Science Group of the Anthroposophical Society in Great Britain
Newsletter – September 2007

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News

Biogenic origin of granite

This item from Jos Verhulst, whom we thank for drawing the matter to our attention, is an edited translation of the original text which was a mixture of Dutch, German and English. It may be of particular interest to members as it is about a paper by a group of scientists who suggest that the plant kingdom was involved in the genesis of granite. This accords with various indications by Rudolf Steiner regarding the plant origin of the mineral kingdom. As an example, we append a short quotation from Steiner where he describes the situation on Old Moon.

We know little about the early history of the origin of the Earth. It is generally accepted that the Earth arose about 4.5 billion years ago by the accretion of material circling the young Sun. Life then arose a long time after this. The scenarios that have been sketched regarding the origins and early history of the Earth are full of hidden hypotheses and suppositions. It is a matter of interest whether we have available a list of facts and phenomena or whether at the same time there are hidden among them all kinds of theoretical and speculative frameworks. Real insight into the origin of the Earth will come when we can firmly and directly connect the facts with each other to form a theory, more or less like the joining of dots on a page immediately produces a picture. That is something for the future and in anticipation of it we need to organise the already available 'dots' in the inventory of knowledge as best we can, without excessive speculation about the still unknown overall picture.

Recently an interesting paper has appeared in which five geologists show that life on Earth must have played a vital role in both the origins of granite and the production of the continents (Minik T. Rosing, Dennis K. Bird, Norman H. Sleep, William Glassley, Francis Albarede, 'The rise of continents – An essay on the geologic consequences of photosynthesis', *Palaeogeography, Palaeoclimatology, Palaeoecology* **232**, 99-113, 2006). As usual with this type of article, one finds many hypotheses, surmises and assumptions. However, in addition it mentions three phenomena which are worth noting (moreover there are frequently disputable aspects of what are called 'facts').

1. Granite is a rock specific to the Earth: 'Granite forms the continents and strikes many people as the most common rock type on Earth because of its ubiquity in our surroundings. However, on a cosmic scale, granite is probably a very rare and unusual rock type; it has never been observed elsewhere in our Solar System. In contrast, basalt, which forms Earth's oceanic crust, is a very common rock type. The crusts of Mars, Venus and the Moon all have significant basaltic components, and even asteroids have basaltic components' (p. 103). The Earth's crust is estimated to comprise 85% granite. The surface of the Earth seems therefore not only exceptional because of the presence of life (and with it the coherent absence of chemical equilibrium), but also because of the presence of granite.
2. Granite is the oldest component of the Earth's crust: 'The oldest tiny vestiges of crust on Earth are ca 4000 Myr old and granitic in composition' (p. 102).
3. Life appears to be even older than granite: '...the oldest vestiges of Earth's crust carry signatures of advanced and probably photosynthesizing life' (p. 101, see also Rosing, M.T. & Frei, R., 2004. U-rich Archaean sea-floor sediments from Greenland – indications of N3700Ma oxygenic photosynthesis. *Earth and Planetary Science Letters* **217**, 237–244.)

The authors connect these three observations together to develop their theory according to which the continents, comprising primarily granite, owe their origins to life on Earth: 'The striking temporal overlap between the possible advent of photosynthesis [...] and the beginning stabilization of continents, coupled with the correlation that granite only occurs on life bearing planets (from the admittedly limited statistics we have), we hypothesize that granitic continents on Earth are a consequence of the life induced early Archaean bonanza, and that granitic continents are likely biomarkers for photosynthetic life on silicate planets in general' (p. 109). And they also write: 'We find it striking that stable continents did not form during the first 600-800 million years of Earth's history, and that there exists a temporal correlation between the emergence of photosynthesis and the rise of the continents' (p. 110).

Granite, with its three components, is a splendid rock. It is a pleasure to continue weighing in one's hand this wonderfully composed being, with its finer or coarser structure, its blending of white and black with pale or intense colour in between. In our cellar are some crates containing granite collected during trips some years ago in Brittany and the Harz mountains. I still vividly remember the remarkable more or less orthogonal fracture patterns in the granite blocks (those that so fascinated Goethe) on Brittany's *Ile Grande*, the remarkable *cuvettes* in the red coastal granite at Ploumanach (http://www.sgmb.univ-rennes1.fr/DOSSIERS/patrimoine/PLOUMfeuille.htm), or the beauty of the granite boulders in a babbling brook on the flanks of the Brocken (http://cgl-online.de/granit.htm). Granite is durable.

That granite so closely coincides with the phenomenon of life, and is, as it were, a child of that life, therefore seems to me to be a poetic and beautiful presumption. For it appears to be too soon to be sure, and we must live with melancholic longing for knowledge, as the poet wrote: 'With this attitude I approach you, greatest, most honourable monuments of time. Sitting on a high bare summit and overlooking a wide landscape, I can say to myself: Here, you are resting without intermediary on a ground which reaches down to the deepest recesses of the earth; no more recent layer, no heaped-up, conglomerate debris have laid themselves between you and the firm foundation of the primeval world; you do not walk over a continuous grave as in those fair fruitful valleys; these summits have not brought forth anything living nor have they devoured anything living; they are before all life and above all life. At this moment when the inner attracting and moving forces of the earth have, so to speak, an immediate effect on

me, when the influences of the sky hover nearer to me, my mood is raised to higher contemplation of nature and, as the spirit of man brings life to everything, a comparison comes alive in me the loftiness of which I cannot resist. So lonely, I tell myself, gazing down from this entirely bare summit, and hardly seeing in the distance at its foot a scantily growing bit of moss, so lonely, I say, is the mood of a man who desires to open his soul only to the oldest, first, deepest feelings of truth. Indeed, he can say to himself: here, on the oldest, eternal Altar, built directly on the depth of creation, I offer a sacrifice to the Being of all Beings. I feel the first, firmest beginnings of our existence; I overlook the world, her rockier and her gentler valleys, and her distant, fertile pastures; my soul is lifted above itself and above everything, and longs for the closer sky.' (*Granite*, J. W. von Goethe, 1784)

Appended quotation from Steiner: 'And just as on the earth our minerals form the solid ground on which we move about, the beings of the old Moon moved over what was then the lowest kingdom – that of the plant-mineral. This basic substance of old Moon was not a mineral substance such as we have on earth hut was something that was half alive. If you think of something akin to a peat bog or boiled spinach, but living and bubbling, you have a rough idea of what this basic substance was like. No rocks projected from it but, instead, there were shapes composed of something like wood, thickened plant masses, horny structures. To clairvoyant vision movement took place on a plant-mineral foundation which subsequently densified and turned into the stones of today'. (Steiner, R. *Universe Earth and Man*, Rudolf Steiner Press, London, 1987)

'Schiller File' now published in English

The 'Schiller File' is a compilation by Paul Eugen Schiller of indications by Rudolf Steiner regarding various aspects of the natural sciences. It has long remained inaccessible to people who do not read German, but Henry Goulden, a member of the Science Group, has translated it into English and arranged its publication. More details can be found in the 'Publications' section of this Newsletter. We hope to publish a review in the next edition.

Reviewers sought

We have received review copies of two books which would conceivably be of interest to members.

One is *Time Stands Still – New Light on Megalithic Science* by Keith Critchlow, and the other is *Drawing Geometry* by Jon Allen, both published by Floris Books, 2007.

If you have experience of either of these subjects and would like to write a review for this Newsletter, please contact the editor who will send you the review copy.

Natural Science Group – Calling Scientists

At the last meeting it was agreed that those who wish to have an input would forward their ideas on the form and goals of the prenatal Natural Science Group. So far it seems that there are two of us who wish to have that input.

If there are more, would you/they send something appropriate to Mark Moodie who will disseminate any returns in good time for the next meeting.

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Reviews

Notes for a Romantic Encyclopaedia – Das Allgemeine Brouillon by Novalis, Translated, edited, and with an introduction by David W. Wood. Suny Press, NY; $35.00 Hardcover – 288 pages; Release Date: January 2007; ISBN: 0-7914-6973-5

This is a somewhat unlikely title to be reviewed in these columns, but *Notes for a Romantic Encyclopaedia* has a largely scientific content. Novalis (Friedrich von Hardenberg, 1772-1801) was a mineralogist and geologist and worked as a mining engineer.

As the body of the book really does comprise notes and is not a narrative, it is not comfortably readable. But of course an encyclopaedia is not for reading through and the enquirer is provided with an excellent index with subheadings to help him find the notes on his particular subject of interest.

By contrast, the introduction by David Wood is a thoroughly readable narrative. Its 22 pages (plus seven pages of footnotes) give some biographical detail about Novalis and describe the genesis of the encyclopaedia as well as the approach behind it. Novalis, like Goethe, is known principally as a poet. However, he was also a scientist, but this aspect of his work suffered at the hands of editors and publishers over the years. To help us understand Novalis' scientific thinking Wood includes as an appendix some thirty pages of notes from Novalis' *Freiberg Natural Scientific Studies (1798/1799)*.

The notebook for the encyclopaedia was not fully published in German until 1929. Wood points out that for Novalis, philosophy and poetry are two sides of the same coin and quotes Novalis as follows: 'the separation into poet and thinker is...to the *disadvantage* of both—It is a sign of sickness' and 'In the future I'll carry out nothing but poesy—all the sciences must all be *poeticised* '.

Wood does not overlook the need to explain to the modern reader the seemingly contradictory term *Romantic Encyclopaedia* or Novalis' equally strange-sounding 'scientific Bible'. By *romanticising*, Novalis meant a kind of 'qualitative potentisation', a raising of the subject matter to a higher level, an artistic and philosophic elevation towards the infinite. For example, the intuition of the 'I' by his inspirer Fichte he elevates to a higher kind of 'I' which relates to the human being as the wise man is to the child. And even the term 'encyclopaedia' has a special meaning for Novalis. In his 'encyclopedistics' it is not a question of listing facts in alphabetical order – a task for the intellect – but rather stressing the unity that underlies our knowledge and thinking, a 'science of sciences', a 'systematic conception of science' concerned with reciprocal relations – a task for the reason, indeed *genius*. Wood concludes his introduction as follows:

> 'Ultimately, romanticizing is a philosophy of artistic activity, and it is precisely in this original and transformational sense that we must understand the term—it is an attempt to transform the world. The *Romantic Encyclopaedia* is Novalis's most mature philosophical work, whose boldness of vision and wealth of sparkling ideas can still inspire us today. This project is simply a continuation of that noble task he had already announced in *Pollen*: "We are on a mission: to educate the Earth". (Pollen, no. 32, Novalis)'

Perhaps because of the lack of a coherent narrative it is a seemingly impossible task systematically to review the 189 pages of Novalis' notes, even though they are made more accessible by Wood's 430 footnotes to them. I found myself scanning the pages for topics that caught my interest. I choose the following as an example: note 129 entitled 'Physics (Chemistry)' contained the following comment 'hydrogen is perhaps a gaseous metal (rich colours in marshes)'. How did he

know? It was not until 1935 that it was predicted that metallic hydrogen would form by putting the gas under immense pressure, and not until 1996 that the first claim was made to have produced the metal. Was Novalis showing remarkable prescience or was he merely surmising from the fact that bubbles form on the surface of a metal and it 'disappears' when treated with dilute acid to produce hydrogen – a method routinely used to prepare hydrogen in his lifetime?

As the entries are aphoristic or in note form, many are difficult to make sense of taken alone. I looked at some of the longer entries for evidence of a coherently developed theme. Entry 661 which covers nearly a page vividly illustrates the unifying approach behind Novalis's enterprise. It begins with a discussion of the proliferation of taxa in plant and animal taxonomy as the principle of individualisation or autonomy imposes itself on organic evolution and, somewhat bewilderingly, turns into a discussion of political theory. Here, the linking metaphor lies in the conflict between monarchy and aristocracy on the one hand, i.e. the individualising principle, and democracy on the other. At least, that is my interpretation of the basis of this note.

Who is this book intended for? At a price of about £18, it seems somewhat unlikely that scientists in general would want it on their shelves of their personal libraries as an occasional reference work. Academic and public libraries might stock it, although we hear increasingly that they are getting rid of books to cut storage costs and because of the proliferation of digital sources. Scholars of Novalis and German Romanticism might conceivably own copies. But surely if they were serious about their field they would have studied the German of that period, perhaps to the extent that David Wood must have done to be able to undertake what must have been a difficult text to translate in view of its note or non-narrative form. However, the book provides an opportunity for Novalis enthusiasts who do not have German to see into another aspect of his work. Except to say that the Novalis material reads as if it was written in English in the first place, having not read the original German, I cannot comment authoritatively on the quality of the translation. But one who can is Elizabeth Millán-Zaibert, translator of Manfred Frank's *The Philosophical Foundations of Early German Romanticism*. She writes: 'Wood's excellent translation of a difficult text is of the highest quality and will be of great service to the field'.

I leave you with the following thought from Novalis' notes (1065): every Englishman is an island. Curiously, this is the only quote from Novalis included in *The Treasury of Humorous Quotations* by Bentley and Esar (Dent, London, 1964).

David Heaf

Aether

Produced by Michael Finesilver; published by Pathway Initiatives, 2006. ISBN: 1-900034-10-7. More details from Michael Finesilver at mif (at) gotadsl.co.uk or www.aetheraware.org.

Aether comes in two versions: as a CD-ROM containing eight hours of audio (in MP3 format), and as a printed paperback verbatim transcript of the audio contributions.

The recordings are up-to-date, all but two having been made between 2004 and 2006. The 'cast list' numbers 13 contributors (several of whom I have met). They are (together with their stated qualifications/area of expertise): Nick Thomas (independent scientist, mathematician, 17 years an RAF electrical engineering officer, authority on aetheric technology); Edi Bilimoria (consultant engineer for the Channel Tunnel, London Underground and other major projects); Dr. Margaret Colquhoun (biologist/ecologist, Executive Director of the Life Science Trust UK); Patrick Dixon (actor, esotericist); Dr. Geoffrey Douch (GP, homeopath, anthroposophical doctor);

Prof. Brian Goodwin (biologist, Open University, University of Sussex, Schumacher College UK); David Lorimer (teacher and Programme Director of the Scientific and Medical Network); Laurence Newey (esotericist); Yiannis Pittis (healer, clairvoyant, Director of the Philalethia College of Healing);

Prof. Ian Thompson (physics, at the University of Surrey UK); Michael Watson (independent scientist, avionics engineer in the design of the Concorde aircraft, authority on aetheric technology); John Wilkes (sculptor, inventor of Flowforms, Director of the Virbela Research Institute); Prof. Arthur Zajonc (physics, at Amherst College USA).

The concept seems at first sight a reasonable one: record conversations with a diverse range of people presumed to be knowledgeable about the subject area in question and who approach it from a broad range of differing perspectives; structure the recordings in a sensible and approachable way; edit them down to a manageable size and transcribe them for the print edition.

Does it work? With all respect for Michael Finesilver's hard work and his obvious concern to spread awareness of the existence and manifestations of the 'aetheric', I do not think so. Leaving aside the fact that the conversations and linking narration are accompanied on the CD-ROM by what is (to me) an intensely annoying 'spacey', 'new-agey' background soundtrack (sufficiently intrusive and annoying to interfere with my taking seriously what is being said), the approaches are so different (and frequently so vague and general) that I am not sure that any accurate, clear and useful concept of the 'aetheric' emerges from it all – though valid and interesting points are, of course, made.

The following are just some of the definitions of the 'Aether' to be found in the introductory section (the first 25 or so pages of the print version):

- 'It's the Aether that gives us life. It's the Aether that gives us vitality. It's the Aether that makes us healthy or ill. Or at least it has a huge role to play in all of that'. (Nick Thomas)
- 'It's what's in the world when there are no material objects'. (Ian Thompson)
- 'The Aether is not just an abstract force like electricity is. It's got this mobility inside it which electricity doesn't have'. (Michael Watson)
- 'We can expand our idea of the Aether by also considering it in terms of fire ... we find the idea of 'celestial fire' in the ancient Greek concept of *aither*, the fifth element'. (Lawrence Newey)
- 'When we do some lectures on healing or aura and so on, I give a simple practice, and then we have pretty much a 99% success of everybody being able to see the 'aetheric body' – that glow that is around the physical form'. (Yiannis Pittis)
- 'In our language, various terms have been substituted for the missing Aether ... an 'air of celebration', a 'highly charged atmosphere', an 'air of grace', the 'chemistry' between people, the 'thrill' of anticipation or excitement ... these physical-material terms are used poetically to describe our experiencing of the aethereal realm ... another familiar aethereal phenomenon is what's known as the *ethos* of any organisation ... the primary quality of the Aether is that of *aliveness*, *livingness*, *vitality* ...Life itself'. (Michael Finesilver)
- 'The Aetheric ... refers to what the ancient Indian cultures, the Yogic, Chinese, call *prana* or *chi*, which is the energy body ... .' (Patrick Dixon)

– 'The Aether is the one universal lying behind all manifestation. Aether is a universal matrix ... in Mahayana Buddhism we have the concept of "generative emptiness" ... the aether can be described as a sublime form of matter – the true substance that lies behind matter as science understands it ... .' (Lawrence Newey)
– 'There is a very strong connection between what we call the soul and the Aetheric body in a way ... .' (Patrick Dixon)
– 'The Aether is therefore a vast storehouse of the most immense and immeasurable amounts of energy ... Through the Aether, we are all united in the One life. This is the wider purpose of meditation, of linking us all together through the Aetheric medium'. (Lawrence Newey)
– '.. the Aetheric is about rhythm and time ... the Aetheric manifests more in music'. (Patrick Dixon).

By the time the reader (or listener) reaches page 30 or its audio equivalent, he or she will have been exposed to a wide range of terms with esoteric connotations: *akasha* and *Akashic Record, prana, chi, kamaloka, Rückschau*; there is even mention of *'secret brotherhoods*' (without any explanation as to what is meant). It may well be that the CD-ROM/book are likely to be bought only by those who already have some familiarity with this area; general readers (if such exist) are likely to be utterly bewildered by this stage (if they have not already given up long ago).

What might be the target audience? I find it difficult to imagine that anyone within the world of conventional science (i.e. a constituency which is particularly in need of exposure to ideas which break the mould of materialist dogma) would have much patience with either version of *Aether*. I suspect that for many this compilation will merely reinforce their distaste and contempt for 'alternative' science and 'New Age' ideas.

Aether takes as a starting point the idea that 'there is something missing' in current conceptions – both scientific and general – of the world. But for me there is also 'something missing' from *Aether* – an understanding, or even any hint of an understanding, that it is essential to take the concept of the 'aether' or 'etheric' beyond that of an invisible *force.* There is still something 'mechanical' about the way it is described. It is perhaps indicative that a large section of the content goes under the heading of 'The Engineer's Report' (by Nick Thomas, himself a former engineer). In his approach to the etheric, Rudolf Steiner stressed the need to go beyond the idea of *forces* – to the *Beings* which 'embody' and 'operate' them, and, of course, in particular to that Being of whom John wrote: 'In Him was Life, and the Life was the Light of the world...', and who defined Himself as 'The Way, the Truth and the Life'. Whether intentionally or not, *Aether* seems to shy away from what is for me the central reality of the etheric [I prefer this spelling, though I understand and can accept the reasons why Michael chose the older, and now rather quaint-looking, form].

There are no doubt occasional flashes of real insight in *Aether*. But the overall impression I take from it is of a jumble of ideas of mixed quality which ultimately lacks the degree of cohesion and clarity this subject sorely needs.

Paul Carline

Nature's Due – Healing Our Fragmented Culture
by Brian Goodwin, Floris 2007, ISBN: 978-086315-596-3, p/b, 192 pp, £14.99

The 'new' biology is biology in the form of an exact science of complex systems concerned with dynamics and emergent order. Then everything in biology changes. Instead of the metaphors of conflict, competition, selfish genes, climbing peaks in fitness landscapes, what you get is evolution as a dance. It has no goal. As Stephen Jay Gould says, it has no purpose, no progress, no sense of direction. It's a dance through morphospace, the space of the forms of organisms.

> '...the life sciences have [been] transformed under the impact of chaos and complexity theories so that emergent properties are recognized as the stuff of evolution ... these properties are intrinsically unpredictable ... reality turns out to be, in general, holistic, unpredictable and creative ... it emerges that the natural world shares with us the same type of creative process as that which we experience in culture, so that nature and culture become one.'
>
> 'We have to adopt the idea of the whole ... The concept of Wholes or Holism supplies just that creative feature which appears characteristic of the evolutionary universe. For a whole is more than the sum of its parts ... elements, parts, constituents ... become creative. [...] The real universe is holistic; it consists of wholes which transcend their parts. [...] It is this intimate union of parts in a whole which is creative, and which gives rise to characters and types of behaviour which are quite different from those of the parts, and which could never have been predicted from a knowledge merely of the parts. Such new characters are said to be emergent characters... .'

One could be forgiven for thinking that these two quotes come from the same author, so similar are they in concept. In fact, a gap of nearly 80 years and several thousand miles separates them. The first comes from the new book *Nature's Due* by Brian Goodwin, former Professor of Biology at the Open University, currently lecturer in holistic science at Schumacher College, Devon. The second is an extract from a speech given in 1929 by Jan Smuts to a British Association conference in Cape Town on the subject of 'The Nature of Life'. Smuts was then 59 and had already served the first five of his total of 14 years (in two stints) as Prime Minister of South Africa. In 1926, he had published his book *Holism and Evolution*. Smuts is credited with inventing the terms holism and holistic.

> 'What science most needs today is new fundamental concepts', said Smuts. '... the mechanical model is as dead as the dodo ... the quantum has torpedoed the mechanism ... Mechanists are wrong in their view of life because they are wrong in their view of matter.'

Smuts was apparently influenced in his views by Transcendentalism, and as a student at Cambridge had written a book about Walt Whitman, whom he greatly admired (Smuts was a brilliant student, getting a double first and being described by his law professor as the most brilliant student he had ever taught). However, it would be a mistake to think that Smuts had a spiritual view of nature – another respect in which his views parallel those of Goodwin. He (Smuts) rejected 'vitalism' out of hand as 'obsolete'. His definition of vitalism is interesting. It is, he says, the view which 'looks on life as an indwelling substantive entity, energy or force in living organisms over and above their material bodies and exerting real influence and activity in them. It is nothing but the ancient anima and just as obsolete'. Whether that is an accurate definition of 'vitalism' or not, the energy or force Smuts describes is in essence virtually identical to what Rudolf Steiner termed 'the etheric formative force' – not the same as 'Life' itself, but an essential, though invisible, element of all forms of life.

Goodwin does not mention vitalism as such, but – in a suggestive aside – notes that 'animism' (which he defines only as 'the belief that rocks or trees or crystals themselves have feelings' – not at all the same as Smuts' vitalism, or Aristotle's anima) is 'on the horizon, though still out of bounds for most scientists'.

This apart, is Brian Goodwin's 2007 version of 'holism' any more enlightening or soundly based than was Smuts' 1929 version? I think not. Both are, ultimately, purely materialistic. Life remains, for both, 'an emergent property of matter' (Smuts: 'Life is nothing but the emergent behaviour of certain advanced types of wholes'.) Both essentially accept the materialistic theory of evolution (even if Goodwin does challenge Darwinism in some respects). Thus, for Smuts: '... all detailed changes or processes in living beings or living substance are in the last resort reducible to physical and chemical reactions'. For Goodwin: 'The everyday phenomena of life such as the shapes of organisms or the patterns of their behaviour are also properties that emerge from complex interactions of their parts in ways we do not understand. [...] Evolutionary biologists have been struggling with questions about the origins of species diversity and their adaptive properties since it was accepted that species have emerged through natural processes and are not created by a divine, all-powerful being' (my emphasis).

To be sure, there is in both a tacit admission that life remains a mystery (Goodwin: 'ways we do not understand'; Smuts: 'He who would explain the nature of life must surely be able to read the riddle of the universe: and the man to do that is not yet born ... science has not yet very much to say on the nature of life.'). In his earlier book, *How the Leopard Changed its Spots*, Goodwin wrote that 'the large-scale aspects of evolution remain unexplained, including the origin of species. [...] Some other process is responsible for the emergent properties of life ... Clearly something is missing from biology'. Smuts may well not have been aware of the work of the man 'able to read the riddle of the universe' – Rudolf Steiner – who was born nine years before Smuts and had died just three years before the Cape Town conference. Goodwin does not have the same excuse; he is very much aware of Steiner's work, but clearly cannot make the crucial step beyond Goethe (whom he very much admires, and to whom he devotes an impressive 15 pages of *Nature's Due*) into a spiritual view of life

Goodwin's appeal to humanity to find a new, constructive and harmonious relationship to nature is, of course, important and relevant, as is his recognition that 'the simplistic, but powerful and undoubtedly effective, worldview of 'science' impales itself on its own contradictions' and has become part of the problem. He quotes from an article entitled 'Biology and Meaning' which he wrote in 1972 and which was included in Volume 4 of *Towards a Theoretical Biology*, edited by C. H. Waddington: 'Thus science as we know it has largely opted to pursue the course of manipulation and power, drawing us inevitably into a Faustian crisis which arises from the irreconcilability of manipulation and wisdom. [...] How can we redefine the scientific enterprise so that it is coupled with the search for meaning and wisdom, not just the acquisition of knowledge and power?'

Does *Nature's Due* manage this much-needed redefinition – and re-orientation – of science? Ultimately not. In 2007, Goodwin appears to have ended his search for meaning and wisdom. He has decided that what we should be looking for is not the meaning of life, but '*lives of meaning* through relationship ... looking for the meaning of life is a distracting *chimaera*'. Later in the book, describing a meditative experience of a willow tree in 2003, he writes: 'Eros was there, with Gaia and Chaos, the Orphic Trinity continuing to express the life of the cosmos in this little corner of England. We may celebrate and enhance this creativity by appropriate participation, or we may exploit and damage it; *but we are minor players* in the greater scheme of things, which will continue with or *without us*' (my emphases). Elsewhere, Goodwin has described the 'new' biology as:

> 'biology in the form of an exact science of complex systems concerned with dynamics and emergent order. Then everything in biology changes. Instead of the metaphors of conflict, competition, selfish genes, climbing peaks in fitness landscapes, what you get is evolution as a dance. It has no goal. As Stephen Jay Gould says, it has no purpose, no progress, no sense of direction. It's a dance through morphospace, the space of the forms of organisms'.

The sub-plot of the book could indeed be said to be the denial of the meaning and purpose of human existence which has been the most powerfully corrupting aspect of modern science, especially since Darwin. The comparison with Smuts reveals just how strong is the (Ahrimanic) grip of matter – and the essential denial of life – even on the minds of those such as Smuts and Goodwin who have been able to penetrate through the imposing façade of materialistic science to reveal some of its deep inconsistencies and untruths.

Goodwin is undoubtedly a sensitive man, and I am not suggesting that his denial is anything other than an honest one. But the question remains: does his analysis of the problem and his proposed remedy actually take us much further? Goodwin's exploration of 'meaning through relationship' leads him to imply that we can learn the laws of evolution and thus become better 'adapted' to our environment by studying the behaviour of social insects such as bees, ants and termites. Thus he describes, for example, a study of 'the emergence of a coherent rhythm in the brood chamber of certain species of ant from interactions between workers whose individual behaviour is chaotic in the technical sense of the term'. Order is supposed to 'magically' emerge from chaos beyond a certain level of complexity. But such studies – many of which include computer modelling – will not give the right answers if researchers are not asking the right questions, and especially if there is a predetermined (materialistic) hypothesis. As Mark Twain observed: 'You cannot expect to see straight if your imagination is out of focus'.

So Goodwin writes of the results of this study: 'It is *as if* the ants are *exploring* the range of possible order that can emerge as a coherent pattern, the fractal structure finally condensing into coherent rhythmic order over the whole colony when the critical density is exceeded' (my emphasis again). This may be considered to be cutting-edge science at the Santa Fe Institute in New Mexico, with which Goodwin has been long associated. In this reviewer's eyes, it is little short of gobbledygook dressed up as science, entirely missing – and clouding – the point. The language can frequently verge on the absurd. Thus Goodwin: 'Here meaning enters the dynamics of living process in describing how organisms make sense of the historical information bequeathed to them in their genes by creating themselves as forms that express embodied meaning. Language is involved in this process in terms of the self-referential networks within cells that create forms with meaning from genetic texts'. Apart from being tautologous, is this tortured formulation actually anything more than crude neo-Darwinian theory in fancy clothes?

When challenged, Darwin himself later admitted that 'no doubt "natural selection" is a false term'. Using the language of conscious choice and purpose for a process which one asserts is devoid of either consciousness or purpose is not merely unscientific – it is dishonest. The 'new biology' Goodwin wishes to see makes liberal use of such 'false terms', which give the appearance of solidity, of containing a truth about nature. In reality, the attempt to explain the behaviour of organisms in such terms as 'emergence', 'emergent properties' and 'self-

organization', reveals only the complete absence of any real understanding of what is going on in nature. The terms act as smokescreens or red herrings, creating a pretence of understanding where none exists. Ultimately, they are dishonest.

I do not believe that an analysis based on the view that we humans are merely 'minor players in the greater scheme of things, which will continue with or without us' can generate any real and sustained sense of responsibility towards nature and a recognition of 'nature's due'. Any action to protect nature then arises out of an instinct of mere self-preservation which is not necessarily compelling. Indeed, there are many in our time who from diverse motives (even supposedly 'religious' ones) are quite comfortable with the idea of the imminent extinction of human life.

Nature's Due offers only a superficial, 'touchy-feely, meaning-in-relationship' reason for ending our destructive exploitation of the planet. For Goodwin, the ultimate goal can only lie in some imagined 'return to Eden'. There is no sense of a higher purpose and meaning in human existence which necessarily includes an active responsibility to acknowledge and express gratitude for the sacrifice of those beings which live hidden within the outer forms of the 'natural' world – in effect to 'redeem' them by releasing them from their 'enchantment' in order that they, too, may continue their evolutionary path. Only such a view can genuinely lead us to a sense of 'nature's due', and thus to a healing of the Earth grounded in (spiritual) reality.

Early in the book, Goodwin describes what was clearly a near-death experience. After becoming ill during a teaching session on the dynamics of the heart at Schumacher College, Goodwin discovers that his own heart is undergoing a life-threatening 'dissecting aneurysm of the aorta'. In surgery he receives a new aorta from a cow, and an aortic valve from a pig (for which he is genuinely grateful). Complications meant a return to intensive care, 'where I wobbled between this world and the next. It was during this time, when my body was making up its mind [?] which way to go, that I went on some remarkable trips, some of which I have come to regard as learning journeys ... When I began to come round again, I was convinced that they had really happened.

'While sedated in intensive care, so that according to normal criteria I had no signs of conscious awareness, my psyche was extremely active and I was experiencing intense visions and emotions. I found myself in a landscape like the foothills of the Rockies, familiar to me from my many visits to Santa Fe over the years. The rising mountains were covered with aspens whose leaves are capable of the most beautiful quivering motion. I raised my right hand and rotated it slightly. In response, the aspen trees started to sway back and forth and the leaves quivered with feeling. I then noticed that there were a lot of animals among the trees. I rotated my forearm around, and in response the animals began to leap about and turn somersaults. I was totally enchanted by this spectacle, filled with an extraordinary sense of peace and connection to the plants and animals'.

Unfortunately, the reality revealed by this experience – one in which there is not a mere merging of the human with the natural world, but a relationship in which the human has both power and responsibility, in which plants and animals are seen to be in some special way dependent on us – does not appear to have been 'taken to heart' by Goodwin. This is the reality expressed in the mysterious words of St. Paul: 'For the creation waits with eager longing for the revealing of the sons of God; for the creation was subjected to futility, not of its own will, but by the will of him who subjected it in hope; because the creation itself will be set free from its bondage to decay and obtain the glorious liberty of the children of God'.

This is a crucial part of the 'something missing from biology' without which we will not be able to enter into an appropriate relationship to nature.

Paul Carline

Meetings/Conferences

Research Group

There will be a meeting for members of the Research Group on Saturday 22 September 2007 from 9.30 a.m. to 4.30 p.m. at the Rudolf Steiner School, Bristol.

At the last meeting in Ruskin Mill, it was mooted that an actual topic should be taken up for discussion, in order to give our group more focus. The subject agreed upon was magnetism viz. Earth magnetism. We shall of course continue with further discussion of the aims of the Group towards forming a centre for research. Coffee and tea will be available but please bring a packed lunch. For further information about the meeting, reading preparation for it, and/or joining the Research Group, please contact Henry Goulden, The Chapel, Treligga, Delabole, Cornwall, PL33 9EE. Tel: 01840 212728.

UK Group of the Science Section

The Science Section for members of the School of Spiritual Science who are taking responsibility for the scientific work has been meeting twice a year in autumn and spring.

Our next meeting is on Saturday, 24 November 2007 at Ruskin Mill, Nailsworth, Gloucestershire. We will be joined by Johannes Kühl, leader of the Science Section.

At our last meeting, Stephen Moore-Bridger suggested studying the biographies of prominent individuals in the history of science; this was met with enthusiasm and we agreed to look at David Bohm before our next meeting. (Biography: *Infinite Potential – The Life and Times of David Bohm* by F. David Peat. Perseus Publishing 1996. ISBN 0-201-32820-8).

In the evening, Johannes Kühl will give a public talk on *Spiritual Dimensions to the Environmental Crisis* and on Sunday morning we will run an open workshop to explore ways of observing phenomena. Some experiments with water will be set up for observation.

We will meet with Oliver Conradt, leader of the Mathematics and Astronomy Section, on 9 February 2008.

If you are interested in attending, but do not normally receive notification of Section meetings, please contact Simon Charter, Juniper Cottage, Ludlow Green, Ruscombe, GL6 6DQ. Tel: 01453 755614.

Email: simon (at) ebbandflow.fslife.co.uk.

Courses

Erscheinungen am Sternhimmel – Venus

Astronomical study-weekend. 15-16 September 2007; Goetheanum, Dornach, Switzerland.

Speakers: Liesbeth Bisterbosch; Oliver Conradt; Seija Zimmermann. Language: German.

Details: Mathematisch-Astronomisch Sektion am Goetheanum, Dornach, Switzerland. +41 (0)61 706 4444; Fax: +41 (0)61 706 4446; Email: tickets (at) goetheanum.ch;

www.goetheanum.ch

Elementen der Projektiven Geometrie
Practical course, 10-13 October 2007. Goetheanum, Dornach, Switzerland.

Speakers: Oliver Conradt, Uwe Hansen, Robert Neumann, Anja Remde. Language: German.

Details: Mathematisch-Astronomisch Sektion am Goetheanum, Dornach, Switzerland. +41 (0)61 706 4444; Fax: +41 (0)61 706 4446; Email: tickets (at) goetheanum.ch; www.goetheanum.ch

Enzo Nastati – full introductory course
7-11 January 2008 at Oaklands Park, Newnham, Gloucestershire, GL14 1EF, UK. Cost: £190.

Can we use Dr Steiner's foundations of agriculture to understand and address modern issues:

- Electromagnetic pollution
- Transgenic organisms
- Chemical residues
- Heavy-metal and hydrocarbon pollution
- Radioactivity
- The loss of humus
- The threat to bees
- Weakened plant strains
- Diseases and pests
- The looming water crisis
- Local effects of climate change ... ?

Can we grow quality in quantity whilst improving our soils - and make it affordable?

What do the recent fundamental changes in the etheric world imply for agriculture?

Enzo Nastati of L'Albero della Vita has worked – successfully! – on these issues since 1976. His brief courses around the UK in 2007 made it clear we have an exceptional teacher grounded in practical work. Bring books and boots; we will study on the land as well as in the lecture room. It is highly recommended that you have at least read Rudolf Steiner's *Agriculture Course*, and please have questions ready.

Full details, local accommodation, subsidies etc: Considera. Oaklands Park, Newnham, Gloucestershire, GL14 1EF, UK or enzo2008 (at) considera.org or 020 7193 4697.

Soul of Science
16-27 June 2008 at Schumacher College, Dartington, Totnes, Devon, UK.

The practice of modern science has for centuries been divorced from values other than that of 'objectivity' and this has done much to alienate us from our direct, intuitive experience of nature. This approach has now been challenged.

This course will explore a new view of science which integrates it with spirituality, values and the role of the observer. Using the history of human conceptions of light, and the work of Goethe and Rudolf Steiner, Arthur Zajonc will discuss the evolution of consciousness and the philosophy of science.

Rupert Sheldrake will present a holistic understanding of science in which the cosmos is no longer seen as a machine, but is regarded more like a developing organism with an inherent memory; the old idea of determinism has given way to a recognition of indeterminism, chaos and complexity. Participants will explore the implications of this new way of looking at science for our understanding of art, pilgrimage, ritual and spiritual experience.

This course is intended for: scientists from all disciplines, philosophers, science teachers, academics and individuals who wish to engage with the fundamental questions of what and how we can know about the world we inhabit.

Fees: 1 week: £90; 2 weeks: £1,400. Contact details at the foot of the next item.

Masters Degree in Holistic Science
One year: September to August at Schumacher College
Schumacher College, in partnership with the University of Plymouth, is the first in the world to offer a postgraduate programme in Holistic Science.

A Science of Qualities: This residential course offers methodologies that go beyond reductionism in understanding the dynamics of whole systems. These are explored at all levels from individual organisms to organisations and from ecosystems to the Earth. Students develop an understanding of holistic principles and learn to work with them creatively.

The MSc in Holistic Science advocates a participatory science of qualities, values and interactions which underpins an ecological world view. The course integrates qualitative and quantitative approaches which include chaos and complexity theories, computer modelling, intuitive perception, collaborative projects and co-operative enquiry. These are used to explore issues of justice, equity and freedom for the full community of subjects on the planet. Information about the programme, including the student handbook, application form, articles of related interest, examples of student work, course and fee information are available at www.schumachercollege.org.uk.

Deadline for applications: 30 April 2008.

Core Faculty: Stephan Harding & Brian Goodwin. Visiting teachers regularly include: Henri Bortoft, Rupert Sheldrake, Margaret Colquhoun, Patrick Harpur, Patricia Shaw, Seaton Baxter, Francoise Wemelsfelder, James Lovelock, Arthur Zajonc, Craig Holdrege, Terry Irwin and Gideon Kossoff.

Schumacher College, The Old Postern, Dartington, Totnes, Devon, TQ9 6EA, UK. Tel: +44 (0)1803 865938. Fax: +44 (0)1803 866899. Email: admin (at) schumachercollege.org.uk. Web: www.schumachercollege.org.uk

Publications

Archetype

Issue 13, September 2007 – intended issue date: 30.9.07

- Integrity as identity, *Sylvie Pouteau.*
- The 'I' and the reality of the atom, *Peter Gschwind.*
- Goetheanism – its methods and significance in the science of the living, *Ernst-Michael Kranich.*

52 pages. A5 format. Price: £4.00 per copy including UK postage (overseas postage: Europe add £0.50, elsewhere add £1.00).

Orders to: David Heaf, Hafan, Cae Llwyd, Llanystumdwy, Gwynedd, LL52 0SG, UK. Tel/Fax: +44 (0)1766 523181

Email: 101622.2773 (at) compuserve.com

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Cheques should be made payable to 'Science Group – AS in GB' Please refer to published currency exchange rates applicable at time of order. All back issues are still available – for contents/prices of back issues please see: http://www.science.anth.org.uk/archetyp.htm or enquire at the above address for details.

The Schiller File – Supplements to the Collected Edition of Rudolf Steiner

Paul Eugen Schiller – English translation by Henry Goulden © 2007; x+188 pages with numerous illustrations, some coloured. Also includes an appendix, name index with biographies and subject index.

ISBN- 13: 978-090482216-8; Price £20

Contents: Scientific research suggested by Dr. Rudolf Steiner concerning electricity, terrestrial magnetism, radio, conduction of heat, sensitive flames, etheric formative forces, the four ethers, resonant oscillation etc.

Dr. Rudolf Steiner (1861-1925) is known in the English-speaking world chiefly for his enunciations in education and agriculture: it is seldom realised that in the first instance Steiner was a scientist, qualified in mathematics, natural history and chemistry. Therefore it is not surprising that in 1882, still in his early twenties, he was invited to edit and introduce the entire natural scientific writings of Goethe, for a new edition published by Joseph Kürschner. Goethe's Natural Scientific Writings with the introductions, footnotes and commentaries by Rudolf Steiner are available in a facsimile German edition of 5 vol. (circa 2,000 pages) from Rudolf Steiner Verlag, Dornach, Switzerland, as GA 1, ISBN 3 7274 5210 2. The work was completed in 1894.

Throughout his life Rudolf Steiner took an intense interest in the scientific questions of his day and especially in the research of the scientists who came to him for advice, as the pages of the so-called 'Schiller File' reveal. Dipl. Ing. Dr. Paul Eugen Schiller (1900-1992), throughout his long career as an engineer and natural scientist, kept copious notes of the work carried out in the Research Institute in Stuttgart and later at the Goetheanum in Dornach, Switzerland. Schiller's notes and comments, together with the reports by other scientists of their discussions with Rudolf Steiner, are to be found in the 'File'. There are also commentaries and explanatory notes by the Swiss scientist Dr. Stephan Clerc.

The result is thus an anthology of insights into the realm of science: profound, sometimes aphoristic and often relating to new paths in scientific research.

'Die Sinne trügen nicht, aber das Urteil trügt. [The senses do not lie; it is the judgement that deceives.] {From: 'Spruche in Prosa [Amphorisms in Prose]', p. 349 in J. W. Goethe, 'Naturwissenschafthiche Schriften [Natural Scientific Writings], GA le, Fünfter Band [Volume 5] (1897) (Zweite Abteilung des vierten Bandes [Part Two of the Fourth Volume]), GA le, Rudolf Steiner Verlag, Dornach/Schweiz [Switzerland], 3. Auflage [3rd Edition] Dornach 1975; 4th Auflage (Sonderausgabe) [4th Edition (Special Edition)] Dornach 1982.}

Order from bookshops or from Henry Goulden Books, The Chapel, Treligga, Delabole, Cornwall, PL33 9EE. Tel/Fax: +44 (0)1840 212728. Trade: usual discounts apply.

from the publisher's flyer

In Context, The Newsletter of the Nature Institute

No. 17, Fall 2007: As well as short items of news, reviews and comment, the publication carries the following 'Notes and Reviews': Putting genetic miscalculation on the record, *Craig Holdrege.* Purple trillium (*Trillium erectum*), *Reinout Amons*. *E. Coli* and a sick food system, *Craig Holdrege*. Stepping out of old ruts (Foreword to 'Goethe's Science of Living Form – The Artistic Stages', Nigel Hoffman, 2007, www.adonispress.org), *Craig Holdrege*. Remembering ourselves (the Introduction to 'Devices of the Soul – Battling for Our Selves in the Age of Machines', Steve Talbott, 2007, O'Reilly Media; www.oreilly.com), *Steve Talbott*.

Editor: Steve Talbott. Single copies of *In Context* are available free of charge while the supply lasts. Contact details: The Nature Institute, 20 May Hill Road, Ghent, NY 12075. Tel: +1 518 672-0116. Fax: +1 518 672 4270. Email: info (at) nature-institute.org. Web: www.natureinstitute.org.

The Nature Institute's online *NetFuture* newsletter is available at http://netfuture.org.

Elemente der Naturwissenschaft

No. 86, 2007: Das Ich und die Wirklichkeit der Atome, *Peter Gschwind*. Goetheanismus – seine Methode und Bedeutung in der Wissenschaft des Lebendigen, *Ernst-Michael Kranich*. Metamorphosen der Pflanze, *Peer Schilperoord*. Die Ozeane – Lebenszentren der Erde, *Olaf Oltmann*. A letter to the Science Section: Why some anthroposophists support Darwinism, *Don Cruse*. Embryology and Evolution: A Re-examination of the Evidence, *Paul Carline*. Highlights aus der modernen Biologie im Blick auf Goethes Konzept des Organismus, *Ruth Richter & Florian Leiber*.

Editorial board: Johannes Wirz (editor-in-chief), Birgit Althaler (editorial assistant), Haijo Knijpenga, Johannes Kühl, Barbara Schmocker.

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E-mail: science (at) goetheanum.ch.

Cost: Annual subscription (2 issues, including postage): €20.- / CHF 32.-. Single issues: €12.- / CHF 18.- ISSN 0422-9630.

A list of the contents of back issues is available at http://www.science.anth.org.uk/elemindx.htm.

Time Stands Still – New Light on Megalithic Science

Keith Critchlow; Photographs by Rod Bull

240 x 208 mm; 240 pp. ISBN 978-086315-587-1, p/b £20.00, 2007, Floris Books, Edinburgh. www.florisbooks.co.uk.

A new edition of Keith Critchlow's classic piece of research into the Neolithic peoples and their knowledge. The first time this book has been in print in over 20 years, and the first ever paperback edition.

In 1979, Keith Critchlow wrote what would become an enduring piece of scholarship in the study of the Neolithic peoples. Now, this long-awaited revised edition of *Time Stands Still* will make the world of megalithic science available to a whole new generation of professionals and enthusiasts.

The text has been reworked by Keith Critchlow and a foreword and afterword added. The many stunning photographs of the original have been redistributed throughout the text, along with several new colour images. The book also features over 150 black and white illustrations, hand-drawn by the author himself.

This could not have come at a more opportune moment. In light of recent concerns about the conservation of Stonehenge, and with sacred areas across the country being increasingly overlooked, the significance of these monuments must be championed more strongly than ever before.

The remarkable findings of *Time Stands Still* are just as important today as when the book was first published, and this new edition will be of interest both to people coming to the area of study recently or for the first time, and to those already familiar with Keith Critchlow's work.

Keith Critchlow is a well-known lecturer and author. He is a founder member of RILKO (Research Into Lost Knowledge Organisation), a founder member and Director of Studies of Kairos foundation and a founder member and President of the Temenos Academy. He has been a senior lecturer at the Architectural Association in London and has taught Islamic Art at the Royal College of Art; he now lectures worldwide on architecture and sacred geometry. *from the publisher's flyer*

Mathematisch-Physikalisch Korrespondenz

No. 228, Spring 2007: Das Ich und die Wirklichkeit der Atome *P. Gschwind*. Selected topics in three-dimensional synthetic projective geometry, Chapter 6: Foundations of three-dimensional Euclidean and non-Euclidean Geometry, *Renatus Ziegler*.

No. 229, Summer 2007: Was bedeutet de einsteinische Energieformel? *H. Bauer*. Zur inneren Struktur der Materie – Moleküle, *P. Gschwind & I. Hartmann*; Ein Dreigliederung im Bereich einfacher Folgen, *U. Hansen*. Selected topics in three-dimensional synthetic projective geometry, Chapter 7: Fundamental notions of line geometry in three-dimensional projective space, *Renatus Ziegler*. And other short contributions.

Subscriptions are SFr 50/€30 per year.

Edited by Prof. Dr. Peter Gschwind, Mathematisch-Physicalisches Institut, Benedikt Hugiweg 18, CH-4143 Dornach, Switzerland. Tel: +41 61 701 5968. Email: p.p.gschwind (at) intergga.ch.

Wasserzeichen

Nr. 26 (2007): Rhythmische Bewegungen des Wassers – Welle, Schwall und Beckenschwingung, *Michael Jacobi*; Wassertropfen – Teil 2, *Andreas Wilkens*; In addition to the articles in this beautifully illustrated in-house magazine, its 55 pages have many shorter contributions including items on the Flow Research Institute's work, conferences, publications and funding. Price €3.00 per issue. Free to sponsors.

Editors, Georg Nitsche & Andreas Wilkens, Institut für Strömungswissenschaften, Stutzhofweg 11, D-79737 Herrischried, Germany, Tel: +49 (0)77 64 9333 0, Fax +49 (0)77 64 9333 22.

Email: sekretariat (at) stroemungsinstitut.de.
Internet: www.stroemungsinstitut.de.

Jupiter – Astronomy, Mathematics and Anthroposophy

Volume 2(1), May 2007: Die Erscheinungen des Mars im Jahr 2007/08, *Iris und Gerhard Stocker;* Der Mensch und das Weltall in der heutigen akademischen Kosmologie, *Konrad Rudnicki*; Die Berechtigung der Mathematik in der Astronomic und ihre Grenzen, *Elisaheth Vreede*; Rudolf Steiner und die Berechnung der Unendlichkeit, *Renatus Ziegler*; Ein interessantes Kreisteilungsproblem, *Bengt Ulin*; Eine praktikable Teilbarkeitsregel für die 7, *Holger Krug*; Astronomic für Sternfreunde, *Interview mit Walter Kraul*; Rudolf Kühn, *Walter Kraul*; Werner Rauer, *Jeanette Terra & Wolfgang Fackler*; Werner Rauer in der Mathematisch-Astronomischen Sektion, *Georg Glöckler & Wolfgang Held*; Die Planeten an den Lebenstoren von Werner Rauer, *Michael Hertel*; Sunspaces, *Andrew Wolpert*. The 66 pages of this issue include book reviews, correspondence and a diary of events.

Editor-in-Chief: Oliver Conradt, Section for Mathematics and Astronomy, Goetheanum, Postfach. CH-4143 Dornach/Switzerland. Tel: +41 (0)61 7064220, Fax: +41 (0)61 7064223, Email: mas (at) goetheanum.org.

Publisher: Verlag am Goetheanum, Postfach 131, CH-4143 Dornach, Switzerland.

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Subscription: Annual subscription € 30.- / CHF 50.-

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ISSN 1661-8750; ISBN 978-3-7235-1298-2

Membership

We welcome to the Science Group Philippe Rigal (Scotland). The Group has 66 subscribers.

The membership subscription is £5 (UK), £6 (Europe) or £7 (elsewhere).

Next Issue

This newsletter is issued to members in March and September each year. Copy for the next issue should reach the editor at the address below by 20th February 2008.

Dr David J. Heaf, Hafan, Cae Llwyd, Llanystumdwy, Cricieth, Gwynedd, LL52 0SG, UK. Tel/Fax: +44 (0)1766 523181. Email: 101622.2773 (at) Compuserve.Com.

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