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BEHIND THE UNIVERSE

Martin Redfern talks to scientists whose research has led them to speculate on the forces in nature that may produce the order of life and human consciousness.

Speakers: *Sir Fred Hoyle*
Prof. David Bohm
Prof. Glen Schaefer
Dr. Peter Fenwick

MAN and the HEALTH of NATURE

Professor Glen Schaefer

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(A 15 minute interview transmitted on 5,6,8,11 January; with minor editing)

MAN and the HEALTH of NATURE

Glen Schaefer

In today's programme Martin Redfern introduces Professor Glen Schaefer who is head of the Ecological Physics Research Group at Cranfield Institute of Technology.

Martin Redfern:

As a child in the Canadian countryside, Glen Schaefer was fascinated by the subtle complexity of the living world around him, by the delicate balance of insects, plant and animal life many of us take for granted. After beginning his academic career in mathematical physics he has now come back to ecology, and in particular the studies of the insect populations so often branded by man as pests. Professor Schaefer has developed radar and infra-red techniques that allow him to track migrating locusts, moths or aphids through the sky, as swarms or even as individuals though they may be several kilometres away and high overhead. Through the greater understanding this gives, his international work is pointing him to new strategies for controlling insects that are more effective and less harmful to the rest of the natural environment. It's also shown him the futility of indiscriminate spraying of crops and forests, something which by destroying natural predators and reducing plants' natural immunity, can do more harm than good.

Glen Schaefer:

The most worked out example that I have been involved with through our radar work, etc., has been the spruce budworm moth in the huge natural forest area of Eastern Canada, which is, we now know, the manager of that forest, in that whenever the insects become very numerous they overeat the buds of the trees, the old trees mainly, which then die, blow down, burn up, so that the young ones can come through, producing in this way a natural cycle of insects and forest. During the moth build-up stage in recent times, men have said 'We want that forest for our fat weekend newspapers, etc.; we now have lots of aircraft and insecticide, let us finally deal with this disaster of a dying forest', not realising that only by such a cyclic procedure can the forest at present continue, by letting the young trees have their sunlight.

What has been the long-term effect then of frequent attempts to control the spruce budworm through spraying.

Wherever spray has been used, it has been found to be needed again the next year, and the result is that it has created in those very areas a permanent epidemic of spruce budworm instead of a cycle. This is a clear example of a situation now occurring on most kinds of crops in every country on earth, wherever chemicals are used widely, which is virtually everywhere. The more you spray, the more insects you kill, the more you have the next season or generation. We need only touch this delicately balanced huge entity, the body of nature, full of huge forces, to upset the balance; touch it ever so slightly, half a percent, one percent, we are only now learning that. In our ignorance we think we have the power to have dominion by bringing forward science and technology to our advantage. The result is that nature has replied to undo excessive profit, excessive greed.

Professor Schaefer's work is largely concerned with the effects of chemical pesticides on the body of nature, and with devising alternative treatments for crop diseases. But he also makes some interesting comparisons with human medicine, with the effects of chemical drugs on the bodies of people.

I have noticed this, and the more I think of it the clearer it becomes - the parallel between an individual's body and the way he tries to get help for it from chemical medicine, and the body of nature and the way we try to treat nature's apparent illnesses, on a larger scale. With a human body, we pour in chemicals in order to kill so-called germs; with nature, we pour on chemicals to kill insects, micro-organisms and weeds. The result is very similar in both cases. In our bodily case we are now warned, even by doctors, not to overuse agents because of immunity being set up, so that when your need may be greater later, a range of agents may not be effective. It is exactly the same with chemicals on fields - the more you use them the more side effects you have. This is alarming. We now also know that these chemicals are very rare kinds of inventions, both medical and agricultural; they have to be viewed as a valuable resource, not to be used unless absolutely necessary. This is not in the usual interests of the industries concerned, and it is a tough problem for them. Nature's reply is leading us to turn rapidly towards non-chemical means, biological means, for dealing with so-called pest problems. To use a biological has great attraction because there are non-polluting biological controls already in the natural system. Any specific so-called pest has usually a variety of biological agents around it, for example viruses or bacteria, acting specifically or nearly so for its own control. The technology for preparing and applying these biologicals is much more difficult, naturally, because ignorance will no longer do; a chemical allows you to be ignorant because it is non-selective in general. For the first time in the Western world we have had success three years in a row, working together with the U.K. Forestry Commission and the Institute of Virology, protecting Scottish forests by aircraft spraying of biological materials at an economic rate. Protection is now turning rapidly away from chemicals to biologicals. This seems to be the next step forward for the world.

Can you imagine a similar strategy developing for treating disease in people in the same sort of way as you can use biological controls for treating pests in forestry or agriculture?

The use of biologicals on nature requires careful monitoring of what is in fact going on, and much more knowledge of what you are doing and the timing of it. That is already beginning to take place in medicine, is it not, in which scanning devices are coming along, and there is more routine preventative check-ups, and consideration of food quality. People's general awareness of the meaning of health is increasing, regarding both body and nature, and this must be beneficial.

But Professor Schaefer's ideas go far beyond ideas of chemical or even biological treatments of environmental and bodily ills. Such symptoms are, he believes, inseparably linked with mind, both in man and in nature.

Today, we only need to talk of placebos, blank pills, in the human case, to realise that the psyche does affect the body in a psycho...somatic way, where it is obviously a case of faith, some form of belief, strong belief, which produces the effects, if the patient does not know the blankness. You only need to say the word 'hypnotism' or 'suggestion' or 'auto-suggestion' to know immediately that the body of an individual can respond to a change of thought or belief; that is obvious. I am wondering for many years whether it would be possible to go beyond chemicals and go beyond biologicals into an era with a psychosomatic method for dealing with environmental problems, which I believe are humanly caused in any case. In the last analysis, it is mankind that has altered the environment. Is it possible to undo that, psychosomatically? In this case, psycho may not be an individual mind; it may well be more a collective mind. 'Soma', which means body, is a collective body, the body of nature. One has to bring in, at the least level, although I don't stop there mentally, the idea of the collective unconscious, which was publicised by Jung. Mankind has a shared mind, which is a very ancient belief, called the akashic memory. We know that almost all day long we behave in ways we didn't want to; so we are tricked by unconscious mental influences. It's not me that doeth it, says St. Paul, but it is 'sin' that dwelleth within me. We share, in belief at least, a common mind, which has been formed I believe by concensus, stage by stage, step by step, over long periods of time, and that needs altering. The tendrils which seem to link minds together, in a telepathic or other unconscious way, need to be broken. I feel that the collective unconscious is only a big belief system. It is like the placebo effect at a higher level, but until you are aware that there is such a belief system of interlinking minds, it is impossible to break the tendrils, the hereditary umbilicals. But it can be done, and when it is done new visible thought forms emerge, and you will observe .... maybe like St. Francis .... altered behaviour in the environment.

There are many people who have held the idea of a collective unconsciousness as being something rather marvellous, but you're suggesting, as I understand it, that it's really a handicap.

This is an explosive thing to say ... but I believe it contains plenty of detrimental assumptions and insidious influences, as well as some beneficial instincts, of course. Just think of the image of the scapegoat, the image of putting onto animals the sin of humanity, so to speak, and sending them forth out of the camp. You can see how animal behaviour has become tainted, but can be altered I believe if our own attitudes, or possible those of a community, are corrected. But we need some guidance as to how to do that.

And if we can't turn to a collective unconscious for that guidance, where is it going to come from?

I would say that what we need to be aware of is the collective conscious, and I would call this a divine Mind, which is permanent, immediately available, and when listened to, in our better moments, can be demonstrated in surprising effects.

Professor Glen Schaefer of Cranfield Institute of Technology was talking to Martin Redfern. Professor Schaefer has outlined his views in a short book; it's called Universe with Man in Mind, and it is published by Translational Press and is available in the UK at a price of £1.70. [2 Handley Page Close, Wharley End, Cranfield, Beds.]

MARTIN: Sir Fred Hoyle has never been one to climb on a band-wagon of scientific - or philosophical - thought. But when he finds clues that lead him to an unorthodox view, he follows them with a stubborn determination that may reflect his Yorkshire ancestry.

More than 35 years ago, with Willie Fowler in the States and others, Fred Hoyle formulated what is now the standard explanation of how chemical elements form by nuclear synthesis in stars. As recently as 1983, Professor Fowler shared the Nobel Prize for Physics for his part in the work. Many believe that, had Sir Fred stuck to orthodox theories, he too would have had a share. But he did not.

Instead, he went on to develop the "steady state" theory of cosmology. This suggests that the universe has remained essentially the same for all eternity, its expansion and evolution balanced by the continuous creation of new matter. With widespread evidence for the "Big Bang" theory, suggesting the universe is a mere twenty thousand million years old, there are few astronomers who still agree with Sir Fred. But that doesn't concern him unduly.

TAPE - BAND 1: I'm interested in science, and in science only. I'm not interested in what people believe. I'm not interested in what I call scientific sociology. On many issues, I'm extremely orthodox. It's not that I just sought out the unorthodox things because I have a compulsion to go that way; it's just that when you go for the problems that are unsolved and are interesting, they naturally

TAPE - BAND 1 CONT. OVER

lead you to the unorthodox, and it's always seemed to me to be very clear that if orthodox views were correct about unsolved problems, the problems would be solved. If you have the whole scientific world working on a particular line, on what you've just called the band-wagon, if the band-wagon were right that problem wouldn't exist any more. There's a lot of very clever people around - don't misunderstand me there. Technically the people on the band-wagon are quite competent. The only thing that stops them from a complete solution of what they're seeking is that they're on the wrong track. That's the only possible explanation. So when I'm looking for problems to solve that are unsolved, it automatically leads me into unorthodox positions.

MARTIN: In the last few years, some unorthodox astronomy has led Sir Fred towards views of biology that are even less orthodox and which have led him into some fierce arguments with the scientific band-wagon. They arose when he and a student, now professor, Chandara Wickramasinghe, started to look at the nature of light and other radiation from clouds of interstellar dust. They proposed various compositions for the dust. First, hydrogen gas, then graphite, then a mixture of graphite, ice and rock, then more complex organic molecules. Each explanation fitted the data better than the one before, but none was exact. They were left with the closest fit being hollow shells of organic compounds, all the same size.

MARTIN CONTINUED OVER

ARTIN: Then, looking through a biology textbook, they spotted just such objects - bacteria. Dried, dead or even living, they believe there are vast clouds of bacteria in space. Both astronomers and biologists have contested their view, but they are convinced.

Sir Fred in particular finds the prospect of a huge organic potential in space helps him with doubts he's had since childhood on Darwin's theory of evolution. Life, even the individual chemical components of life, such as proteins and enzymes, are incredibly complex. Whilst the pressures of natural selection pick out the genes that encode for useful proteins and ensure their survival, Sir Fred cannot imagine how those genes could have appeared by chance in the first place, from a sort of organic soup on Earth.

TAPE - BAND 2 If you can imagine, if I give you an analogy, that there are several people, a party, without food in a desert, starving to death, with no tools at all, and they come upon a cache of tinned food which they desperately need, but there's nothing around, the Darwinian theory is rather like saying that, because the party has a huge necessity to open the tins, the tin-opener suddenly appears - that, as it were, the necessity creates the property that is required. That lies at the root of the Darwinian theory, and it is nonsense. All the properties of biological systems involve a whole battery of enzymes, which are very complicated substances, and there is no way one is going to find these by random shufflings.

MARTIN Much more complex than a tin-opener.

TAPE - BAND 2: CONTINUED OVER

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PE - BAND 2: Much more complex than a tin-opener, indeed. So already in my earlier years I could see that it was very easy, starting with animals that have a spread of properties, varieties as one says, it's very easy to select for those varieties that are already there. But the question is, where do the varities that match the environment come from in the first place? I think it comes because of an incidence on to the Earth from outside of already fully-fledged genes, which are picked up by terrestrial systems. In fact, terrestrial systems are simply aggregates of cosmic genes, the workable aggregates being decided by the environment here and by natural selection in the environment.

MARTIN: That theory, that evolution is driven by a steady rain of genes, viruses or bacteria from space, a sort of cosmic genetic engineering experiment, still awaits conclusive evidence. There isn't time, in one short programme, to air the often bitter arguments for and against it. But already it's leading Sir Fred on to new and perhaps unexpected ideas about what may lie behind the universe - or perhaps behind the life in it.

TAPE - BAND 3: The point that hits me in the eye as soon as I move off the Earth is that it becomes presumptuous then to suppose that no intelligence is involved in this process, because already on the Earth we've produced an intelligence in ourselves. We can understand genetic engineering-can do it in the lab - and therefore

TAPE - BAND 2 CONTINUED OVER

TAPE - BAND 3: my thoughts instantly broaden - I don't know if this is the correct way to go - but they have to broaden, because as soon as one steps off the Earth, as I say, you have to consider the possibility that an intelligence is involved. And this is precisely what orthodox science has fought since Darwin to avoid. This has always been the conflict in human culture and that is the reason why these ideas have encountered such resistance, in spite of there being a huge volume of fact pointing in this direction. They will fight it to the last ditch. Because the instant you move off the Earth you have to contemplate the problem that there might be intelligences other than ourselves.

MARTIN Not just like the organic soups on Earth - only a bigger soup bowl.

TAPE - BAND 3: That's right. Maybe it's just a bigger soup-bowl, maybe that's the right way to go. But you have to contemplate that there are other possibilities. And when you begin to bring in intelligence, I'm not necessarily saying it's an intelligence like ours, or even based on DNA or anything of that sort, once you bring it into the problem, then you notice that the one thing that intelligence is superbly good at is ordering, making decisions about the order of things. And that is just what is the problem with life - it's order. I have an analogy

TAPE - BAND 3 CONTINUED OVER

APE - BAND 3

which is very telling, and that is that if you blindfold a person and give him the Rubic Cube that we were all trying to solve about a year ago, and they just move the faces at random, it turns out that it would be something like three hundred times the age of the Earth before, moving at random, they arrived at the solved Cube by chance. And that is very much like the organic soup kind of theories. But if there is a person who stands behind the blindfold person and observes each move, and simply says "No" - a person who understands the Cube - and says "No" each time a wrong move is made, and the rule then is that the blindfold person reverses the move they've made and tries another, that will solve the Cube in two hours, just the word "No". That shows how subtle intelligence can be, and this of course is why the religious concepts, the traditional ones that the scientist objects to are wrong, because they invent fanciful stories. It doesn't need that at all, it needs just the most refined subtlety on the part of an intelligence - that's sufficient. I prefer to put an intelligence rather than God - because that has all sorts of connotations that one doesn't want to be dragged down with - old-fashioned things. But as soon as you put an

TAPE - BAND 3 CONTINUED OVER

TAPE - BAND 3 intelligence in, the directive influences can be extraordinarily subtle, almost vestigial, and yet they will make a big difference to the problem of order. And what I'm saying is that when we look at life we have overwhelmingly a problem of order.

MARTIN Would you think of this - I know we're talking about what we think rather than about science now - but would you think of this as something that's still conscious of what it's doing, if you like?

TAPE - BAND 3: I would go so far as to say - yes to that. I don't think it's a sort of semi- inorganic kind of intelligence, but I'm not saying that it's an intelligence any way like the views that the people in the past in past religions have had, or that we could even conceive at the moment of what it's like. I don't know, I mean we have to investigate the matter. There may be clues. There may be plenty of clues lying about in living systems as to what the intelligence was like which produced it. For all I know, they may be there.

MARTIN: Do you think eventually that these ideas will penetrate through the orthodoxy and the experiments will be carried out?

TAPE - BAND 3: This is not an argument between people that we've been going into. It's an argument between people and the Universe. And the correct point of view just eventually shatters any human resistance - it's just a series of the most incredible hammer blows. I've found - if I may put it somewhat fancifully and romantically - the Universe behaves very kindly towards honest mistakes. If one makes an honest mistake, it's very easy to correct. But the Universe is utterly ruthless to those people who resist the obvious truth. So I'm not much worried about that. But I do have one reservation, and that is the question of whether there's going to be enough time. You see, it may be that if people believe the Darwinian view, that survival is all, then any route to survival, whether it involves lying and deceit, or what have you, becomes justified. But once you hold the view that you are part of a huge cosmic process, the nature of life on the Earth and one's attitude towards it becomes changed. And it may just be - I don't know but the thought enters my head - that if you hold the view that people have held over the last century, our species may be on an automatic self-destruct path. We may be. And in that case the amount of time may be very

TAPE - BAND 3 CONTINUED OVER

TAPE - BAND 3: short. And in that case it could happen that, for example, if the balloon went up tomorrow, as we used to say in wartime years, it could perhaps happen that the human species will never know. So it isn't clear to me whether there really is going to be enough time. People have had already a century since Darwin to get themselves right, and they haven't taken the opportunity. I don't think it would take more than another twenty years to get it right now, but it isn't clear to me that there's going to be another twenty years.

BEHIND THE UNIVERSE NO. 2

by Martin Redfern (S)
contributor - David Bohm (OC)

ANNOUNCER: BBC World Service: Behind the Universe, presented by Martin Redfern.

MARTIN REDFERN: A number of leading scientists are coming to some very unexpected conclusions about the nature of the Universe, the matter, and even the people in it. From ideas and theories to firm convictions, a few researchers are realising that there may be more to the world than meets the eye, the telescope or the particle accelerator. David Bohm, Emeritus professor of physics at Birkbeck College in London, is one of them.

DAVID BOHM: I have developed a view in which we say that the behaviour of matter is immensely more subtle than we had thought. There has been in earlier physics an idea that if you analysed matter into smaller and smaller products their behaviour would eventually get simpler and simpler. But quantum mechanics shows this is not the case, that as you get to very small products, the behaviour grows complex and subtle. And this is rather like people, a large mass of people can be treated statistically, treated simply, like by the insurance company. But as you reach the individuals, it gets very complex and subtle, and similarly it looks as if the electron can become very complex and subtle. Its behaviour depends on the context.

MARTIN REDFERN: David Bohm was a student at the time when quantum theory was turning many of the commonsense ideas of particle physics upside down. Through its strange mathematics it seemed to be casting a sort of fuzzy uncertainty over the nature of matter and causing problems even to the minds of people like Einstein. In 1951, Bohm completed what became a standard textbook on quantum theory. It led to many discussions with Einstein, discussions that left Bohm too, dissatisfied with the theory. He couldn't accept something in which, as quantum theorists such as Bohr and Heisenberg suggested, uncertainty was a fundamental feature. So he began to look for an underlying structure that might explain matter more precisely, though still in the framework of quantum mechanics. Now, he believes he has the beginnings of such a structure in what he calls "implicate order".

DAVID BOHM: Quantum mechanics suggests that we have this different order which can be illustrated by a certain device which consisted of two concentric glass cylinders - the inner one fixed and the outer one rotated slowly. Between them was placed a viscous fluid, such as glycerine. Into that was placed a drop of an insoluble ink. Now, if you turn the outer cylinder the outer parts of the fluid are moving faster than the inner, so if you take an element of fluid, it will slowly be drawn into a thread, as the ink goes with it. Eventually, this thread of ink becomes invisible. It looks as if it's not there. But, if you turn back very slowly the outer cylinder, then slowly that thread draws back and suddenly the ink droplet appears.

Now, you could say that there was a certain order in that ink droplet before it was drawn back, which I call an enfolded order, an implicate order - that this order was not visible to the eye, but it was still there.

MARTIN: Now, how does something like that, which is really an artificial creation, an experiment, how does that relate to the sort of order that might be enfolded within the basic matter in the universe?

DAVID BOHM: Yes, well this is not even an experiment what I discovered. It was merely an illustrative device to show what we mean. But one can think now that the electron is in a similar order that it unfolds from the background of space into a momentary concentration and then folds back, unfolds again and then folds back and so that what you call the track of an electron is constantly forming and dissolving and really the whole is involved all the time.

MARTIN: Just like a wave in the sea that appears out of the otherwise flat sea?

DAVID BOHM: Yes, well one after another, you see. But the difference is that this focuses on a spot rather than it being a wave. But it may become more like a wave, that's the whole point; that the order of the electron is enfolded so that it can become like a wave or like a particle. And it may unfold here and suddenly unfold somewhere else without it unfolding somewhere in between. Now, this explains what an electron is supposed to do, which is to go from one state to another without passing in between.

MARTIN: Jumping from between various different levels of energy?

DAVID BOHM: Yes.

MARTIN: But it means really doesn't it that matter as we see it is only just part of what there is in the world?

DAVID BOHM: Yes. We can regard matter as a small ripple on something much vaster in empty space. Yes, in fact, the quantum mechanics implies that in empty space the waves of electromagnetic and other kinds of energy have what's called 'zero-point energy', even when there is no visible matter there, and this energy would be infinite according to quantum mechanics, but if it were cut off at some reasonable wavelength, it would turn out to finite but enormous. For example, the energy in one cubic centimetre of empty space might be immensely greater than the whole energy of all the matter in the universe. The universe is a kind of a ripple on space. From our point of view it looks like everything but from another point of view it looks like a small ripple.

MARTIN: Could one think of space like an invisible well out of which one can draw a vast amount of matter or energy?

DAVID BOHM: Well, it can be regarded as a potentiality, an invisible source of potentialities of all kinds.

MARTIN: Now if particles can be in one place and come into another state without going through anything in between, that must mean that they have connections that are much broader than the particle itself, doesn't it?

DAVID BOHM: Yes, it means that every particle is basically grounded in the whole of the universe, and there it is enfolded together with all the others and they're all interconnected.

MARTIN: That makes a rather mind-boggling system in which one has to take the entire universe into account in doing any studies, doesn't it?

DAVID BOHM: Yes. Well, if you study the quantum mechanics, you'll discover, however, that there were certain cases where some of the movements were relatively independent of the others in spite of their interconnections, so it is possible to discover contexts which have a certain relative independence, that up to a point can be studied on their own, but beyond that point not.

MARTIN: In terms of the sort of physics which is done in experiment, looking at particles, how does that put the sort of connectedness between the particle and the experiment, or even the observer of the experiment?

DAVID BOHM: Yes, well ultimately the particle and the experiment have the same ground. They're interconnected in the same with the observer. Therefore though, you see, you may have a minor effect on this table by thinking about it. It's too small to matter. The same can be said about the experiment, but there are other situations where it's not so easy. If we have two human beings who are observing each other, or if a person is observing himself, then clearly the observer and the observed cannot be separated. Therefore the ordinary way of thinking about it will not be adequate.

MARTIN: Does that mean that at least in terms of human interractions, one would need a new framework of thought.

DAVID BOHM: I think so, yes. It's clear that there's only a limited extent to which you can think of other people as separate from yourself, or one part of yourself as separate from another, if you try to observe yourself. So, we need another framework which does not induce this separation.

MARTIN: You talked about the relationships between two people affecting each other, and their thought processes. Can one extend that to ideas of consciousness, either of the individuals or of a larger grouping?

DAVID BOHM: Yes, well, I think that consciousness could be looked at as being an enfolded order. See, the word implicate means "enfold" basically in Latin, as does the word "implicit". Now, if you say that we say thoughts are implicit, this suggests that one enfolds another and we unfold them. We explicate them. And one can see a lot of evidence that consciousness operates in this enfolded order, that thoughts will enfold into feelings, and feelings unfold into thoughts. All of this unfolds into physical action. Descartes has set the tone for a lot of questions and thought on this by separating the two - consciousness and matter, saying matter is extended substance made of separate things, and consciousness is thinking substance, not extended into space and not made up of separate thoughts, but all the thoughts are together, which suggests an enfolded order, implicitly. Now, but then he was unable to discuss the relationship between them, because they were so different. I think the implicate order suggests a possible resolution by saying that matter and mind are both in the implicate order and therefore it's not so mysterious that they could be connected. I think the bridge between mind and matter is in meaning. Matter has meaning to the mental side of us, and I call that soma-significance, and soma represents the body, I extend it to matter.

I say soma has signficance. So there's a soma-signficant relation. Every time we perceived matter we perceive its meaning. Without its meaning there's nothing to perceive. Now if we see this as a chair, or wood, or a table or sky, or space - whatever it is that's a meaning, right? Now, then it goes the other way, namely, meaning has a profound effect on matter, namely, I call that sigma-somatic. For example, if you are walking on a dark night and see a shadow and if this means an assailant, then your body is mobilised. The adrenalin is flowing. The heart is beating. Tremendous somatic effect. But if you suddenly see it's only a shadow, it all vanishes and it's all different. So, if you look though all phases of life you will see that meaning has an immediate and profound effect on matter of the body.

MARTIN: So one might say that there's only meaning in the bits of the things that you say that I can actually understand?

DAVID BOHM: For you there's meaning, but we will say that meaning has potential. It can expand and expand, right? Meaning is communicated from one to another, you see there's no such thing as personal meaning, because all meanings have been developed together by the whole of mankind. A person by himself would probably not develop much meaning. You see, there's evidence that children raised as wolves are really wolves and not human beings. They can't live in human society. Everything means to them what it would mean to a wolf, right?

MARTIN: But meaning is something, then, which not only links mind with matter, but it links minds of different people.

DAVID BOHM: Oh yes, it links the whole of mankind through communication. So if we share meanings, we are sharing our minds, You see, meaning is being, because the minute something means something to you, you are changed accordingly.

MARTIN: Would you say that implicit in that is some sort of higher form of consciousness of a large group of people?

DAVID BOHM: Yes, implicit is the possibility of a higher form of consciousness. At present it's not commonly realised that because of the meaning of everybody being separated and therefore everybody tries to hold on to his own consciousness, you see, and it cannot be realised, but a change of meaning could produce a change of consciousness of the kind you describe.

MARTIN: How might that come about, do you think?

DAVID BOHM: Well, in many ways. I mean I think that most directly is that people would simply talk to each other freely you see, in a dialogue. See, the word "dialogue" is based on Greek root "dia" and "logos". Now "dia" doesn't mean "two", but it means "through". "Logos" is "word" but here it's clear the meaning of the word that counts. You could say "dialogue" is the flow of meaning freely through people. Now, ordinarily people don't dialogue, you see. You could take the extreme case of an international conference on reducing the number of atomic weapons. There's no dialogue, there's not free flow, but everybody has a very fixed position, right? Well, actually, in society there's not much free flow because people are frightened, are protecting themselves and so on. But if there were a free flow of meaning, then you would establish one consciousness - in my view.

ANNOUNCER: Professor David Bohm was talking to Martin Redfern. If you'd like to read more about David Bohm's ideas, he's written a book called "Wholeness and the Implicate Order". It's published in Britain by Routledge and Kegan Paul (Price £8.95 hardback or £2.95 paperback).

Next week at the same time, Martin Redfern will be hearing a new view of the universe from Professor of Ecological Physics at Cranfield Institute of Technology, Glen Schaefer.

**** E N D ****

BEHIND THE UNIVERSE NO. 3

by Martin Redfern
contributor - Professor Glen Schaefer (OC)

ANNOUNCER: BBC World Service. Behind The Universe. Martin Redfern talks to eminent scientists whose research has led them to speculate on the forces in nature that may produce the order of life and human consciousness. In today's programme, Martin introduces Professor Glen Schaefer, who is head of the Ecological Physics Research Group at Cranfield Institute of Technology.

MARTIN REDFERN: As a child in the Canadian countryside, Glen Schaefer was fascinated by the subtle complexity of the living world around him, by the delicate balance of insect, plant and animal life many of us take for granted. After beginning his academic career in physics he has now come back to ecology and in particular to studies of the insect population so often branded by man as 'pests'.

Professor Schaefer has developed radar and infrared techniques that allow him to track migrating locusts, moths or aphids through the sky as swarms, or even as individuals, though they may be several kilometres away and high overhead.

Through the greater understanding this gives, his work is pointing him to new strategies for controlling insects that are more effective and less harmful to the rest of the natural environment. It's also shown him the futility of indiscriminate spraying of crops and forests, something which, by destroying natural predators and reducing plants' natural immunity, can do more harm than good.

GLEN SCHAEFER: The most worked out example that I've been involved with through our radar work etc. has been the spruce budworm moth in the Canadian forest area of East Canada, which is, we now know, the manager of that forest in that, whenever the insects become very numerous, they overeat the buds of the trees, the old trees mainly, which then die - blow down, burn up, and the young ones come through. And it has been found that in this natural cycle, of buildup and return to low levels again, during the buildup stage in recent times men have said "We want that forest for our big fat newspapers etc. on the weekends, and we now have lots of aircraft and insecticide. Let us finally deal with this disaster of a dying forest", not realising that only by such a procedure the forest can continue, and the young have their sunlight.

MARTIN: What has been the longterm effect, then, of frequent attempts to control the spruce budworm through spraying?

GLEN SCHAEFER: Wherever spray has been used, it has been found to be needed again the next year, and the result is, that it has created in those very areas a permanent epidemic of spruce budworm instead of a cycle. This is a clear example of a situation now occurring in every country on Earth, wherever chemicals are used widely, which is virtually everywhere. The more you spray, the more you kill, the more you have the next season. That is true everywhere. We need only touch this delicately balanced, huge entity - the body of nature, full of huge forces, to upset the balance ever so slightly - half a percent, one percent. We're now only learning that. In our ignorance, we think we have the power to have dominion by bringing forward science and technology to our advantage. The result is that nature has replied to undo excessive profit, excessive food production, usually for the purpose of greed.

MARTIN REDFERN: Professor Schaefer's work is largely concerned with the effects of chemical pesticides on the body of nature and with devising alternative treatments for crop diseases. But he also makes some interesting comparisons with human medicine: with the effects of chemical DRUGS on the bodies of PEOPLE.

GLEN SCHAEFER: I've noticed this, and the more I think of it, the clearer it becomes. The parallel between an individual's body and the way he tries to get help for it from chemical medicine and the body of nature and the way we try to treat that apparent infection in the case of nature on a large scale. With the human body we pour in chemicals in order to kill so-called germs. On nature we pour on chemicals to kill. The result is in both cases very similar. In our own bodily case, we are now warned, even by doctors, not to overuse agents because of immunity being set up, so that when you really need something later, it may not be effective, if you've used too much earlier on. This is exactly the same with chemicals on a field. The more you use it, the more side-effects you have. So this is very alarming indeed. We now must view these chemicals, which are very rare kinds of inventions, both medicinally and on nature, as a valuable resource not to be used unless absolutely necessary. This is not in the interest of the industries concerned and it's a tough problem. This is leading us to rapidly turn towards non-chemical means - biological means for dealing with a pest problem.

To use a biological has great attraction, because there are biological controls already in the natural system. Any particular so-called pest has usually a variety of biological agents around it - viruses, for example, bacteria, specifically for its own species control. The technology is much more difficult, naturally, because ignorance will no longer do. A chemical allows you to be ignorant, because it's non-selective in general. But, for the first time in the Western world, we have had success working with the Forestry Commission here in Scotland, and the Institute of Virology to in fact have three years of success in a row, by aircraft spraying of biological materials at an economic rate, so that control is now turning rapidly away from the chemicals in the Forestry Commission to biologicals. And this seems to be the way forward now for the world.

MARTIN: Can you imagine a similar strategy developing for treating disease in people in the same sort of way as you can use biological controls for treating pests in forestry or agriculture.

GLEN SCHAEFER: The use of biologicals on nature requires careful monitoring of what is going on - more and more knowledge of what you're doing, and the timing of it. That's already beginning to take place in medicine, is it not, in which scanning devices are coming along, much more routine checkups are being made by people so that a general awareness is going up which means understanding is increasing of both systems, and this must be good.

MARTIN REDFERN: But Professor Schaefer's ideas go far beyond ideas of chemical or even biological treatments of environmental and bodily ills. Such symptoms are, he believes, inseparably linked with mind. Both in man and in nature.

GLEN SCHAEFER: We only need to talk in the case of man and his body, in the human case, of placebos - blank pills - to realise that the psyche does affect the body in a psychosomatic way, and it is obviously a case of faith of some form, belief, strong belief which, if the patient does not know, the blankness will have to a large extent the same effect. You only need to say the word "hypnotism" or "suggestion" or "autosuggestion" to know immediately that the body of an individual can respond to a change of thought or belief. That's obvious. I'm wondering, for many years, whether it would be possible to go beyond chemicals, to go beyond biologicals, into an era with a psychosomatic method in dealing with environmental problems, which I believe are humanly caused in any case, in a lot last run. We have altered the environment in the subtle ways I've been mentioning earlier. Is it possible to undo that psychosomatically? Psycho may not be an individual mind in this case, it may well be more a collective mind, and "soma" which means body. It is a kind of collective body, the body of nature. One has to bring in at the least level, although I don't stay there mentally, the idea which was made public by Jung on a collective unconscious. I believe that mankind has a shared mind - a very ancient view, anciently called "the Acachic Memory", and we know that almost all day long we behave in ways we didn't want to. So we are tricked by unconscious mental influences. "It's not me that doeth it," says St. Paul, "but the sin that is within me". We share, in belief at least, a common mind, which has been formed, I believe, by concensus, stage by stage, step by step over long periods of time, and that needs altering. The so-called tendrils which seem to link minds together in a telepathic way, or in some unconscious way, need to be broken. I feel, however, that it's only a big belief system, like the placebo effect at a higher level, but until you are aware that there is such a belief system of interlinking minds, it is impossible to break the tendrils, the umbilicals. But it can be done, and when it's done, it can be replaced by a new thought pattern, and you will observe, maybe, like St. Francis, an altered behaviour in the environment.

MARTIN: There are many people who have held the idea of a collective unconsciousness as being something rather marvellous, but you're suggesting, as I understand it, that it's really a handicap.

GLEN SCHAEFER: This is an explosive thing to say, but I believe it is generally full of useless, detrimental, insidious influences, as well as some good things, of course. Just think of the image of the scapegoat. The image of putting on to animals the sin of humanity, so to speak, and sending it forth out of the camp. You can see how animal behaviour has become tainted, and can easily alter, I believe, if our own attitudes or, possibly, those of the community, are altered. But we need some guidance as to how to do that.

MARTIN: And if we can't turn to a collective unconscious for that guidance, where is it going to come from?

GLEN SCHAEFER: I would say what we need to be aware of is the collective conscious, and I would call this a divine mind, which is permanent, immediately available, if turned to, as can be demonstrated in our better moments with surprising effects.

ANNOUNCER: Professor Glen Schaefer of Cranfield Institute of Technology was talking to Martin Redfern.

And Glen Schaefer has outlined his views in a short book. It's called "Universe with Man, In Mind" and is published in the UK by Translational Press at a price of £1.70.

Next week in 'Behind the Universe' Martin Redfern will be talking to Dr. Peter Fenwick of the Institute of Psychiatry in London. They'll discuss how studies of the human brain are leading towards a new understanding of consciousness and how it might develop. That's 'Behind the Universe', next week at 2100 GMT on Saturday, 12th January.

***** E N D ******

BEHIND THE UNIVERSE NO. 4

by Martin Redfern
contributor - Dr. Peter Fenwick (OC)

ANNOUNCER: BBC World Service. Behind the Universe. In the last of four programmes, Martin Redfern talks to Dr. Peter Fenwick who is consultant neuropsychiatrist at London's Institute of Psychiatry.

MARTIN REDFERN: Our view of the world comes to us via the senses into our brains. In the other direction our thoughts and ideas influence our actions and relationships and thus our environment. At the heart of this two-way process lies what we term consciousness, in reality a whole spectrum of mental states ranging upwards from sleep.

In the last few years, the study of brain function by researchers such as Peter Fenwick has thrown much light on the mechanisms of mind. We perceive the universe through a series of mental processes in which coded signals from, for example, the retina of the eye, are turned into a model of the three-dimensional object which is being looked at. Studies of brain structure are revealing how that signal is processed but not how the resulting image is displayed in consciousness.

Similarly, ideas and feelings can be communicated from the brain through language. The two hemispheres of the brain each have a role to play. The left hemisphere orders concepts into words and controls language, but the right hemisphere deals with spacial awareness and the emotional tones that colour our speech. Without both halves of the brain working together, speech is impaired. But this knowledge of the roles of the two hemispheres, and indeed of other brain mechanisms, still doesn't yield up the secrets of consciousness.

Though stimulation with electrodes can trigger different thought processes and thus relate them to different parts of the brain, they cannot locate the images or emotions themselves. This seeming lack of connection between mechanism and perceptual experience has limited our understanding. Dr. Peter Fenwick, however, goes further. His studies of the mind of man do lead him to ideas about the nature of consciousness.

DR. PETER FENWICK: We look upon consciousness as an entity in itself. We say that we're either conscious or not conscious. But, of course, consciousness is a vast array of functions. For example, the functions of intelligence, the function of understanding, and so on. I think where the question is, is as follows: how come that we are subjectively aware of the outside world. How is it that this quality of subjective awareness arises when certain processes go on within the brain? And is this function just limited to the brain itself, or is it in fact part of a wider perspective of nature? Should we always limit consciousness to the brain, or can we say that the consciousness of other people and the world is involved as well?

Now quite clearly, at one level, one has to say that the consciousness that we have is dependent upon the consciousness of the world as a whole. For example, supposing we shut off the external world completely, we shut off our feelings, we shut off our vision and our hearing, and so on. Then the perceived world that we have would disappear and brain function would be altered to such a degree that we ourselves as we know ourselves fragment. These are the experiments which are done in sensory isolation chambers. So in order for a structured conscious world to arise, we have to have a structured input. And therefore in no sense are we independent of the external world - we are part of it. So if you ask questions about individual consciousness in terms of brain function, you get one set of answers, but it's quite incomplete without looking at what is going on around and external to the individual as well.

MARTIN: Is it something, do you think, that we have any control over? I mean, can we influence our own brain activity and thus the way we relate to the outside world?

DR. PETER FENWICK: I'm sure that this is something which we will be able to do, and that the quality of the environment that we have structures in many ways the psychology of the individual, just as the psychology of the individual structures the environment in which we live. And thus, by altering the quality of the world which is around us, we either enhance or limit possibilities of experience inside ourselves. And thus, I think, we who live in cities are really very different people from those who live in the country. And this is because of the quality of perceptions that fall upon us.

MARTIN: We've talked really about brains as being a very individual piece of property, as it were, and how each of them might react to the outside world, but through influencing the outside world, is that in a way a form of communication? Can we go beyond the individual brain and the individual consciousness?

DR. PETER FENWICK: That has to be true, because, as soon as you accept that there are groups of individuals with a common culture, then culture itself reflects the understanding and level of consciousness, if you like, of the group. And therefore, in a much wider sense the group behaves as a whole, and according to the culture of the group, so the range and possibilities of the individual are enhanced or diminished. But it seems to me that it's even wider than that. It seems to me that it is the very structure of nature itself which creates the opportunity for the development of the true human potential. It is, if you like, the possibilities which are present in the atoms and molecules that allows the neurones of the central nervous system to arise, and it is the information exchange within those neurones that allows the sensory world to arise. But yet it is those very same atoms and molecules and the laws which control them which allows the external world to arise, and because of the view that we take of the world, we seem to split ourselves off from the world and make ourselves different from the world when we are in fact very much part of the ongoing biological process.

MARTIN: So, could you say that life and even consciousness are really properties of matter?

DR. PETER FENWICK: In that sense life and consciousness have to be properties of matter. They have to be properties of the universe. We are part, if you like, of the organic flow of nature.

MARTIN: And if that development has already led to human consciousness, is it a development which might continue?

DR. PETER FENWICK: I think when we think of human consciousness, we tend to think of our own individual consciousness. And what is very clear from that is that this varies from day to day and time to time. What is also very clear is that there are certain structures within the brain which add particular qualities to that consciousness. What is also clear is that these very areas themselves can be enhanced or diminished by various either mental practices or by drugs. Therefore the range of conscious perceptions that we have is very large indeed. And I'm quite sure that the possibilities of human consciousness are infinitely greater than the ones which we are experiencing at the present time. And it's not inconceivable that this new world that arises and which has been described by the mystics of old is a world which is perfectly possible for most people to attain. In other words there are states of brain function then which seem to be expansions on our everyday state, which lead to a greater sensitivity and understanding, and also lead to a reduction in this feeling of separateness and individuality that we have. We seem to become much more part of nature.

MARTIN: Is it possible to say whether feelings such as these are something which as a product really of the nerve cells and the chemistry in our brains or if it's those chemicals and cells touching on something more fundamental that exists in the world anyway.

DR. PETER FENWICK: Because we are part of the world and not independent from it, I suspect that that question will finally have no meaning. I think it appears to have a meaning because we focus on either one or the other. But in fact we are part of the stream of the organic world, and thus I think that it's only a very limited view that keeps us separate from it. I think probably the question will turn out to be the wrong question to ask.

MARTIN: In this series we've heard from various people who have suggested that behind the phenomena in the universe there is some intelligence. Would you go so far as to say that that is some sort of intelligence which already exists that we're working up towards, or do you think it's something that is going to grow out of the development first of life then of consciousness in the way that you're talking about it?

DR. PETER FENWICK: When I look at human brains, I see structure. I see structure and form. And from that structure and form arises a whole new set of possibilities. I see nothing disordered, I see nothing random. And if that view is correct, then intelligence has to already preexist. You can't say that/it is something that we're working towards. So there has to be the basic intelligence of the universe, which structures and underlies the construction of the brain. Arising within that brain is the individual sense of consciousness. And I think what is also clear is that if you look at human brains and brains which have occurred before them, then the range of possibilities are continually increasing. So I think both of what you say are correct, and that is that there is already innate intelligence, form and structure, but yet within that there is progress towards.

MARTIN: So if the intelligence is an already existing part of nature, then the intelligence and indeed consciousness can exist outside a brain. Is that the case?

DR. PETER FENWICK: You are forced to that position, and you have to accept that position, because it is the functioning of the brain that allows personal consciousness to arise. But personal consciousness seems to be a reflection of both the outside and the inside worlds which are already part of organic life. And therefore consciousness must exist independently of it.

MARTIN: Is it something do you think that science in the conventional sense will ever be able to find through experiment or particle accelerator, or anything like that?

DR. PETER FENWICK: No, because I think it's at a different level. It's at the level of complexity that the measuring instruments that we have at the moment can't detect. What you need is a consciousness metre. But what form that will take I don't know.

MARTIN: Perhaps only another consciousness.

DR. PETER FENWICK: I'm sure. Just that.

ANNOUNCER: In "Behind the Universe", Martin Redfern was talking to Dr. Peter Fenwick, consultant neuropsychiatrist at the Institute of Psychiatry in London.

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