil sustainability criteria by using natural vegetative processes and growth conditions to a significant extent. Examples were presented in the workshop showing that where this is done there is a tremendous improvement of the economic, societal and personal conditions of the producers themselves. Respecting intrinsic value and integrity of plants results in a real added value in the cultural sphere. This lends support to the ideas derived from philosophical considerations that these concepts arise from the strong, practical interrelation of nature and man. As a consequence, commissions, working groups or advisory boards dealing with the issue of intrinsic value and integrity of plants should be genuinely interdisciplinary and broadly based.

There was general agreement that basing the paradigm for understanding plants exclusively on molecular biology is inadequate for judging the essence of integrity and intrinsic value of plants and for assessing where these attributes might be violated. Therefore, alternative paradigms are necessary. The holistic approaches presented by some speakers are good examples for demonstrating that moral reflections on plants require a spiritual foundation. Indeed it was clearly evident from them that such a foundation is accessible and communicable to a modern consciousness and that unbiased observation of plants together with deliberate attention to personal intentionality reveal their spatial and temporal contexts which transcend purely sensual qualities and turn out to be relevant for making judgements.

A thorough examination of the technical procedures involved in the generation of genetically modified plants vividly illustrated the need to base the development of viewpoints concerning intrinsic value and integrity of plants in the context of genetic engineering on actual experience. Thus, when attempting to understand the concepts, intentions, working hypotheses or possible benefits and risks, it is strongly recommended that we also try to gain insights into the current experimental situations and laboratory conditions of plants.

Complementary unbiased observations of developmental and vegetative processes are a promising addition to the toolbox when trying to understand plant integrity and intrinsic value.

Johannes Wirz and David Heaf

(For details of contributors and contents please see 'Publications' section below.)

Future Meetings

Lili Kolisko Quarter-Centenary Conference

A group of people including Science Group members as well as members of the Science Section of the School of Spiritual Science are holding a weekend conference on 23-25 November 2001 to commemorate the work of Lili Kolisko who died on 20th November 1976. The venue is the Centre for Science & Art, Stroud. The programme contains oral presentations, an exhibition of work, a visit to Kolisko Farm, a demonstration of capillary dynamolysis and ample opportunities for discussion. This conference comes at a time when there is a growing interest in picture-forming qualitative methods. Indeed, their application in food quality assessment was featured in a presentation of Ursula Balzer-Graf's work to the Soil Association conference, Cirencester in 2000. Contributions are already programmed from Richard Swann, Henry Goulden and Nick Kollerstrom. The organisers would welcome further offers of contributions to the content and funding of this conference.

As part of the preparations for the conference a new section of the Science Group's web site has been opened comprising Nick Kollerstrom's work using Lilly Kolisko's capillary dynamolysis (Steigbild) method for studying metal-planet relationships. The URL is <http://www.anth.org.uk/Science/kolisko/>. For further details please contact: Richard Swann, Orchard Leigh Camphill Community, Bath Road, Eastington, Stonehouse, Gloucestershire GL10 3AY. Tel: 00 44 1453 825617; Fax 00 44 1453 823811. E-mail: raswann@callnetuk.com.

A digital version of the conference information is at: <http://www.anth.org.uk/Science/koliskoconf.htm>.

Microbiological processes – a key to a chemistry of life

This workshop and round-table discussion for members of the School of Spiritual Science taking responsibility for the scientific work will take place from 19-22 September 2001 in Dornach, Switzerland. Contributions will be made by Johannes Kühl, Norbert Pfennig, Jochen Bockemühl, Meinhard Simon and Christoph Rehm. Full details can be obtained from the Science Section at the Goetheanum, Postfach, CH4143 Dornach Switzerland. Tel: 00 41 61 706 4210. Fax: 00 41 61 706 4215. Email science@goetheanum.ch.

Earthly and Heavenly Harmonies

4 - 7 October 2001, at Hawkwood College, Painswick Old Road, Stroud, Glos, GL6 7QW.

The 'Eclipse Conference' of 1999 had 62 participants and was deemed a success. Topics covered in this conference will include: The planets and metals; A mythology of Jupiter and Saturn; The Aurora; Sunspots; Agriculture in relation to the cosmos.

Tutors will include: John Meeks, astronomer and colleague of the Mathematical-Astronomical Section of the Anthroposophical Society in Dornach, Alan Brockman, a leading Bio-Dynamic farmer, Liesbeth Bisterbosch, an astronomer from Holland, Ron Jarman, Nick Kollerstrom, Maggie Salter, Henry Goulden and Robert Byrnes.

There will be an exhibition of John Salter's sculptures on the zodiac. Further information on the conference will be available in the New Year. The concert on Saturday evening with internationally renowned concert pianist Bernard Roberts will be free for conference participants.

Enquiries to Henry Goulden, The Chapel, Treligga, Delabole, Cornwall PL33 9EE. Tel 00 44 (0)1840 212728. Bookings at Hawkwood: Tel: 01453 759034, Fax: 01453 764607. Email: hawkwoodcollege@cs.com. Web: www.hawkwoodcollege.co.uk.

UK group of the Science Section

There will be a meeting of the UK group of the Science Section on Sunday 21st October 2001 for members of the School of Spiritual Science who are taking responsibility for the scientific work. Full details are available from Richard Swann whose contact details are in the opposite column.

The Ethers and the Fallen Ethers

A conference of the Natural Science, Mathematics and Astronomy Section of the School of Spiritual Science in North America will take place on 15-18 November 2001 at Pasadena, California on the above theme hosted by the Anthroposophical Society, Los Angeles Branch. This conference is for members of the School of Spiritual Science. Details are available from the conference organisers Sandra Doren at sd62q@nih.gov, tel: +1-301-585-4-35 or Jim Kotz at jimk_99_11@yahoo.com, tel +1-850-212-8169.

Ifgene workshop 2002

The International Forum For Genetic Engineering (*Ifgene*) is in the early stages of planning a UK workshop on the theme 'Intrinsic Value and Integrity of Farming System Biota in the Context of Genetic Engineering'. The date is likely to be early Autumn 2002 and Edinburgh is being considered as the venue. More details can be obtained from *Ifgene* UK co-ordinator, Dr David Heaf (address at the end of this newsletter) or by checking *Ifgene* web site (from January 2002) at <http://www.anth.org/ifgene/>.

Courses

Schumacher College

Farming for better food – Solutions to the global crisis in agriculture with Mark Ritchie, Jules Pretty and Tim Lang. 4-23 November 2001

Digital future? Information technology and the earth with Chet Bowers and Langdon Winner. 6-25 Jan 2002.

Seeing with new eyes: science and the nature of life with Chris Clarke, Rupert Sheldrake, Arthur Zajonc and Brian Goodwin (more details below).

Plus a number of workshops and conferences on ecological themes.

Contact: Schumacher College, The Old Postern, Dartington, Totnes, Devon TQ9 6EA, UK Tel: +44 (0)1803 865934; Fax: +44 (0)1803 866899; Email: schumcoll@gn.apc.org Website: <http://www.gn.apc.org/schumachercollege/>

Seeing with new eyes: science and the nature of life

Chris Clarke, Rupert Sheldrake, Arthur Zajonc & Brian Goodwin. March 3-22, 2002

For nearly 400 years, Western culture has been heavily influenced by a science and a technology which assumes that the universe is a meaningless machine made up of disconnected

atoms. But science is gradually changing, and these underlying assumptions can now be authoritatively challenged. This course will study some of the key changes coming from cosmology, high-energy physics, quantum theory and the perception of light, discussing what they mean for the nature of life and consciousness and how we understand the world. Biology is also being transformed, as the necessity of studying organisms as living wholes – rather than collections of cells – becomes ever more apparent. The importance of understanding the living world as interdependent systems has major implications for how we interact in social groups and the structure of our institutions, and these will be explored using a variety of methodologies.

Chris Clarke was Professor of Applied Mathematics at the University of Southampton and now concentrates on teaching in the area of science and spirituality. He is author of *Reality Through the Looking Glass*. Rupert Sheldrake is a biologist and author of *Dogs that Know When Their Owners are Coming Home*, and *Other Unexplained Powers of Animals*, a sequel to his best-selling *Seven Experiments that Could Change the World*. Arthur Zajonc is professor of physics at Amherst College, and lectures widely on the history and philosophy of science. He is author of *Goethe's Way of Science*. Brian Goodwin was Professor of Biology at the Open University, and is now Co-ordinator of the MSc in Holistic Science at Schumacher College. He is author of *How the Leopard Changed its Spots*.

Further details from Schumacher College (contact details with preceding item).

Publications

The Intrinsic Value and Integrity of Plants in the Context of Genetic Engineering

Proceedings of an Ifgene workshop on 9 - 11 May 2001 at the Goetheanum, Dornach, Switzerland. Contents: Dignity of plants and perception, *Christoph Rehmann-Sutter*. Dignity of living beings and the possibility of a non-egalitarian biocentrism, *Klaus Peter Rippe*. The intrinsic value of animals: its implementation in governmental regulations in the Netherlands and its implication for plants, *Henk Verhoog*. Dignity of Man and Intrinsic Value of the Creature (Würde der Kreatur) – conflicting or interdependent legal concepts in legal reality?, *Hanspeter Schmidt*. Shamans and scientists, *Jeremy Narby*. A Goethean view of plants: unconventional approaches, *Jochen Bockemühl*. Ethical plant breeding techniques from an organic point of view, *Edith Lammerts van Bueren*. Does gene transfer violate the integrity of plants? *Michel Haring*. Solutions of agronomic problems based on 'ecological integrity' *Florianne Koechlin*. A practising horticulturist's view on the integrity of plants, *Christian Hiss*. The food plant from the processor's perspective: the example of the cocoa tree, *Craig Sams*. The socio-cultural question: does genetic engineering advance sustainable development?, *Miges Baumann*.

Plus transcripts of the discussions & 17 illustrations (13 in colour). 66 pages. Format: A4; paperback. ISBN 0-9541035-0-5. Printed in UK. Edited by David Heaf and Johannes Wirz. More information on this publication and workshop at: <http://www.anth.org/ifgene/papersMay2001.htm>

UK orders (cheques only) & enquiries to: David Heaf, Ifgene UK, Hafan Llanystumdwy, LL52 0SG, UK. Tel/Fax: +44 1766 523181, Email: 101622.2773@compuserve.com. UK price 10.00 pounds sterling including postage. Cheques to 'International Forum for Genetic Engineering'

Non-UK orders (including all credit card payments) & enquiries to: Ifgene, c/o Naturwissenschaftliche Sektion am Goetheanum, Postfach, CH-4143 Dornach 1, Switzerland, Email: johannes.wirz@goetheanum.ch, Fax: +41 61 706 4215, Price: 25.00 Swiss francs (approx US \$15; including postage worldwide). Downloadable order form for non-UK orders and for credit card payments worldwide at: <http://www.anth.org/ifgene/papersMay2001.htm>.

Archetype

Published by the Science Group of the Anthroposophical Society in Great Britain.

Issue 7, September 2001: The fourth dimension, *Rudolf Steiner* (Berlin, 24.3.05). Large Dam Projects – Examples of Faustian Machinations, *Eduard Naudascher*. Lilly Kolisko – Life and Work 1889-1976, *Gisbert Husemann*.

44 pages, A5. Price: £3.00 incl. UK p&p (overseas p&p: EU add £0.50, elsewhere add £1.00). Orders to the editor, David Heaf (address at the end of this newsletter). Cheques (including international money orders and non-UK currency cheques payable to 'Science Group, AS in GB'). Foreign currency banknotes acceptable at current exchange rates at the sender's risk. All back issues are still available: please enquire or see <http://www.anth.org.uk/Science/archetyp.htm>.

Mathematisch-Physikalisch Korrespondenz

204, Easter 2001: Die geometrische Algebra der ebenen Vektorgeometrie, *Oliver Conradt*. Unendlichferner Punkt – ein Unrecht gedachter Begriff?, *Arnold Bernhard*. Der Elektronen- und Photonenspin. Dritter Teil: Das Bewegungsgesetz für die Quanten der elektromagnetischen Welle, *Karl-Heinz Niklowitz*.

205, St John's 2001: Rudolf Steiner zur Statistik, *Renatus Ziegler*. Documentation on Rudolf Steiner's indications regarding the concepts chance, chaos, statistics and probability determination. Arbeitshefte der Mathematisch-Astronomisch Sektion am Goetheanum, Kleine Reihe, Heft 3, 2001.

206, Michaelmas 2001: Das ägyptische Dreieck als Keim aller pythagoräischen Dreiecke, *Georg Glöckler*. Die geometrische Algebra der räumlichen Vektorgeometrie, *Oliver Conradt*. Das Zeitproblem, *Kurt Pfister*.

Subscriptions are Sfr45/DM50 per year. Edited by Dr. Peter Gschwind, Mathematisch-Physikalisches Institut, Benedikt Hugiweg 18, CH-4143 Dornach, Switzerland.

Newsletter of the Society for the Evolution of Science

Vol. 17 (1) Spring 2001: Goethe's concept of time and modern research in biological heterochrony, *Wolfgang Schäd*. Editor/Treasurer: Jim Kotz, 3698 Dwight Davis Drive, Tallahassee, FL 32312, USA. Email: jimk_99_11@yahoo.com.

Wasserzeichen

Nr. 14 (2001): Whilst this issue of *Wasserzeichen* contains no main articles, its 35 pages have many short contributions including items on the Flow Research Institute's work, its conferences and publications. Price DM 3.00 per issue. Free to sponsors. Institut für Strömungswissenschaften, Stutzhofweg 11, D-79737 Herrisried, Germany, Tel: +49 (0)77 64 269, Fax +49 (0)7764 1324.

In Context – The Newsletter of the Nature Institute

No. 4, Fall 2000: Main article: Skunk cabbage (*Symplocarpus foetidus*), *Craig Holdrege*.

No. 5, Spring 2001: Main Articles: Elephantine intelligence, *Craig Holdrege*. Life beyond genes: reflections on the Human Genome Project, *Craig Holdrege and Johannes Wirz*. These

newsletters include many comment items on contemporary issues as well as a description of the life and work of the Institute. The main articles are illustrated. Contact details: The Nature Institute, 169 Route 21C, Ghent, NY 12075. Tel: 518 672-0116. Fax: 518 672 4270. Email: nature@taconic.net.

Waldorf Science Newsletter

7, #14, Spring 2001: Pictorial earthquake (using a pendulum and sand) – see www.earthquakerose.com. Boiling with snow (Boiling water at 40°C) Grade 9 physics experiment, *Henry Saphir*. Toward a Waldorf high school science & technology curriculum for the 21st century, *Dick Oliver*. Thermal decomposition of calcium carbonate, *John Hoffman*. Crystal reveals unexpected beginnings, *J. Gorman*. Sustainable development, *Prince Charles* (from the Reith Lectures). Cosmic ray studies on skis, *John Petering*. Experiments: Lentz's law demonstrations; Three faces of Lentz's law – Simple activities in 11th grade physics. Notes on the physics underlying the 'brushless safety-pin motor'.

Edited by David Mitchell and John Petering, \$5.00 each
Contacts: Judy Grumstrup-Scott, Association of Waldorf Schools in North America (AWSNA) Publications, Email: jgscott@awsna.org. Web site: www.awsna.org. David Mitchell, 1158 Quince Avenue, Boulder, CO 80304, USA. Fax 303/ 541-9244. Email: davidm@awsna.org.

Tycho de Brahe Jahrbuch für Goetheanismus

2001: Tycho Brahe in seiner gegenwärtigen Aktualität 14.12.1546 – 24.10.1601, *M. Peters*. Was ist Goetheanismus? *W. Schad*. Johannes Müller im 19. Jahrhundert – Schicksal von Leben und Werk, *P. Selg*. Von der Umwandlungskraft der Luft – Zur Chemie-Epoche der 9. Klasse der Waldorfschule, *U. Wunderlin*. Die heimischen Johanniskraut-Arten der Gattung *Hypericum* im Vergleich, *B. Busse*. Kopffüßler, Schnecken und Muscheln in ihrer organismischen Verwandtschaftsordnung, *Th. Göbel & W. Schad*. Die Manteltiere (Tunikaten) – Aspekte zu ihrer Dreigliederung, *M. Simon*. Dynamische Anatomie des Fuß-Skeletts und ihre Darstellung im Märchen von Aschenputtel, *P. Paede*. Der Fuß – die menschlichste Gliedmaße, *P. Paede*. Beiträge der klinischen Rhythmusforschung zur therapeutischen Physiologie, *Ch. Heckmann*.

Edited by Rolf Dorka, Roselies Gehlig, Thomas Göbel, Angelika Heinze, Wolfgang Schad & Hans-Joachim Strüh. Tycho de Brahe Verlag GdBR, Am Eichhof, 75223 Niefern-Öschelbronn, Germany. Contact Dr. Roselies Gehlig, Email: Chemie.Carus@t-online.de.

Science Group Membership & Finances

The Science Group is open to members of the Anthroposophical Society worldwide. At the discretion of the committee, non-members of the Society may join the Group as Associate Members.

The membership subscription is currently £5 (UK), £6 (Europe) or £7 elsewhere. This newsletter is issued to members in March and September each year. The Group's account at 31 July 2001 is £946 in credit (31 January 2001). At an *ad hoc* meeting of committee members on 24 February 2001 it was decided that £100 would be allocated to the setting up of the Kolisko conference in November 1001. This edition of the newsletter goes to 74 subscribers in 11 countries.

Next Issue

Copy for the next issue should reach the editor at the address below by 20th February 2002.

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Science Group web site: <http://www.anth.org.uk/Science>