Science Group of the Anthroposophical Society in Great Britain
Newsletter - September 2003

Contents

News

Shape changes in mistletoe berries correlate with the moon's position in the constellations grouped according to elements

In the September 2003 issue of *Archetype* Heidi Flückiger and Stephan Baumgartner report their results of applying an adaptation of Lawrence Edwards' path curve method to mistletoe berries. In the summary of their paper they write:

'Path curves are fundamental constructions of projective geometry. They might also serve as single-parametric archetypal forms in the plant and animal kingdom. This hypothesis is based on the observation that a large variety of buds, cones, and eggs show a striking similarity to path curves. The outline of mistletoe (Viscum album L.) berries also follows a path curve geometry.

We investigated temporal changes in the shape of mistletoe berries by means of empirical determination of the corresponding path curve form parameter λ. Periods of observation reported here were several months in the years 1995, 1997 and 1998.

The existing hypothesis of a correlation of the form parameter λ with alignments of the moon with other planets was falsified. Correlation with various meteorological factors or with solar activity was also not found.

In contrast, a tentative hypothesis of a correlation between the shape of mistletoe berries and the position of the moon in the zodiac, based on the results of the year 1995, was verified in two successive years (1997 and 1998). It seems as if the λ value increases if the moon is situated in the astronomical zodiac signs Gemini, Cancer, Libra, Scorpio, Aquarius and Pisces ('Air' and 'Water' signs). Correspondingly, a position in the signs of Aries, Taurus, Leo, Virgo, Sagittarius and Capricorn ('Fire' and 'Earth' signs) is correlated with a decrease of the λ value. The results warrant further investigations.'

Details of how to order *Archetype* can be found on page 11 of this Newsletter.

Steigbild Dishes (further update to contact details)

Janet Barker updated us in the March issue about the availability of glass dishes for capillary dynamolysis experiments. Her new email address is janet.barker (at) tiscali.ch.

Comment

Letter to the Editor

I'd like to take the opportunity to thank yourself and all other regular contributors to the Newsletter. I noted with interest the editorial *Letter to Members* and confess to some guilt that I've so far felt unable to contribute in any area, other than as a supporter and 'lay' reader. Recognising and agreeing though I do with the bullet points set out in the article. I've personally always felt the scope of the institutionalised scientific challenge to Steiner's anthroposophy so vast as to be approachable only where the individual's attempt is supported by a professional credibility. For example, your own review of *Concerning Clones... etc.* (Anthro-Tech Institute) shows both familiarity with conventional genetics technology developments but also with Steiner's occult science and lecture courses. This is similarly displayed with the Lili Kolisko article and Judyth Sassoon's entry.

To draw to a conclusion, my point is that since 'lay' supporters of the AS in GB or those with awakening attraction to anthroposophy are unlikely to become experts in the very many branches and sub-disciplines of science and technology, they should only practically aspire to bring anthroposophy to their own workplace in whatever measure they can morally carry. To further the AS in GB Science Group's remit I would encourage having the Newsletter expand its format to carry even more such critiqued contributions and perhaps some of the varied and interesting looking publications that are often referred to in brief in the latter sections of the Newsletter.

This is, I realize, something of a 'tall order' editorially and begins to move towards a magazine in scope, but is still one I feel the role of the group naturally encompasses and would further support the Group work. *David Edwards*

The Newsletter was originally conceived as a simple calendar of forthcoming events of interest to scientists working with anthroposophy. The intention was to keep it simple in order to minimise obstacles to it appearing at predictable times each year so that event organisers could be sure of a reliable vehicle for communication. It started when the Group already had a magazine called Science Forum *whose publication was not periodical. Although the Newsletter has gradually expanded its type of content to include articles, it has still deliberately been kept basic so that it can easily be compiled and then printed on an ordinary office printer. When the* Science Forum *initiative ceased, a member suggested the creation of a journal for longer articles with more of a research report nature. Our journal* Archetype *was the result and the 9th issue comes out this September. Details of Archetype are on page 11. Ed.*

Again clones: Another perspective on Paul Emberson's book *Concerning Clones and the Lost Hierarchy*

There is a passage in Plato's *Phaedrus* describing how the god Theuth offered the gift of writing to King Thamus 'as a medicine to wisdom and memory'. The king, however, rejected the gift as poison 'that brings false wisdom and no real memory' [Plato, Phaedrus, in *Plato in Twelve Volumes*, Harold N. Fowler (tr.), Vol. 1, Cambridge: Harvard University Press, 1982, pp.561-565]. The same Greek word 'pharmakon' was used in the text to mean both medicine and poison, and illustrates how ambiguity is born whenever oral communication is

enshrined in the written word. An oral rendition of concepts, if done well, adjusts itself and evolves to fit the audience; it contains a vital force that automatically promotes dialogue and living, imaginative ideas. The written word does not engage the same faculties. It promotes analysis and provides a sense of history. It does not encourage living dialogue but instead leads to discussions, frequently centred on verbal interpretation and meaning. Something of the living spirit of the original thought is commonly lost in writing.

With this preamble, I would like to respond to the review of the book *Concerning Clones...*, which appeared in the March 2003 edition of the Science Group Newsletter. The book was reviewed by David Heaf and Johannes Wirz and their expert, up to date knowledge of biotechnology and its social impact is above reproach. They presented Paul Emberson's book, quite correctly, as a compilation of four lectures originally given in March 2002 at the Anthro-Tech Institute, Switzerland. However, the character of their critique was somewhat dismissive. Since theirs are the only publicly available comments that I know of, I fear that the slightly offhand statements could deter other readers from assessing the book for themselves. I would therefore like to balance the situation and give a slightly different point of view.

As one of the attendees at the March 2002 Anthro-Tech seminar, I was exposed to the lectures in their oral form and consequently (King Thamus would suggest) my approach to their transcriptions might be different from that of a 'fresh' reader. Nevertheless, I was very surprised by the disparaging tone that the reviewers occasionally chose to adopt. Heaf and Wirz found the contents of Lecture 1 a 'bewildering assortment of historical, scientific and occult facts' Personally, I found this lecture far from bewildering. I thought it was an impressive analysis showing how discoveries in science and events in history are tied together with the activity of the spiritual world. Was my opinion influenced by my presence at the original lecture? Assuredly the transcriptions lack the vitality of the oral renditions, but they do not differ greatly in either content or format so I must leave the question of my own bias open and allow readers to come to their own conclusions.

I do agree with the reviewers that the book is 'accessible to the lay reader who is willing to (accept) occult teachings'. I would add that in making this statement the reviewers touch something that is essential to a true appreciation of the book: the reader has to be open to high-level research into occult matters. The lectures at Anthro-Tech were not given as a thesis on the techniques or ethics of cloning but rather to promote an understanding of spiritual activity as it relates to cloning. The book is a work inspired by spiritual not academic science. I cannot help feeling, on the basis of the reviewers' occasionally narrow comments, that they expected a more traditional discussion on cloning and were surprised by the book's heavy esotericism.

Some of the summary statements (such as 'biotechnologists will strive to eliminate the male line') suggest an oversimplified approach to the occult matters discussed in the book. It is clear that the alluring simplicity of these 'bottom lines' fits in extremely well with today's discriminatory predisposition to single things out of context and make them as straightforward as possible. In academia, for example, we love our catchy summaries but conclusions derived from metaphysical processes are rarely absolute and cannot be packaged into one-sentence *résumés* without appearing slightly ridiculous. The whole process of thought and investigation leading to a metaphysical concept is lost because spiritual activity is not reducible to short, sharp, easily grasped factoids. A bottom line on metaphysical research comes out as an absurdity and frequently discredits work in the field. I found the reviewers' simplistic statements quite misleading and felt that they did not give due credit to Paul Emberson's lectures, which clearly emerged from deeply considered occult research.

Although not an expert in the field of biotechnology (he has never made any such claims and openly states that he derived his information from published literature), Paul Emberson is an expert in metaphysics and occult science. Anyone attending his lectures at Anthro-Tech will soon realise that he has made a serious and profound study of Anthroposphy and its application. He has the rare talent to teach Anthroposphy with clarity and to make it accessible to everyone. Furthermore, he is someone who puts spiritual science into practice – both in scientific research and in the study of world events. Emberson approaches the questions surrounding cloning as an original Anthroposophical thinker and a true occult scientist. It is right that this should be done even if the conclusions are disturbing. I do not think that the persons involved in creating Dolly could be excluded from the discussion. If they had not been named explicitly, their participation in the events would still be implicitly clear – everyone with even the remotest interest in cloning knows who created Dolly – and nowhere in the book is there any suggestion that these scientists made conscious, sinister choices**.**

I also do not really understand why the reviewers concluded that the descendants of the Cain and Abel spiritual streams represent, respectively, pro- and anti- GE 'lobbies'. If anything it should be the other way round seeing as, according to the book, the Abel stream played an important role in the creation of the first mammalian clone. But I believe it is more realistic and also more in the spirit of Paul Emberson's work to conclude that scientists involve themselves in genetic engineering irrespective of whether they are connected with the Cain or Abel lineage, though the direction of their research interests may be influenced by their spiritual heritage.

Furthermore, there is certainly no implication that only females can be cloned. Severino Antinori (the Italian embryologist specialising in fertility treatments) has publicly acknowledged that in the volunteer couples applying to him for cloning it is very commonly the male partner who insists that he should be the genetic donor. In every case the men say that if the female partner were to be cloned, they would feel totally excluded from the process of making a baby. Here we have a confirmation of the undercurrents that Paul Emberson speaks of. Already, within the family situation, men are starting to feel uncomfortable about cloning. They are afraid of being made redundant from the reproductive process because, ultimately, SHE still gets to carry the baby.

In view of this I will end with some superficial and frivolous speculations of my own, to cheer my female heart (incidentally, though initially a lady with a perfectly reasonable attitude to men, 'Kiss Me' Kate betrayed the feminist cause when she fell for Petruchio and we shall never forgive her). Mammalian cloning is fraught with difficulty. So far all claims of a successful human cloning have gone unconfirmed. However, I believe that there is enough interest and funds for this process to become a realistic option in human reproduction. I do not really envisage that cloning will totally replace sexual reproduction in the near future, but if it were to become a significant reproductive method it's fun to speculate on the consequences. If men and women remain more or less as they are now, it's a fair bet that more women will still be interested in producing and caring for young than men. Presumably these young would be their own female clones. Would men consequently develop maternal instincts to match those of women and care for their own offspring? Or would they seek out suit-

able ladies and attempt to win them over with chocolates and puppy-dog eyes. In view of the fact that cloning is likely to create uglier humans it's possible that women might no longer find male partners attractive and might not be interested in caring for anybody's clone but their own (the averaging of facial features brought about by sex is thought to contribute to 'attractiveness' and would be eliminated by cloning). If men are to survive the clone wars, they may have to take lessons from the cuckoo and learn to secrete their changelings into the cribs of unsuspecting (and anatomically ignorant) mothers.

My silly conjectures are useful only because they highlight an immediate and observable consequence of cloning technology – the fear that there might be a total power shift in reproductive control in favour of women. Paul Emberson is by no means the only author to discuss this, although he is the first to attempt to explain it from a spiritual perspective.

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Article

The Phenomenon of Coloured Shadows

Malin J. Starrett, D. Phil.

The question of the nature of the coloured shadows has produced many difficulties for many researchers for over two centuries. By way of introduction to this field of research, it may be useful to present a more general problem in science which has appeared in the last few decades. The problem is this – the history and philosophy of science is kept very separate from scientific practice.

In the last forty years, the history and philosophy of science has received a great deal of attention – Thomas Kuhn's book *The Structure of Scientific Revolutions* (1962) began a revolution where many famous discoveries, theories and even experiments were radically re-assessed. Many people could see – for the first time – that the simple stories of scientific progress to be found in scientific textbooks are found wanting. Gradually, the historians and philosophers of science gained confidence to go further – the growth of a community life amongst these researchers helped the confidence to grow. As well as studying text sources, historians and philosophers of science began to follow practising scientists into the laboratory to observe the modern approach to science – the individual human beings involved, the communities of practitioners, the laboratory environment, the equipment utilised, the experiments carried out, the working with results and data, the publishing of articles including many details such as use of language, rhetorical techniques, use of citations and references etc.[1] However – crucially – the historians and philosophers of science were unable or unwilling to do experiments even though in many instances they displayed in-depth theoretical knowledge in a discipline and often, many specific criticisms of experimental method.[2]

At the opposite pole in this duality, the communities of practising scientists seem to have completely ignored the revolution in the history and philosophy of science. For instance, the same potted histories of scientific discovery which appeared in textbooks fifty years ago are to be found in newly published textbooks today. To embrace the revolution in the history and philosophy of science would entail a complete renewal of power structures and institutions in science, a renewal of many *basic assumptions* in scientific disciplines (indeed, the very idea of a *basic assumption* might become questionable), a renewal of many theories and a renewal of scientific education. The institutions of science and the communities of practitioners were not prepared to lose power and certainty of belief.[3] Therefore, they chose to stay completely separate from the historians and philosophers of science.

I think that these two poles could creatively work together and inform each other to produce something new. The duality would then be transformed to a dynamic interplay of poles. Here is a contemporary need – to create bridges between practical experimental science and the history and philosophy of science.

There was a man who did pioneering work to explore these poles and he carried the pain of not ignoring either. He was Johann Wolfgang von Goethe who was an historian of science, a philosopher of science and an experimental practitioner. In the late 19th and early 20th centuries, Rudolf Steiner recognised the importance of Goethe's scientific studies and he developed this work further. In his scientific lecture courses, Steiner called for radical renewal in the natural sciences –penetrating to the basic assumptions in the textbooks, and much further.

I think that many anthroposophists interested in renewing the natural sciences have not quite grasped the scope of the project.

The phenomenon of coloured shadows was important for Goethe's colour researches. Here is a quotation from a note by Douglas Miller who edited and translated a recent collection of Goethe's scientific work entitled *Scientific Studies*:

> Goethe climbed the Brocken in December, 1777; his notation of coloured shadows from that climb is the first extant record of his interest in the subject of colour theory.[4]

Here is Goethe's account of this encounter with the coloured shadows, as contained in the *Didactic Section* of the *Theory of Colour*:

> Once, on a winter's journey in the Harz Mountains, I made my descent from the Brocken as evening fell. The broad slope above and below me was snow-covered, the meadow lay beneath a blanket of snow, every isolated tree and jutting crag, every wooded grove and rocky prominence was rimmed with frost, and the sun was just setting beyond the Oder ponds.
>
> Because of the snow's yellowish cast, pale violet shadows had accompanied us all day, but now, as an intensified yellow reflected from the areas in the light, we were obliged to describe the shadows as deep blue.
>
> At last the sun began to disappear and its rays, subdued by the strong haze, spread the most beautiful purple hue over my surroundings. At that point the colour of the shadows was transformed into a green comparable in clarity to a sea green and in beauty to an emerald green. The effect grew ever more vivid; it was as if we found ourselves in a fairy world for everything had clothed itself in these two lively colours so beautifully harmonious with one another. When the sun had set, the magnificent display finally faded into grey twilight and then into a clear moonlit night filled with stars.[5]

Goethe's interest in colour phenomena led to the researches published in his 'Contribution to Optics' in 1791 and 1792. However, the planned third instalment of the *Beiträge* was halted as Sepper (1988) explains in his book *Goethe Contra Newton: Polemics and the project for a new science of color*:

> Between the publication of the first two instalments of the *Beiträge* (1791-92) and 1798, the year in which he drafted the first outlines for what became *Zur Farbenlehre,* Goethe discovered that his initial plan for a continuing series of *Beiträge* could not be accomplished. The problem developed in the projected third instalment on colored shadows.[6]

With the phenomenon of coloured shadows, Goethe discovered that purely physical approaches to colour phenomena were not enough.[7] He began to see that the human being and the outer world work together in colour. This new recognition

led Goethe towards the basis for his *Theory of Colour* – Part One of the *Didactic Section,* the 'Physiological Colours'.

Sepper (1988) also advances the idea that Goethe's efforts to comprehend the coloured shadows led towards a change in his general approach to scientific enquiry:

> By late 1794, however, Goethe began to take a greater interest in the possibility that there are manifold legitimate ways of conceiving things. In a letter to Jacobi he said that his optical studies included not only discovering phenomena, fixing them in the form of experiments, and organizing the experiences, but also getting to know the various *Vorstellungsarten,* with the object of remaining as many-sided as possible…[8]

Therefore, it seems that the phenomenon of coloured shadows was the spark which ignited Goethe's interest in researching colour phenomena; through the difficulties in understanding this phenomenon it led Goethe to work towards the *Theory of Colour* and the coloured shadows seem to have been influential in Goethe's recognition of *Vorstellungsarten.*

Goethe's recognition that there are multiple valid viewpoints in any given situation developed in harmony with extensive researches in the history of science. Seriously entertaining the work of previous researchers requires open mindedness, flexibility to see that there are various valid viewpoints and it inevitably raises questions regarding changes in human consciousness through the centuries. Many years after Goethe's pioneering work, Kuhn (1962) re-presented some of these issues:

> The more carefully they [science historians] study, say, Aristotelian dynamics, phlogistic chemistry, or caloric thermodynamics, the more certain they feel that those once current views of nature were, as a whole, neither less scientific nor more the product of human idiosyncrasy than those current today... historians of science have begun to ask new sorts of questions and to trace different, and often less than cumulative, developmental lines for the sciences. Rather than seeking the permanent contributions of an older science to our present vantage, they attempt to display the historical integrity of that science in its own time.[9]

Those familiar with the spiritual-scientific researches of Steiner may find many themes and issues discussed in the recent literature of the history and philosophy of science which hint towards the evolution of consciousness and various esoteric streams active in guiding the public face of science.

Following the approach of seriously entertaining the work of previous researchers and seriously considering the history and philosophy of science, I will now describe some of the early researches to study the nature of coloured shadows.

There was a debate about the nature of coloured shadows in the late 18th and the first half of the 19th century. The debate centred around the various results obtained when coloured shadows are viewed through a narrow black tube. You can re-enact these experiments with simple equipment at home. Choose a day where the sky is overcast and choose a room with a single window which has heavy curtains. If you close the curtains until there is only about a six inch gap, you will have a colourless daylight source which can cast shadows. Place a sheet of white paper or card upright on a table surface as far as possible from the window (the distance helps to produce more definite shadows). An upright cylindrical object, for instance a kitchen roll tube, can then be placed on the table in front of the screen to produce a single dark shadow (Fig. 1).

The next step is to introduce another light source. Close the curtains so that the shadow disappears. Then place a candle at 'A' and light it. A dark shadow now appears on the right side of the screen (Fig. 2). If you now gently open the curtains to a narrow gap, the left shadow returns and both shadows are now coloured! By careful adjustment of the candle position and the

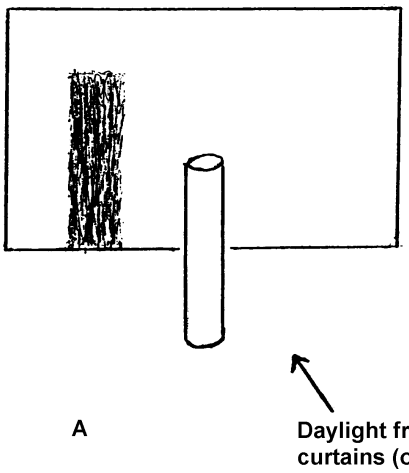

Fig. 1

gap in the curtains, you should be able to produce a strong yellow-orange coloured shadow on the left and a beautiful blue coloured shadow on the right.

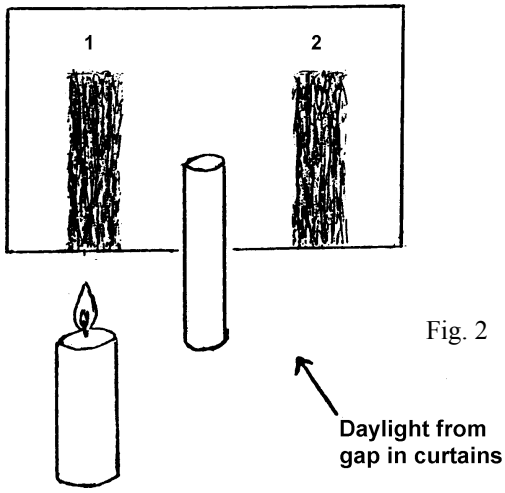

Fig. 2

Shadow 1, on the left, is cast by the daylight and is illuminated by the yellow-orange candle light. As expected, it appears yellow-orange.

The region surrounding the two shadows is produced by a mixture of colourless daylight and yellow-orange candle light. As expected, it appears with a very pale warm tint or even white.

Shadow 2, on the right, is cast by the yellow-orange candle light and it is illuminated by the colourless daylight. Unexpectedly, it appears blue!

The unexpectedly coloured shadow[10] – on the right side in this experiment – raised many questions for researchers. Basically, the blue colour appearing does not bear any obvious relationship to the physical illuminations involved in producing it.[11]

Various researchers attempted to explore the nature of unexpectedly blue coloured shadows by utilising a very simple technological device – a viewing tube. You can make a viewing tube by rolling up a matt black sheet of A4 black paper so that it is about 12 inches long with a 1 inch diameter. I will now describe three experiments from various researchers which all utilise a viewing tube.

1. Lieutenant-General Sir Benjamin Thompson, Count of Rumford, described an experiment with a viewing tube which requires an assistant.[12] Produce the coloured shadows as described above and then carefully mark the paper screen with two little pencil lines to show the position of the blue coloured shadow. And now for the clever part! Ask your assistant to hold a piece of card in front of the candle so that its light doesn't reach the screen. When this is done, both coloured

shadows disappear but a grey shadow remains on the left. You should now hold one hand over one eye and hold the tube up to the other eye, keeping the narrow field of view centred between the two pencil lines drawn previously. It may help to rest your 'tube' arm on the table surface with the end of the tube quite close to the screen. It is also important that you sit in a position where you are not blocking the daylight coming to the screen. When everyone and everything is in position, you then need to ask the assistant to choose a moment to silently release the card from in front of the candle.

What happened?

Count Rumford found that the assistant could see a whole little colour world[13] of two coloured shadows while he, looking through the tube, could not see any change at all. It was only when he pulled the tube away from his eye that Count Rumford could see the blue coloured shadow. Count Rumford concluded that because the blue coloured shadow could only be seen with the surrounding field of colour in view, it must be a 'subjective' creation of our visual process.

2. A few decades later, Gottfried Osann challenged Count Rumford's conclusions by describing a variation of the viewing tube experiment.[14] This experiment does not require an assistant. The equipment is arranged as in the previous experiment, but on this occasion, the whole little colour world should be viewed and then the blue coloured shadow should be viewed in isolation through the tube.

Osann found that the blue coloured shadow could still be seen as blue when the surroundings were removed by the tube and that this blue colour did not fade away. Osann concluded that the blue coloured shadow must in some way be 'objective' – the unexpected blue could still be seen with the warm coloured surroundings removed.

3. In 1838, Gustav Theodor Fechner challenged Osann's conclusion with another version of the viewing tube experiment.[15] This version is something of a hybrid of Count Rumford's and Osann's experiments. This experiment also requires an assistant. The 'observer' should begin by viewing the whole little colour world of two coloured shadows and then, as in Osann's version, the blue coloured shadow should be viewed through the tube. And now for the *very clever* part! While the observer is still looking through the tube, the assistant should choose a moment to silently block the candle light.

Fechner, still looking through the tube, could not see any change – the blue was still seen. However, the assistant saw that both coloured shadows had now disappeared, with only one grey shadow remaining on the left side. Fechner could only see the blue which he had originally seen at the start of the experiment, until he pulled the tube away, at which moment the blue disappeared. Fechner concluded that the unexpectedly blue coloured shadow must in some way be 'subjective'.

The results of these experiments are obviously a bag of contradictions! Please note that two of the experiments – the one from Osann and the one from Fechner – do not reconcile with the generally agreed explanations of contrast colours. In both these experiments, the unexpected blue colour can be seen with the surrounding warm field of colour removed. In fact, Count Rumford's experiment is the only one which 'fits' with the generally accepted explanations of contrast phenomena. Nineteenth century science was unable or unwilling to investigate these contradictory results any further. Instead, colour science chose to stick with one half of the equivocal results so that it became generally agreed that unexpectedly coloured shadows are somehow 'subjective'.[16] This became a new *basic assumption* in colour science which has remained, largely unchallenged, to the present day.

Perhaps some 20th century colour researchers quietly knew of these contradictory results because 20th century colour science textbooks hardly ever grant more than two pages to the coloured shadows. The viewing tube experiments are hardly ever mentioned – especially all three together. I learned of Osann's and Fechner's experiments in a recent history of science book – Turner's *In The Eye's Mind – Vision and the Helmholtz-Hering Controversy* (1994). Turner gave two paragraphs describing these experiments[17], but that was enough. I suspect that most contemporary colour scientists do not know about the contradictory results produced by the viewing tube experiments.

I will now briefly discuss Goethe's approach to the coloured shadows. Here is a quotation from the *Theory of Colour*:

> 66. We will recognize immediately that the shadow is blue, but only by looking closely will we conclude that the white paper acts as a reddish yellow surface which causes the eye to require this blue.[18]

With various simple experiments, Goethe indicates that our active eyes and inner life produce the unexpected blue colour in the shadow as a complement to the pale reddish yellow surroundings. This activity is at once both an act of opposition and a striving towards harmony and wholeness. The blue is *called forth* as a *required colour* by our visual process. Therefore, Goethe indicates that unexpectedly coloured shadows are 'subjective'.

In Part One of the *Didactic Section* of the *Theory of Colour*, Goethe devotes about four pages to discussing the phenomenon of coloured shadows. He indicates that the unexpectedly coloured shadows are 'subjective', but he doesn't explicitly state this. He also declines to discuss Count Rumford's viewing tube experiment of 1794, even though he did know about it. Here is a quotation from Sepper (1988):

> This kind of discrepancy between the theoretical color and the perceived color led Benjamin Thompson, Count Rumford, to conclude that colored shadows are optical illusions; to which Goethe thundered in reply: 'It is blasphemy to say there is such a thing as an *optical illusion*…'[19]

I think that Goethe did not wish to associate his approach to the coloured shadows with that of Count Rumford even though, in very general terms, they both classed unexpectedly coloured shadows as 'subjective'. Goethe's distancing himself from Count Rumford's conclusion seems to have extended to experimental techniques. Goethe does not mention the use of viewing tubes to study the nature of unexpectedly coloured shadows in the part of the *Theory of Colour* devoted to this phenomenon. However, in the *Supplementary Section* of the *Theory of Colour* – one of the sections as yet not published in English translation – Goethe does generally discuss the viewing tube as a 'tool':

> Let us now refer to the recommended device of looking with one eye through a narrow, black tube.
>
> Why black?
>
> For purposes of deception, quite expedient, since contrasted with darkness, whatever is light becomes lighter still, and every colour approaches white.
>
> Why narrow?
>
> Likewise conducive to aberration. The eye receives only in the smallest measure what is to be differentiated, and is put in the position of being dazzled by the light penetrating it. That is precisely the Newtonian spirit which still presides over the heads of scientists.[20]

Goethe recognised that the use of viewing tubes is problematic. In the first half of the quotation, he indicates that *the viewing tube itself produces a contrast effect* – the dark surroundings in the tube will *lighten* whatever is viewed through the tube. Any coloured region viewed through the tube will be, to some extent, *desaturated* or made less intense. At the end of

the quotation, Goethe indicates that the viewing tube arises from a certain world view.

Quite apart from colour science, I think that the above quotation shows us how developed Goethe's approach to science was. Goethe knew that scientific instruments – even very simple ones such as a viewing tube – need to be carefully thought about and considered. Goethe knew that the 'tools' of science come with their own histories, their own qualities and often, their own world view. Goethe's critical consideration of the viewing tube was a pioneering example of the critical approach towards scientific instruments which contemporary philosophers of science now utilise.[21]

The above quotation from Goethe is incomplete without showing you the paragraph which follows it:

> In the peculiar weather of the past December, where the blue of the sky was more beautiful than is usually the case with us here, the blue was for both the restricted as well as for the unimpeded eye, completely visible. I looked through a tube blackened on the inside, one inch in diameter. (It must have this diameter if it is to accommodate the eyeball) A white tube permitted little difference to be noticed.[22]

Somewhat paradoxically, Goethe is here stating that he utilised a viewing tube to study the nature of the blue sky! I think that this contradiction can be easily resolved. Goethe knew about the problems with viewing tubes and yet he also knew that to communicate with his contemporary researchers, it was sometimes necessary to step into their *Vorstellungsarten*, with its methods and techniques.

As previously discussed, Goethe doesn't mention the use of viewing tubes in the part of his *Theory of Colour* devoted to the coloured shadows. However, he does discuss similar masking techniques in a few other places in the *Didactic Section.* For instance, here are two paragraphs discussing techniques to study the nature of colour phenomena produced by sunlight reflecting off a tangled coil of fine steel wire:

> 368. When this effect is viewed through a pair of opera glasses the colours will vanish along with the expanded radiance in which they appeared, and we will see only small luminous points, repeated images of the sun. This tells us that the effect is subjective in nature, and that the phenomenon is related to those described as radiant halos (Para. 100).
>
> 369. But we can also demonstrate this phenomenon objectively if we put a white piece of paper under a moderate aperture in a *camera obscura* and hold the tangled wire opposite the paper so that the sunlight shines through the aperture onto the wire. The sunlight will strike on and into the coils of the wire, but will not appear in a point as it does to the concentrating power of the eye. Because the paper can catch the reflection over its entire surface, the sunlight will appear in hair-like lines which are also multicoloured.[23]

This is the river that flows through the *Didactic Section* of Goethe's *Theory of Colour* – difficult to see in specific instances, but always present – that 'subjective' and 'objective' co-exist, interweave and work together. Goethe does classify phenomena as 'subjective' and 'objective' and he tests for this experimentally. In the above quotation, he shows how a colour phenomenon can exist in a more 'subjective' or 'objective' way depending upon the apparatus utilised in the experiment.

Goethe indicates that unexpectedly coloured shadows are 'subjective' in nature but he also emphasises that certain outer physical conditions are necessary to make an environment for the unexpected colours to appear – a dark shadow with colourless light entering into it (Paras. 64 and 69). He also loosens the simplistic idea that the expectedly coloured shadow is purely 'objective' by stating that its colour can be intensified and even modified by the 'subjective' unexpectedly coloured shadow beside it (Para. 76).

I contend that Goethe's usage of the terms 'subjective' and 'objective' to describe colour phenomena was considerably different to their common usage today in that Goethe saw the two as *poles* with infinite variations and nuances in between. As quoted above, he even shows how certain colour phenomena can be moved from the 'subjective' realm to the 'objective' realm. He does place the unexpectedly coloured shadows near to the 'subjective' pole but there's plenty of room for movement in a theory dynamic enough to always see the two poles as working together.

In Steiner's *Light Course* lectures, a critical approach was employed which might be familiar to contemporary historians and philosophers of science. He explored many famous discoveries, experiments and *basic assumptions* in science from new perspectives. He radically re-assessed textbook physics. However, he balanced his critical approach by offering new ideas to renew natural science.

In the seventh *Light Course* lecture, Steiner gave an indication regarding the nature of unexpectedly coloured shadows which has produced much debate and many disagreements amongst anthroposophists. Steiner stated that unexpectedly coloured shadows have an 'objective' reality and he also stated that Goethe was mistaken in indicating that unexpectedly coloured shadows are 'subjective'.[24] It is important to emphasise that these statements were not isolated comments – they should be considered in the context of the whole of the seventh lecture and in fact, in the context of the whole lecture course. This is because Steiner discussed the folly of rigid classification of phenomena into 'subjective' and 'objective' in various places in the *Light Course* lectures, including the seventh lecture.

I think that in making this statement about coloured shadows, Steiner was introducing some movement into an environment where unexpectedly coloured shadows had been 'fixed' as entirely 'subjective'. Steiner re-opened the debate on the nature of unexpectedly coloured shadows.

Steiner's *Light Course* lectures were presented along with experiments. In the seventh lecture, the coloured shadows were produced in an experiment and an unexpectedly coloured shadow was viewed through a tube. It was Osann's version of the viewing tube experiment which Steiner presented. I don't know whether Steiner was familiar with Osann's researches or whether he was familiar with the other versions of the viewing tube experiment by Count Rumford and Fechner. None of the three researchers were mentioned in the lecture. Whatever the specific circumstances, I think that Steiner was *reminding* people that there is experimental evidence which indicates that unexpectedly coloured shadows are 'objective'. He reminded the audience of the validity of this viewpoint.

And now we come to the various statements, comments, recollections and discussions of subsequent researches contained in the notes of the *Light Course* lectures as published in German. Please note that there are presently *four* published editions of the lectures in German, all containing material relating to this statement by Steiner about the coloured shadows. Just like the results of the three viewing tube experiments, these notes are a bag of contradictions![25] In the notes, there are recollections from people who claim that subsequent to the lectures, Steiner did admit that he had made a mistake regarding the nature of unexpectedly coloured shadows. Other recollections indicate that Steiner wished for further researches to be carried out. The above description does not fully portray the equivocal quality of these notes, seen as a whole. To be honest, I think that Steiner probably did agree with various individuals on different occasions that their viewpoints were valid. The various valid viewpoints championed by different indi-

viduals often do not agree. Therefore, in meeting people with a strong metaphysical preference for the idea that unexpectedly coloured shadows are 'subjective', Steiner may well have recognised that preference and entertained it because it does have validity. Likewise, Steiner would have met people who seriously entertained the idea that unexpectedly coloured shadows have an 'objective' reality and his comments on these occasions may have been quite different.

I think that Steiner knew that the fact statements found in science textbooks – and cultured through science education – have a powerful hold on many human beings. I have personally experienced that questioning the *basic assumptions* of modern science can be deeply shocking, especially when actual experiments are involved. The *basic assumptions* of modern science are very similar to religious beliefs; this theme has been discussed in the recent literature of the history and philosophy of science. I think that the power of religiosity in modern science is partly responsible for the shortage of natural scientific research carried out by anthroposophists since the time of Steiner compared with their work in other practical fields. Many anthroposophists have not been able or willing to seriously entertain the ideas and evidence presented by Steiner in the *Light Course* lectures.

As discussed above, there have been debates and disagreements amongst anthroposophists regarding the indications given by Steiner about the nature of unexpectedly coloured shadows. The fragmentary comments contained in the notes of the *Light Course* lectures do not resolve the issues – they are contradictory. Contradictions can produce confusion and uncertainty; they can also create a space for freedom of discovery!

In the last 50 years, there have been a small number of researchers – mostly anthroposophists – who have explored the nature of unexpected colours. The following list gives some brief details of some of these researches:

Edwin Land, the inventor of instant photography, carried out research into colours which unexpectedly appear in projecting pictures, or, as he called them, *natural images*.[26] These colour phenomena are closely related to the coloured shadows and it is little known today that he was also studying the reality status of these unexpected colours.[27]

Wilson and Brocklebank published two critical replies to Land's researches which included some new experimental researches. These articles also relate to the coloured shadows.[28]

Proskauer and Ott carried out extensive researches on coloured shadows. Their work is published in German in a book with a title which translates as *The Riddle of Coloured Shadows*.[29]

Hetzel has also carried out extensive researches into the nature of coloured shadows, including many experiments involving photography. His work is briefly discussed in the notes in the 1987 and 2000 editions of the *Light Course* lectures. His researches are discussed further in two journal articles.[30]

My own doctoral research was partly concerned with exploring the nature of unexpectedly coloured shadows through experiments. My doctoral thesis and a journal article discuss these researches.[31]

Instead of a final definitive conclusion, here are some questions which might encourage further research:

With regard to the viewing tube experiments – How does it *feel* to be the observer? How does it *feel* to be the assistant? Do the viewing tube experiments and the contradictory results produced have some connection to the Dragon within us?

Can we think of ways to study the nature of unexpectedly coloured shadows which do not involve artificially separating the area of interest from its surroundings?

Does the soul experience of a human being seeing an unexpectedly coloured shadow have an influence on its reality status?

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1. Please decide for yourself whether the following notes and references are here to help or hinder!
2. These books can give an overview of this revolution in the history and philosophy of science:
   T. Kuhn *The Structure of Scientific Revolutions* (1962)
   I. Hacking *Representing and Intervening...* (1983)
   B. Latour *Science in Action...* (1987)
   D. Gooding, T. Pinch and S. Schaffer (editors) *The Uses of Experiment...* (1989)
3. Uncertainty was a large theme in 20th century physics. However, it is usually entertained in realms outside of direct human experience e.g. in the strange events in particle accelerators etc. For everyday experience, physicists utilise the simple mechanical-material *basic assumptions* regarding nature, as found in school physics textbooks.
4. J.W. Goethe *Scientific Studies* (1995), Note 35, p.336 . This collection of Goethe's scientific work was edited and translated by Douglas Miller. It contains the *Didactic Section* of the *Theory of Colour*.
5. Goethe (1995) p.181 (Para. 75)
6. D. L. Sepper *Goethe Contra Newton...* (1988) p. 88
7. Sepper (1988) p.89
8. Sepper (1988) p.91-92
9. T. S. Kuhn *The Structure of Scientific Revolutions* 1970, 2nd ed. p. 2
10. My use of the word *unexpected* in this situation comes from the colour researches of Edwin Land.
11. This is why the instructions given above request that you choose an overcast day. If you choose a day with a clear blue sky, blue coloured daylight will enter Shadow 2. Somewhat paradoxically, the results are very similar and maybe even identical – Shadow 2 becomes blue!
12. Count Rumford (Sir Benjamin Thompson) *Philosophical Transactions of the Royal Society* Part I, 1794, p.107-118
13. The term *little colour world* comes from E. Land's published researches.
14. R. S. Turner *In The Eye's Mind...* (1994) p.110
15. Turner (1994) p.110
16. Helmholtz and Hering did debate whether contrast colours are more physiological or psychological in nature, but they were in basic agreement that these unexpected colours are 'subjective'. See R. S. Turner's book.
17. Turner (1994) p.110
18. Goethe (1995) p.179 (Para. 66)
19. Sepper (1988) p.89
20. J. W. Goethe *Theory of Colour (Supplementary Section)* With many thanks to Hans-Georg Hetzel for finding this and translating it.
21. Contemporary philosophers of science utilise the term *black box* for situations where pieces of scientific apparatus are utilised in research without any critical consideration of their contributions to the research results. See B. Latour's book *Science in Action...* (1987)
22. J. W. Goethe *Theory of Colour (Supplementary Section)*
23. Goethe (1995) p.225 (Paras. 368 and 369)
24. Steiner, R. (1925) *First Scientific Lecture Course (Light Course)*, translated by George Adams (1987) p.62-63
25. A distinction should be drawn here between the recollections of what Steiner may have said to various individuals and the recent experimental researches discussed in the notes. The recollections are very contradictory and very difficult to research further; the recent experimental researches are available for anyone to explore further.
26. E. Land *Scientific American* Vol. 200, May 1959, p.84-99
27. To gain a more complete picture of the researches published in the above article it is important to see a long letter which Land published in the September 1959 issue of *Scientific American* p.16-22.
28. M. Wilson and R. Brocklebank *Journal of Photographic Science* Vol. 8, July 1960, p.141-150
    Contemporary Physics Vol. 3, 1961, p.91-111
29. H. Proskauer and G. Ott *Das Rätsel des farbigen Schattens, Versuch einer Lösung* (1979)
30. H. G. Hetzel *Optometrie* No. 4, 1987, p.177-179
    Vereinsspektrum (Journal of the Association for the Promotion of Goethe's *Theory of Colour*) No. 4, 2002/2003, p.24-36
31. M. J. Starrett *Checking the Facts in Science – the experience of experimenting* 2000 (doctoral thesis)
    Source (photographic journal) No. 26, Spring 2001, p.17-27

Reviews

The most primitive primate

A review of: *Developmental Dynamics in Humans and other Primates: Discovering Evolutionary Principles Through Comparative Morphology*. Jos Verhulst. Adonis Press, New York. 2003. ISBN 932776-28-0. 432pp, illustrated. h/b $39.95

This is the English translation of the German original published in 1999 by Verlag Freies Geistesleben under the title *Der Erstgeborene: Mensch und Höhere Tiere in der Evolution* which can be translated as *The Firstborn: Man and Higher Animals in Evolution*, a title which, compared with the title given by Adonis Press, perhaps conveys a better idea of the author's viewpoint. Furthermore it also indicates that data from higher animals other than primates are discussed.

Paul Carline reviewed the German edition in the September 2000 issue of the Newsletter. There he set it in the context of the ongoing evolution-creation debate and added his own translation of the whole of Verhulst's preface to the book.

The book is premised on the following key ideas: evolution is guided by an intrinsic evolutionary factor (internal causation); anthropogenesis is the intrinsic goal of evolution; the dominant morphological processes of anthropogenesis are fetalisation, paedomorphosis or neoteny combined with further modifications through hypermorphosis; the environmental effects dominant in Darwinism (external causation) play a secondary role; higher animals are 'spun off' during anthropogenesis through a reduction in paedomorphosis and an overspecialisation of one or more morphological attributes.

The intrinsic evolutionary factor is a final cause in the Aristotelian sense and is implicit in terms such as archetype, telos or entelechy which refer to a spirit principle attempting to manifest. After Aristotle such ideas resurface, albeit in developed versions, in the work of *inter alia* Johann Wolfgang von Goethe (1749-1832), Karl Snell (1806-1886), Wilhelm Heinrich Preuss (1843-1909), Louis Bolk (1866-1930) and Rudolf Steiner (1861-1925). It is predominantly the work of Bolk which underpins the ideological basis of Verhulst's treatment.

As the ground is already well dug over by Stephen Jay Gould in his *Ontogeny and Phylogeny* (1977, Harvard University Press), a much broader based historical review up to recent thinking in the field, it is worth asking what is new about Verhulst's work especially as it does not include any direct phenomenological study by the author of morphological features but rather observations published by others. The answer is clear almost at a glance through the book's 177 figures. Verhulst has amassed a vast array of evidence in support of the basic ideas of the book. Indeed, as Carline reported in his earlier review, Verhulst has even more comparative morphological evidence than he has presented illustrating the two interweaving principles which Mark Riegner identified in his Foreword to the book as: 1) all organisms are a product of interrelated developmental events that express themselves in differential rates and timing and 2) The human form is the primary reference point for understanding comparative morphology among the primates and even among the vertebrates. The first principle, heterochrony, is the basic argument of *Ontogeny and Phylogeny* but the second is not mentioned explicitly by Gould although his reference to Bolk's belief that 'inner factors controlled the direction of evolution by transforming entire organisms along harmonious and definite paths of vitalistic determination' could perhaps be taken as an implicit reference to a belief in the primacy of the human form. And it is precisely the second interweaving principle that forms the central thread of Verhulst's book. On page 13 we find a quote from Preuss which presumably provided the inspiration for the first word of the book's German title:

> 'The human being is the goal of all telluric processes, and every other form appearing alongside the human form has borrowed its traits from the human being. The human being is the firstborn being of the entire cosmos. Not in our present form, admittedly, but in the form acquired during 273 days in the womb, beginning with ovum and sperm, the human race has experienced all the transformations that led from the very simplest stages of life to our present, perfected form . . . All inorganic matter, regardless of its tremendous mass, must be seen as a waste product of the breakdown of organic matter as a consequence of the life process . . The great inorganic mass of the Earth is a metabolic by-product, both of organisms now inhabiting its surface and of their ancestors.' (1882)

Why is Verhulst so motivated by the belief in the human form in its deepest sense as a primary reference point in evolution that he is willing to amass so much data which can be interpreted to support it? The clearest answer to this comes in the book's preface. The materialistic world view implicit in Darwinism sees evolution occurring through a blind deterministic causality where absolute necessity rules out any possibility of free will. With no free will, moral impulses too are merely determined and thus no longer moral in the fullest sense of the word. Thus the potential for the highest expression of humanness is ruled out in principle by such a world view. Indeed, Bolk himself realised that morality would never have evolved in a power struggle because weakness is a crime. Materialism sets a boundary to evolution. But a theory of evolution with no *a priori* boundaries sees the human form attempting to manifest its fullest potential throughout.

Just as Gould rescues Bolk's data in support of his paedomorphosis theory, so Verhulst completes the job by rescuing Bolk's orthogenetic theory and on the way richly furnishes both aspects with examples. These are presented in such a way that the reader can easily judge for himself whether they support the theories. What is more problematic for readers who, like myself, are not comparative morphologists is whether there exists a body of data which does not fit the theory. For example, I would like to have seen some engagement at least with the work of critics of Bolk's theory. (The brief treatment of Bolk's racist ideas, though tactful and neatly making an epistemological point on an appropriate approach to studying human lives, was off the main thread.) For instance, Gould's key criticism is Bolk's almost complete lack of acknowledgement of the significance of adaptation. But Verhulst, with the advantage of access to nearly three quarters of a century of morphological observations since Bolk, although never straying far into the Darwinist camp, does in places point to characteristics conferring adaptive advantages. One example he gives is that the combination of eccrine sweat glands all over the body with a relatively reduced amount of body hair enables humans to catch game by exhausting it through uninterrupted pursuit.

One more cautionary note is justified: Gould argues that theories cannot be 'proved or disproved by amassing a compendium of empirical results'. By citing over 500 references Verhulst has indeed provided such a compendium. One might justifiably expect that there are results not cited which don't quite fit the theory. On the other hand, we can also reasonably expect that in addition to heterochrony other complex and perhaps secondary processes are at work in the expression of the human form in material substance. Morphologists of the future, their thinking armed with Bolkian phenomenological ideas, i.e. stripped of what Gould calls 'philosophical baggage',

might be in a position to make more rapid progress in characterising any as yet unknown secondary evolutionary processes.

In conclusion, in *Developmental Dynamics* we have something of a paradox: the work of a thinker who is firmly in the evolutionist camp of the creationist-evolutionist debate yet who espouses a spiritual world view. As the English edition helps the ideas in the book to become better known in the scientific world, it will be interesting to watch how they are received. *David Heaf*

A Secret History of Consciousness *by Gary Lachman*.

Lindisfarne Books, Mass. 2003. 314pp. ISBN 1-58420-011-1. p/b. £14.99

Gary Lachman used to be the bass player and composer for a rock group called Blondie and latterly a punk group, Iggy Pop. Obsessed with the occult and what he refers to as 'weird' tales by H. P. Lovecraft etc, he one day found himself in Los Angeles, unemployed and with hardly a cent. He spent what he had on a doughnut and a book, Colin Wilson's *The Outsider*. From which time he dates a profound shift in his consciousness

Lachman begins the book with a quotation from Francis Crick: 'You, your joys and sorrows, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules' and then goes on, in 314 well argued pages to tell us why he thinks this cannot be so.

The ground is thoroughly covered: Daniel Dennett; Coleridge and Wordsworth; Kant, Rilke, Schuré, Hesse, George Steiner, John Cowper Powys; neuroscientists, philosophers and physicists. And towering over it all and informing the author's ideas, Rudolf Steiner.

Having neatly dealt with the ambiguities of 'a' consciousness refuting consciousness, Lachman covers the ideas of consciousness as atoms, molecules and biological activity such as photosynthesis and all the assertions that surround John Searle's idea that 'it is a plain fact about nature that brains cause consciousness'.

He gives space to many scientific approaches, beginning with Wolf Singer's experiment which supports the idea of consciousness as primary and going on to cite the work of neuroscientists Denis Pare and Rodolfi Llinas.

He notes striking parallels between Steiner's insights and the research work of others: Henri Bergson, author of *Creative Evolution* asserts, like Steiner, that what the plant world gained in photosynthesis, it lost in movement; Mavromatis' work, based on an analysis of the brain structure and suggesting that the barrier between unconscious and conscious, dreaming and waking will eventually be experienced by human beings simultaneously, supports Steiner's insight, as does that of Bohr and Heisenberg on maintaining mutually exclusive ideas; psychologist Erich Neumann with others, proposing that earlier stages of consciousness will be recapitulated in the consciousness of children; Melanie Klein and D. W. Winnicott, recognising the 'split' in consciousness recorded in the story of Eden and attesting to the profound achievement of the 'I am'; Stan Gooch, a psychologist who proposed a Neanderthal moon empire, and who suggests that Neanderthal astronomical knowledge sank into myth.

Rudolf Steiner's work is the particular focus of Part 2, Esoteric Revolution. After a whizz through Wilberforce, Huxley, Lamarck, Hegel, Marx and the 'father of modern geology', Charles Lyell, we come to 'the inimitable Helena Petrovna Blavatsky'. She is presented as the person to launch 'the first full scale attack on Darwinian evolution – as well as on the whole edifice of scientific materialism'. Not only did she counter Clausius' second law of thermodynamics but also with her view of cosmic evolution she refuted Darwin. She asserted that all planets 'are, or were man-bearing' which idea has recently been proposed by a physicist, Frank Tippler. There is a good, clear account of Steiner's *Philosophy of Freedom* here, followed by Goethe and 'Cosmic Evolution' and we are also treated to a lucid account of Owen Barfield's realisation that the way language is used affects consciousness and that everything we now accept as abstract in language at one time had a concrete meaning, thus giving the lie to all those who say that anything that pointed to a spiritual reality was 'only' metaphor. And so we come through 'Saving the Appearances' not only to a realisation of ourselves as inextricably part of the world we attempt to manipulate and describe but at the same time, and this is crucial to the proposition, the realisation that if our consciousness was other than it is, the world would be too; Barfield's 'interior is anterior'. This insight is confirmed by the neuroscientists Llinas and Pare referred to above. The crucial point is made that although I may not be the creator of the 'unrepresented' particles of which the material world is supposedly made, I certainly am the creator of my representation of those particles. Enter responsibility and imagination. Hand in hand with the evolution of human consciousness goes what Steiner called 'responsibility to the earth' and Lachman acknowledges Steiner's profound insight that the physical body of the earth will be determined by the kind of thoughts that people think now. I wasn't sure what to make of Lachman's quote from Jurij Moskvitin that 'our world is a slice of a totality to which we can never have full access'. In a mundane sense I cannot pull myself up by my own bootstraps but in another that is exactly what I must attempt.

The last part of Part 4 deals with Colin Wilson who, through his writing, put Lachman on the trail of consciousness studies and so holds a special place in his heart.

Part 5 is mainly devoted to the ideas of the Swiss cultural philosopher Jean Gebser (1905-1973), as set out in his book *Ursprung und Gegenwart* (*The Ever-Present Origin*). Gebser like Barfield recognised that language provided good evidence for the evolution of consciousness and that consciousness was already significantly changing. His conviction of impending global catastrophe echoes Steiner's vision of an age of complete scientific materialism. Lachman says that he is not alone in finding Gebser's book a difficult read and even reading his summary in Chapter 26, I fell upon the references to and quotations from Steiner like a thirsty person finding water in a desert. Quoting from Steiner's *Occult Science*, Lachman observes what he sees as Gebser's shared views on the progression of consciousness; that there was 'a point in evolution where matter first began to exist' and, from *Cosmic Memory*, Steiner's description of Saturn man's early awareness as being 'duller than that of dreamless sleep'. There are many other parallels too. In particular, they both saw the advent of material science as a pre-requisite for human freedom but also the possibility that consciousness would be completely cut off from the spiritual world. According to Lachman, Gebser does not refer to Steiner although his work parallels Steiner's in many ways.

Observations on magic, trance music, sex, drugs and rock and roll, spiritual vacuums and group consciousness reminded me of *The Work of the Angels in Man's Astral Body* and *Brotherhood and the Struggle for Existence*.

'Last Words' goes into considerations of the world we have lost by speeding up: the loss of deep time, and what Bergson called duration. Finally, although Lachman appears to be only gently disagreeing with some of those who welcome the picture dominated culture of the electronic media, I think he does

recognise the massive illusion in what he calls the 'wired world'. The book ends on a sanguine, almost bathetic note, quoting Georg Feuerstein's *Structures of Consciousness*:, 'the world will not become much better, merely a little different and perhaps somewhat more appreciative of the things that really matter', Lachman concludes: 'a possible future that will be "more appreciative of the things that really matter" is something to look forward to'.

I would have preferred more of a bang, less of a whimper to end with.

In my opinion this is a useful and thought provoking book, clearly and enthusiastically written and neatly contextualising many ideas. Lachman seems to have avoided the germ of materialism which can infect so much 'spiritual' writing and investigation. The sections are clearly laid out in the introduction but you will have to make your own index as you go along because, unlike the *Philosophy of Freedom*, you won't want to get it by heart but you might like to use it as a springboard to the many authors cited in the text and notes.

Parts of it will be very familiar to most readers of this newsletter, dealing as it does with Goethe, Steiner and the Theosophists, but for those who have read deeply but not widely, it will be an excellent overview and introduction to Steiner's antecedents and contemporaries and there are many references which can be followed up. For those who know nothing of Steiner's work, it would make an excellent introduction and manages to grasp the essence of his thought, that of the primacy of clear thinking consciousness. In an age of increasing sensory deprivation, the use of crass metaphor and the domination of mundane thinking, this book is a reminder that the point of thinking is not to reproduce the world but to change it. As Descartes didn't say 'I create therefore I am'.

(Unfortunately, the cover of this book looks as though it is aimed at the ufologically credulous and might easily share a shelf with books on satanisn, Alistair Crowley and vampires. Publisher take note) *Pat Cheney*

Meetings

Strader Conference

'An Tobar', Tobermory, Isle of Mull, Scotland. Thursday 30 October – Monday 3 November 2003

For the fourth scene of his third Mystery Play, Rudolf Steiner gave detailed indications for the construction of a set of curious devices representing machines and appliances of a wholly new kind. In the play, they are the invention of an inspired engineer, Dr. Strader. Steiner spoke of the nature of this new technology – unlike anything known today – and of its central role in the most important challenge facing western humanity in the present epoch: how to unite man and machine in the right way. Our conference for 2003 takes up the questions: who is Strader, and what are the strange devices shown on stage?

Today the search for renewable energy that does not pollute our natural environment is gathering momentum. Organic farming, holistic medicine, 'green' technology – these too, reveal a deepening awareness that we need to bring our man-made world into harmony with outer nature and with our own human spirit.

Much work is being done; and yet important long-term aspects of the situation are still not perceived clearly enough. Solar and wind energies, for example, may avoid certain initial problems. But they are mainly used to generate electricity which, in the form of electromagnetic radiation, is itself one of the worst causes of illness in man and animal, and of damage to nature.

Few people know that Rudolf Steiner, who is more familiar to most as the creator of biodynamic agriculture and of new methods in education, made a major contribution to the search for the proper kind of energy. He described how to harness living forces very different from electromagnetism or those released from fossil fuels. Not only did he refer to this crucial issue in many of his lectures, but he also took the unusual step of showing on stage, in his Mystery Plays, actual models of machines and appliances powered by those forces.

The Anthro-Tech Research Institute was created in Switzerland in 1989 to apply Rudolf Steiner's indications to the practical development of the technology he proposed. This is a long-term project of fundamental research. A daughter institute has since been set up in the beautiful Western Isles of Scotland, at Tobermory on the Isle of Mull. Like the parent institute in Switzerland, it will do theoretical and practical research into the development of the new technology.

The drawing reproduced on the front page of the leaflet advertising this event was made and annotated by Dr. Oskar Schmiedel in discussion with Rudolf Steiner, and is a rough sketch of the central device, by which the new forces were to be harnessed. It has often been referred to, somewhat misleadingly, as the Strader Machine. A stage model was built by mechanical engineers in the winter of 1912, following Rudolf Steiner's instructions as closely as was possible using the technology of the time. It was seen on stage only once, in Munich in 1913. An accurate copy of the original model is at our research premises in Switzerland.

Over the last few years, the Anthro-Tech Research Institute has organised conferences and forums at Tobermory on themes related to our particular field of work. This year we invite you to discover with us what lies behind the enigmatic and fascinating figure of Dr. Strader in the Mystery Plays, and what the new moral technology is, which is expressed in the stage models.

The conference will begin on Thursday evening 30 October and will close about noon on Monday 3 November 2003. Further information and practical details can be obtained from: Philippe Rigal, Engineering Services +44 (0)1688 302532; Ute Grund, Hu's Gate Shop +44 (0)1688 302116 or Strader Beckoning +44 (0)1688 302464.

UK group of the Science Section

There will be meetings of the UK group of the Science Section on Saturday 8th November 2003 and Saturday 21st February 2004 for members of the School of Spiritual Science who are taking responsibility for the scientific work.

For further details please contact: Richard Swann, Orchard Leigh Camphill Community, Bath Road, Eastington, Stonehouse, Gloucestershire GL10 3AY. Tel: 01453 825617; Fax 01453 823811. E-mail: raswann (at) lineone.net.

Living Forms Research

Friday evening October 10th to Tuesday morning October 14th in Strontian, Scotland. The papers presented last year are on the website for bud research and related topics: www.anth.org.uk/vortexoflife.

Accommodation: (i) the 14-bed hostel adjacent to the conference rooms in Ardnamurchan High School, Strontian, Argyll, PH36 4JA (Tel. 01397 709228); (ii) the wooden chalets at Seaview Grazings, Strontian. Some may prefer the comfort and nearness of the hostel, whilst others may prefer the greater proximity to nature, plus superb loch view afforded by a room in a chalet.

Half of the £12 per night accommodation cost will be provided by the Research Fund for each participant and at least half of your travelling expenses within the UK. A greater proportion of travel costs will be available to those presenting research papers. (NB. The High School is equipped with excellent computer, video and projection equipment.) An in situ restaurant is available; this year you are asked to pay your own expenses for meals there or in a local pub.

As last year, some sessions will be devoted to practical work each day, measuring bud profiles and using computer programs to evaluate 'lambda' parameters. Again, money from the Research Fund can be made available to purchase computer and photographic equipment for new people seriously intending to take up bud research.

Anyone wishing to participate should write, giving accommodation preference and the title of the paper or talk they may like to present, to Ron Jarman, 67 Bowbridge Lane, Stroud, Glos, GL5 2JN Tel. +44 (0)1453 750477.

Raum & Gegenraum III

Mathematisch-Astronomische Sektion am Goetheanum – Mathematisch Studientage. 8-12 October 2003

Contributors: Stephan Baumgartner, Oliver Conradt, Klaus Emhofer, Heidi Flückiger, Georg Glöckler, Uwe Hansen, Olrike Kleeberg-Neels & Frank Schaefer-Lorinser. Further contributions invited.

Organiser and chairman of the meeting: Dr. Oliver Conradt (o.conradt (at) gmx.net). For the section: Georg Glöckler.

Further information from the office of the Mathematisch-Astronomische Sektion am Goetheanum, Postfach, CH-4143 Dornach, Switzerland. Tel +41 61 706 4228; Fax +41 61 706 4223; email math.astr.sektion (at) goetheanum.ch.

Science Group at Austin Waldorf School, USA

Austin Waldorf School Science Group

The science group at the Austin Waldorf School (Texas) will base its study this year on an article by Horst Wedde, *Wie kann die Menscheit lernen, die Computerwelt zu bestehen?* from *Mathematisch-Physikalische Korrespondenze* **207** (2001), pp. 20-33. In order to judge the effects of computerization on human society and on the soul, Wedde suggests considering the nature of computer technology itself, and also compares it with the inner effects of the earlier industrial revolution.

We invite other participants to join our discussion by post. For further information and a translation of Wedde's article you may contact us at the address below.

We also expect to follow up on last year's topic, the *Warmth Course* by Rudolf Steiner (GA321, 14 lectures, Stuttgart, 1-14 March 1920).

We have made some progress here on some geometrical matters, in the field of 'recreational mathematics'. Some of it involves assembly puzzles treated in the 1920s by Perceval MacMahon, and in the 1930s by Gerhard Kowalewski. We would be delighted to contact any readers of the Science Newsletter who have similar interests.

David Booth, Ph.D., P.O. Box 41531, Austin, Texas 78704, USA

Preliminary Announcements

Values and genes in agri-cultures: a multicultural approach to plant domestication and its historical significance for humanity and the integrity of life

Organised by *If*gene – International Forum for Genetic Engineering, 2004 (date to be decided)

For further details contact: *If*gene-France: Christine Ballivet, Institut Kepler, 6, avenue Georges Clémenceau, F-69230 Saint Genis-Laval. Tel: +33 (0)4 78 56 19 41. Fax: +33 (0)4 78 56 84 57. Email: christine.ballivet (at) libertysurf.fr. Web: http://www.anth.org/ifgene/

Science Group 2004

Derek Forman is planning to organise a Science Group meeting for a weekend in the Autumn of 2004 (exact date and venue not yet fixed, but probably September or October).

So far only Nick Thomas and Derek Forman have agreed to deliver a talk, but anyone else who would like to contribute, please contact Derek either by letter, phone or e-mail at Melford House, Fir Toll Road, Mayfield, East Sussex, TN20 6NB. Tel: +44 (0)1435 873128. Email: derek (at) dforman.fslife.co.uk

Full details will be in the March issue of the Newsletter, but the theme of the conference will be physics orientated and built around two books: *Matter & Mind* by Edelglass, Maier, Gebert and Davy and *Gaia-Sophia* by Kees Zoeteman – the latter mainly for references about time. There is a conflict about cosmology, in particular the meaning of time between the 'orthodox' scientists and Steiner, which Zoeteman addresses.

We define our year with reference to the annual rotation of the earth round the sun, so what could be meant by *x* billion 'years' before the existence of the solar system? I may find Gerhard Kraus *Has Hawking Erred?* may have some relevant comments on this since he disputes the whole concept of space-time. Perhaps he should have called his book *Has Einstein Erred?* but did not dare! The subtitle of the Edelglass *et al*. book is *Imaginative Participation in Science* which will be the title of the conference.

For those who wish to 'mug up' on the contents beforehand, Nick Thomas's *Science Between Space and Counterspace*' might well be worth studying.

Courses

Schumacher College

October 5-24, 2003 Seeing with new eyes: an introduction to holistic science. Tutors: Brian Goodwin, Stephan Harding, Chris Clarke, Mae-Wan Ho and Craig Holdrege

June 13-July 2, 2004 Living Earth: gaia theory explored. Tutors: Stephan Harding, James Lovelock, Lynn Margulis, Ricardo Guerrero and Tom Wakeford

July 4-17, 2004 Complexity and life. Tutors: Fritjof Capra, with Brian Goodwin and Stephan Harding

For further details of Schumacher College and its courses, please contact:

Administrator, Schumacher College, The Old Postern, Dartington, Totnes, Devon TQ9 6EA, UK

Tel: +44 (0)1803 865934; Fax: +44 (0)1803 866899.

Email: admin (at) schumachercollege.org.uk

Web: http://www.schumachercollege.org.uk

Publications

Archetype

Issue 9, September 2003: Shape changes of ripening mistletoe berries, *Heidi Flückiger and Stephan Baumgartner.* Bovine spongiform encephalopathy and uric acid, *Judyth Sassoon.*

Microbial processes and plant life – a key to a chemistry of life, *Norbert Pfennig and Jochen Bockemühl.*
43 pages, A5 format. Price: £3.50 per copy including UK postage (overseas postage: Europe add £0.50, elsewhere add £1.00).
Enquiries and orders to: David Heaf, Hafan, Cae Llwyd, Llanystumdwy, Gwynedd, LL52 0SG, UK. Tel/Fax: +44 (0)1766 523181 Email: 101622.2773 (at) Compuserve.Com

Classification of real projective pathcurves
In 1997, Lou de Boer completed a classification of real projective pathcurves (W-Kurven). Last year, a second – enhanced – version of his paper was completed and since Spring 2003 this has been available on the internet. It is a big (3.3 Mb) PDF-file which can be found at
http://www.anth.org.uk/vortexoflife/Reports.htm
It contains an introduction in which the basic principles of pathcurves and their classification are treated. In the first chapter the motions of points on a line are classified, including a thorough study of the elliptic ones. The second chapter contains the classification and description of all plane pathcurves. The third chapter is restricted to the classification of pathcurves in real space that can be made continuous. The last chapter contains figures of the continuous curves in the plane and in space.
The reader is assumed to have a basic understanding of linear algebra and matrices, as well as of projective geometry.

Putting Soul into Science
I am pleased to announce that my book *Putting Soul into Science*, which has been available for three years at the web site http://www.SouthernCrossReview.org as an electronic book, has been printed and should now be available to order in certain bookshops.
The book is published by the USA company iUniverse, which produces print-on-demand books and can be ordered online at www.iuniverse.com or from other online booksellers such as amazon, bn.com, borders, booksamillion, walmart.com, etc. *Michael Friedjung*

Does Waldorf Offer a Viable Form of Science Education?
A Research Monograph by David Jelinek,Ph.D. and Li-Ling Sun, Ph.D. College of Education, California State University, Sacramento, 6000 J. Street, Sacramento, CA 95819. Email addresses: djelinek (at) csus.edu & lsun (at) csus.edu. © 2003 David Jelinek. 100pp. A PDF file of the monograph is available at http://www.csus.edu/indiv/j/jelinekd/
Abstract: This monograph reports the findings from a multifaceted study undertaken to address the strong need for empirical evaluation of Waldorf education. There is growing interest in the Waldorf method among many parents and educators because they believe it more successfully engages students and supports meaningful learning than do mainstream methods. Yet these parents and educators have little first-hand knowledge of Waldorf pedagogical principles or the founding father's philosophy.
Increasingly, they find themselves caught between the extremes in a debate others have long-engaged over Waldorf education: a debate that can be summarized at one extreme as adamant opposition to the peculiar philosophical background of Rudolf Steiner, whose beliefs, critics claim, constitute 'pseudo- science'; and at the other extreme as a firm conviction that any shortcomings in student achievement under Waldorf methods is the result of shortcomings in implementation of the Waldorf curriculum as intended – and decidedly not because the curriculum is 'pseudo-scientific'. The purpose of this study was to use recognized and accepted methods of inquiry and investigation to uncover the nature of Waldorf science education and to evaluate its applicability to mainstream science education. The study began with four primary questions: 1) How does the Waldorf science curriculum align itself with state and national science standards? 2) What are the perspectives of Waldorf students, teachers and parents regarding science education in the Waldorf context? 3) How do Waldorf students' scientific reasoning and problem solving skills compare to those of their counterparts in mainstream educational settings? 4) Does Waldorf offer a viable form of science education? The findings of the study are reported in four sections. First, it provides a theoretical framework by analyzing Waldorf Theory relative to the theories of Experiential Learning, Developmentalism, ZPD (Vygotsky), Spiral Curriculum, Triarchic Intelligence and Multiple Intelligences. Second, it analyzes the Waldorf science curriculum through document analysis, external reviews and field testing of Waldorf curriculum materials. Third, it analyzes results of interviews and a national survey administered to Waldorf educators. Fourth, it analyzes findings from various logical reasoning and scientific problem-solving tasks administered to Waldorf students, then the results of videotaped Waldorf science lessons.
A concluding discussion examines the research questions in light of the data, with a particularly strong focus on the question of whether or not Waldorf offers a viable form of science education and, if not, what could be done to make it so.
Conclusion: Once again we return to the question: *How **Could** Waldorf Offer a Viable Form of Science Education?* We believe we have answered it by pointing to a rigorous process that distinguishes pseudoscience from science – with a rejection of pseudoscientific ideas, however pivotal they may have been to Waldorf science education in the past. This includes removal of Rudolf Steiner and anthroposophy as sources of accurate scientific concepts, a separation of Waldorf science education from anthroposophy, specific attention to bringing the 'good ideas' of Waldorf into a secular environment, a critical review of Waldorf science resource materials and expungement of materials that don't make the grade. We then pointed to the five 'big ideas' that Waldorf needs to come to terms with: 1) physics' model of the Atom; 2) chemistry's theory of Periodic Law; 3) astronomy's 'Big Bang' theory; 4) geology's 'Plate Tectonics' theory and 5) biology's theory of 'Evolution'.
Is it worth the trouble? Is it realistic to assume that the 'good ideas' of Waldorf could be extracted from the pseudoscientific ones and emerge a strong and vibrant (and viable) form of science education? The evidence from this study indicates that Waldorf will have its work cut out and will have to lose some ideas and people (some anthroposophists are not going to accept the changes that have to be made) along the way, but Waldorf 's rich array of creative methods that stimulate imaginative thought and engage students in potentially meaningful activities could undoubtedly enrich secular education.
Ultimately, our case for encouraging the effort comes anecdotally and is about the students. Time and again as our researchers visited the many Waldorf schools across America we were impressed with the eager, confident and curious Waldorf students we encountered. These students demonstrated original thinking and innovative problem solving, leaving us with the impression that they cared about what they were doing, were intrigued by challenging situations and penetrated matters with thoughtful and creative insights. One can only imagine how far they could go with sound scientific ideas as part of their repertoire. We think it is worth finding out.

(*The Editor thanks Tom Mellett for bringing this monograph to our attention and would be interested in publishing a review of or response to this work, preferably by a Waldorf science teacher.*)

Strader Technology

For some years interest in technologies of the future has livened up especially in the area of free power. The work of early pioneers of so-called etheric technology (Wilhelm Reich, Viktor Schauberger, Nikola Tesla *et al.*) has appeared on the internet amid much comment, especially in relation to a modern vision of a world based on decentralised, ultimately free, power supplies. There, countless engineers and hobbyists try to grasp the experimental configurations and where possible develop them.

Even renowned research institutions are starting to check whether they've been left behind in this field. However it is also noticeable how ideas and impulses from anthroposophically oriented spiritual science remain almost totally ignored. This is probably because in the anthroposophical movement the real issues have so far hardly been addressed. This applies even if one takes into consideration the fact that Steiner's mystery plays, in which the engineer and inventor 'Strader' plays a central part, have been staged for over 80 years or the subject represented by this character has been discussed in countless articles and lectures. And it clearly has not helped the subject further that a company by the name 'Anthro-Tech' has been trying for over a decade to go deeper into 'Strader-technology' and put it to practical application.

It is probably no less significant that although the stage prop model of the 'Strader machine' of 1923-4 survived the burning down of the first Goetheanum, it inexplicably disappeared soon thereafter or that, for instance, the entire archive of the Stuttgart Research institute, Der Kommende Tag A.G., which had its own department engaged in developing technologies using etheric forces, cannot be traced.

Christoph Podak informs us that as a contribution towards trying to improve this situation, he has published a series of articles in German in *Der Europäer* including background material with introductions and copious annotations, some of which is being published for the first time. The above paragraphs are a translation by David Heaf of the introduction to the first article in the series. For further details, including how to order the magazine, please visit the web page http://www.perseus.ch/ or contact Christoph Podak at institout (at) bluewin.ch.

Elemente der Naturwissenschaft

No. 78 (1) 2003. Der 'Sinnenschein' als Schwellenregion zwischen Uber- und Unternatur, *Thomas Schmidt*. Mikrobielle Prozesse und Pflanzenleben – Schlüssel zu einer Chemie des Lebendigen, *Norbert Pfennig und Jochen Bockemühl* (English translation in *Archetype* 9, 2003). 'Stoffe sind festgehaltene Prozesse' – Elemente eines neuen Stoffbegriffs, *Martin Rozumek.* Phanomenologische Identifikation des Indigo aus Waid im Vergleich zu chemisch-synthetischem Indigo, *Theodor Bolsinger*. Asthetische Erkenntnis als Quellpunkt des Hauptunterrichts, *Peter Guttenhofer.* Steiner oder Einstein? – *Peter Gschwind.* Zufall und Freiheit im Kontext der Naturwissenschaften – Teil I: Kausalität und Konditionalität, *Renatus Ziegler*.

This 199-page issue of the journal – the biggest since its launch in 1961 – also contains 19 special contributions commemorating the 70th birthday of Georg Maier as well as a 'Kolloquium' contribution from Andreas Suchantke on evolution and retention (neoteny, paedomorphosis, fetalisation, juvenilisation etc).

Subscription enquiries to: Wochenschrift 'Das Goetheanum', Abo-Service, Postfach, CH-4143 Dornach 1, abo (at) goetheanum.ch

Orders for back/single issues to: Naturwissenschaftliche Sektion am Goetheanum, Postfach, CH-4143 Dornach, Tel. +41 61 7064210. Fax +41 61 7064215. E-mail: science (at) goetheanum.ch. Cost: Annual subscription (2 issues): €15.- / CHF 22.-

Single issues: €8.- / CHF 12.- ISSN 0422-9630

Mathematisch-Physikalisch Korrespondenz

No. 212, Easter 2003 Die dubiose Rolle des Raumzeit-Kontinuums in der Mikrophysik, *Geoffrey F. Chew* (Translation of 'The dubious role of space-time continuum in microscopic physics', *Science Progress,* **LI**, 204, 1963). Ursachenlehre, Zufall und Notwendigkeit, *Renatus Ziegler.* Koordinatenbildung – eine Ergänzung, *H. -J. Stoss.* Quadratische Gleichungen in der griechischen Mathematik, *Frank Rothe.* Actual infinity and horizon in scientific knowledge – a letter about the outstanding contemporary Czech mathematician Peter Vopenka and his new book, *Z. Kalva.*

No. 213, St John's 2003 Hyperbolic complex numbers: a brief introduction to their history and applications, *Stephen Eberhart.* Steiner oder Einstein? *Peter Gschwind*.

Subscriptions are Sfr45/€25 per year. Edited by Dr. Peter Gschwind, Mathematisch-Physicalisches Institut, Benedikt Hugiweg 18, CH-4143 Dornach, Switzerland. Email: p.p.gschwind (at) intergga.ch.

Wasserzeichen

Nr. 18 (2003): Main article: Ein Tropfen fällt ins Wasser – Bewegung schafft Form – Form bringt Bewegung, *unattributed.* Apart from the main article in this in-house magazine, its 35 pages have many short contributions including items on the Flow Research Institute's work, its conferences and publications. Price €2.00 per issue. Free to sponsors.

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

Floris Science

The following are two new publications from Floris Books, Edinburgh, which we hope to review in the next issue of the Newsletter.

Flowforms: The Rhythmic Power of Water. John Wilkes. 208pp. ISBN 0-86315-392-5. paperback £16.99 26 June 2003

Projective Geometry. Lawrence Edwards. 352pp (over 200 diagrams). ISBN 0-86315-392-5. Paperback £20.00. 21 August 2003.

Membership

We welcome the following new members to the Group: John Barnes (USA), Philip David (Éire), John Walker (Wales)

Question from the Treasurer

A payment from Antimony Technology appeared on the Group's April 2003 bank statement. If any member recognises this account please could they let me know. *David Heaf*

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 2004.

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