Nota della redazione: Teilhard de Chardin ha immaginato una materia capace di passare dallo "stato idrogeno" allo "stato umano". Perciò ha logicamente ammesso che anche l'atomo possieda in misura infinitesimale un frammento di coscienza.
Ci sono ora dei biologi che sostengono questa stessa idea, ma in maniera forse migliore. Pertanto il pan-empirismo potrebbe sostituire più vantaggiosamente il pan-psichismo teilhardiano. Quest'operazione di "aggiornamento" non sarà l'unica, perché la visione di Teilhard merita di essere riqualificata e arricchita nel tempo.
Nello studio qui riportato è anche interessante la tesi secondo cui in un elemento complesso sono le *relazioni fra le parti* che determinano delle novità emergenti, non il loro intero. Ciò è collegabile all'idea di Teilhard, spesse volte ribadita, che l'*unione differenzia.*

WHY I BECAME A PAN-EXPERIENTIALIST
[Perchè sono diventato un pan-empirico]

Charles Birch[1]

Sommario: *La biologia ha condotto C. Birch dalla teoria meccanicista al pan-empirismo, giacché non poteva comprendere in che maniera la coscienza trovasse posto in un universo meccanicistico. L'evoluzione cosmica non riguarderebbe proprio la materia, bensì lo spirito-materia, dato che lo spirito non può derivare da un'assenza totale di spirito. Il pan-empirismo non sostiene che tutte le cose fisiche hanno una psiche, ma che esse sono composte da entità individuali che sperimentano qualcosa.*

Gli atomi possiedono un aspetto soggettivo che è chiamato 'esperienza', sebbene di tipo molto elementare. Se, a quanto pare, un elettrone in una zona dell'universo è influenzato da un elettrone che sta nella parte opposta, vuol dire che essi fanno parte di un sistema e che ognuno tiene conto dell'altro.

Il pan-empirismo fa distinzione fra relazioni esterne ed interne: sostiene che le parti diventano qualitativamente diverse proprio perché appartengono ad un tutto.

Summary: *Biology led C. Birch from the mechanistic theory to pan-experientialism, since he couldn't understand how consciousness fitted into a mechanist universe. Cosmic evolution would involve not just matter, but mind-matter, because mind cannot derive from no-mind. Pan-experientialism doesn't assert that all physical things have a mind, but that they are composed of individual entities that experience.*

The atoms have a subjective aspect, which is called 'experience', though of a very elemental kind. If an electron at one side of the universe is said to be influenced by an electron at the other end of the universe, this means that they are parts of a network and each takes account of the other.

Pan-experientialism makes a distinction between external relations and internal relations: it states that parts become qualitatively different being parts of a whole.

From my undergraduate years through my post graduate years I was surrounded by materialists. These were scientists whose thought was dominated by the Newtonian worldview. The world was made of billiard ball-like atoms pushed around by each other as a billiard ball is pushed by another on the table. The universe was a gigantic mechanism made up of lesser mechanisms, be they human

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beings or the physicists' fundamental particles. All was to be explained in terms of matter and motion.

1. Biology led me from mechanism to pan-experientialism.

However, there was another side to my life. I did not feel that I was a machine entirely, because I had feelings and machines didn't seem to have feelings. Very early on I was troubled by how consciousness fitted into a mechanistic universe. When I raised this with my materialistic scientific colleagues, they invariably said this was a bit of a problem, philosophers had been arguing that one for ages, they always disagreed and never came to any agreed conclusion. I remember, as a graduate student, my supervisor saying that what the world needed was more science and more scientists, allowing perhaps for one of two philosophers but no more. The chance of philosophers explaining the world was so small that it was a waste of resources to have many of them around. That was one response I got to my dilemma.

A second response is typified by an exchange I had much later at a meeting in Bellagio, in Italy, which resulted in the book Studies in the Philosophy of Biology (Ayala and Dobzhansky 1974). The concluding session was chaired by Jacques Monod. He asked the assembled company if there were any questions left over which might be the subject of a subsequent conference. There was silence until I remarked that we had not discussed consciousness. Monod's response was immediate. He said we should hold off that one until we knew the results of a group or researchers in Paris who were studying sleep. They would surely give us the answer. So that was that. I am still waiting. Implicit in Monod's remark was the faith that consciousness would ultimately yield its secrets to a mechanistic biology and needed no other approach. More recently such a view is expressed by Francis Crick (1994) in his book *The Astonishing Hypothesis: the Scientific Search for the Soul.*

So those are two approaches of my fellow biologists; the first is that philosophers would continue to argue about consciousness and get nowhere, therefore stick to problems that can be solved by traditional science. The second approach was the faith that mechanistic science would eventually solve the problem, just as it was solving the riddle of the gene.

I was unaware for a long time that there were then, and are now, basically just three realistic views about the relation of mentality and physicality: materialism (or mechanism), dualism and pan-experientialism. Each one of these no doubt has its subdivisions but the three major stances remain whatever subdivisions there may be. Materialism is the monistic doctrine that all that exists is matter; if the word consciousness is used it refers to physical and chemical processes going on in the brain. Dualism says there are two sort of entities, matter and mind-the central problem for dualists is how mind and matter relate to each other. Pan-experientialism is a monistic doctrine that

claims that mentality and physicality are two aspects of the same phenomenon. One is as real as the other. Further, the universe is not made of physical substances like Newtonian billiard balls but of events, and these basic events are experiential. This is the doctrine of internal relations. It destroys the notion of material substances and substitutes that of an event. In some sense the word experience or feeling is relevant at all levels from protons to people.

There are many meanings of what is usually termed mind and matter which I do not elaborate here. They are discussed in detail by David Griffin (1994 Appendix A). Of course it is easy to make a caricature of each of these three basic notions of the relation of mentality and physicality and none so easily as for pan-experientialism. I spent three years working alongside Theodosius Dobzhansky who was a dualist. He said that pan-experientialism was to believe that atoms had brains. Rather it is to propose that atoms have a subjective aspect which is called experience or feeling, though of a very elemental kind. We have no direct experiential basis for affirming that all basic actualities, such as atoms, are devoid of experience so why affirm that the world is made of entities devoid of experience or what Whitehead called 'vacuous actualities'?

For reasons such as David Griffin (1994) elaborates I found both materialism and dualism unsatisfactory. In my state of dissatisfaction I was introduced to A.N. Whitehead's (1926) Science and the Modern World and his worldview of pan-experientialism. As a graduate student I paid more attention to his writings than to those of almost anyone else. In this respect I was on the same trail, though somewhat behind, the developmental biologist C.H. Waddington. He says he paid more attention to Whitehead's writings during the last two years as an undergraduate than he did to textbooks in the subjects in which he was taking his exams (Waddington 1969). He told me on one occasion that during those two years he read all the works of Whitehead. As a consequence he became a pan-experientialist and this worldview, he says, had strong practical consequences on both the problems on which he chose to do research and the way he chose to solve them. For example, he interpreted developmental biology in terms of the behaviour of the constituent cells of the developing organism.

While I was struggling with Whitehead I got in touch with Professor W.E. Agar, the professor of Zoology in the University of Melbourne under whom I originally studied biology. I had recalled from my undergraduate days reading, but not fully understanding, a paper entitled *The Concept of Purpose in Biology* he had published in the Quarterly Review of Biology (Agar 1938). He gave a talk in 1949 on the development of these ideas to the student's biological society in the University of Melbourne on Some Philosophical Problems in Biology (Agar 1949). His proposition went something like this. We have two sources of knowledge. Science is concerned with knowledge revealed by the senses, principally through the eyes. But each of us has another source of knowledge

of one special part of nature, namely oneself. We are conscious of feelings of pleasure and pain and purposes directing our actions. Problems arise when we refuse to regard ourselves merely as external spectators of nature but see ourselves as part of nature. We know in ourselves that the brain is the locus of mental activities such as consciousness. The physicist does not hesitate to attribute to atoms the physical properties which he finds necessary to attribute to them in order to explain the physical properties of matter in bulk. But atoms also compose brains. On the same principle, should we not ascribe to atoms a property which will be consistent with their function as elements composing the brain which is the locus of mental activities? And surely the only property of atoms which could provide what we are looking for is some form of mental activity in themselves.

Agar went on to give a picture of cosmic evolution and the evolution of mind. The majority of biologists picture mind as emerging at some stage in the evolution of animals. Before that time there was no mind. From no mind comes mind. Agar proposed the alternative that there has been no moment in evolution when mind made its first appearance. Minds and bodies evolved together even though that body be only a proton or an atom. It is more reasonable to suppose that both objective and subjective have existed as long as anything has existed than to suppose that the subjective has emerged from the non-subjective or that it does not exist at all.

In 1943 Agar published his modestly titled book A Contribution to the Theory of the Living Organism. It was an elaboration of his understanding of pan-experientialism, particularly as promoted by Whitehead. As a biologist he found this model of the living organism illumined critical problems in three areas of biology; developmental biology, animal behaviour and evolution. All living organisms are feeling, experiencing subjects. This applies also to the cells of which they are composed. Were he living today I am sure he would have the same view, despite the great advances in mechanistic biology in the intervening years. His real successors in biology were C.H. Waddington and Sewall Wright, both of whom were well acquainted with the advances in molecular biology in their day. For the most part biologists have stuck either to materialism (e.g. Jacques Monod and Francis Crick), though a few, such as John Eccles, are dualists.

As a developmental biologist, Waddington was interested in gene action in development. The view of the gene that had come out of the development of classical genetics from Morgan and his school was that it was ‘just a simple lump of stuff.’ Waddington’s understanding of developmental biology and his reading of Whitehead suggested quite a different line of thought. It was that the ultimate entities that constitute the universe are not lumps of stuff but events and that these events are ‘occasions of experience.’ He tells us that the lesson he learned from Whitehead was ‘the replacement of “things” by processes’ (Waddington 1969 p.76).

In 1952 the evolutionary biologist Sewall Wright gave a seminal presidential address to the American Society of Naturalists entitled Gene and Organism (Wright 1953). Like Waddington he was concerned to find a metaphor for the gene other that a lump of stuff, however complex that lump was turning out to be. The metaphor he chose for the gene was organism. That cells are organisms in the strictest sense was, he argued, borne out by studies of cells in tissue cultures. There they behaved just like unicellular organisms. He argued that the organisms we are familiar with are colonies of organisms, the cells. So we can think of a hierarchy of organisms from cells to multicellular organisms such as human beings. Then he asked, can we think of the metaphor of organism as applying to the non-living world? The electron has some organismic features such as persistence. The atom has even more clearly self-regulating properties and the same he considered to be true of molecules. In particular he turned his attention to the DNA molecule that constitutes the gene. They and viruses (DNA and RNA) maintain the integrity of a complex pattern and in certain environments (namely that of a cell) have characteristics of life.

Wright went on in his address to compare the hierarchy of organisms from electrons through atoms, molecules and cells to the organism with which we are most intimately acquainted-ourselves. Arguing, as did Agar, he said about ourselves we have two sorts of knowledge, that which is visible from the outside, which science studies, and that which we know from within, namely our consciousness. Starting from his own stream of consciousness he finds that the behaviour of other human beings leads him to ascribe consciousness to them. And by the same route Wright attributed mind, in some form, to other animals, including protozoa. Then why not to the cells that compose multicellular animals? In that case the question arises as to the relation of the minds of a multitude of cells to the unified mind of the animal of which they are a part. This he considered to become a reality via the nervous system.

By such arguments Wright accepted the view that there is a development of complex mind from the simple mind comparable to that which takes place in structure, but he added ‘the emergence of even the simplest mind from no mind at all seems to me at least utterly incomprehensible’ (Wright 1953 p. 14). On another occasion Wright (1977) said that the emergence of a new structure such as a feather from a scale or a new physiological capacity involves nothing more mysterious than differentiated growth. But ‘the emergence of mind from no mind at all is sheer magic’ (p.82). He then compared the development of mind in the course of individual development from the fertilised egg. Is one to suppose, he asks, that at some particular point in that process of development, mind appears from no mind? When pressed, this is what most biologists believe. Yet is it not more reasonable to propose that the mind of a human being must develop from something of the nature of mind in the fertilised egg and back of this to the separate sex cells and in them the DNA molecules?

I was greatly influenced by Agar, Waddington and Sewall Wright. I came to know each one personally, especially Sewall Wright and Waddington. The central question they put to their colleagues was how can mind arise from no mind? Most of their colleagues ignored their question as they did their writings on this subject. It is still true that biologists are deeply enmeshed in the Newtonian universe, far more so than physicists, and they are not yet willing to think at all in non-mechanistic or organismic terms. I am not at all certain for the reasons for this strong prejudice which is not shared by many physicists.

From the thinking of these biologists I was led to the thought of process philosophers in addition to Whitehead, particularly Charles Hartshorne, John Cobb and David Griffin.

Pan-experientialism throws light on a major problem in evolution. It is the question: why did consciousness evolve? There is no problem in supposing that consciousness has survival value. But that does not answer the question. An unconscious robot that had built into its programming all the necessary reactions for avoiding danger and finding food when necessary would also have survival value. Is there some extra value in having consciousness as well as the appropriate reactions to the environment? No one has given a satisfactory answer to this question.

An alternative hypothesis is that if mind is part and parcel of the individual entities of creation from the big bang onwards, then cosmic evolution would necessarily involve not just evolution of matter but of mind-matter, that is to say evolution of experience. There would then be a history of the evolution of experience from elemental experience of protons and the like to human conscious experience. In this view, no particular line is to be drawn between pre-conscious and conscious experience. One merges into the other as indeed it does with us as we experience both unconsciously as well as consciously. This concept is familiar to psychiatrists who tell us that their job is to make the unconscious conscious.

2. I found it makes sense to recognise that the world is made both of things that feel and things that do not feel.

A common caricature of pan-experientialism is to say that its exponents believe that rocks have feelings. The mistake arises because of failure to make the distinction between individual entities that feel (Whitehead 1978), compound individuals that feel as compounds individuals (Hartshorne 1936) and aggregates that do not feel as aggregates though they are constituted of individual entities that do feel (Whitehead 1978).

An individual entity is that which acts and feels as one. To feel in this context means to take account of the environment such that the individual is, at least in part, constituted by such taking account . An electron is an example of an individual entity. An electron at one end of the universe is

said to be influenced by an electron at the other end of the universe. This means each is part of a network and each takes account of the other. There is no real sense any longer in which an electron can be regarded as a particle or substance that exists in itself quite independent of other entities.

A compound individual is a compound of individual entities that acts and feels as one. An atom is a compound of so-called fundamental particles. A molecule is a compound of atoms. A cell is a compound of molecules and so on up the hierarchy of organisms.

By contrast, an aggregate, as I use this term, is a grouping of individual entities that does not lead to a higher order of unified experience. There is as variety of aggregates. A chair, a computer and a motor car are aggregates. They have each a considerable organisation but there is no evidence that they exhibit a unified experience. A motor car may be said to act as one when someone sits in the driver's seat and directs its activity. But it has no such directed action apart from some outside influence such as a driver, be that a human or a robot. A pile of sand is an aggregate and so too is as rock of granite. A rock of granite is far more organised than is a pile of sand but there is no evidence that either has a unified experience. Hartshorne (1977 p.91) gives four reasons for thinking that rocks, chairs and the like are devoid of mind; their inertness, they do not seem to do anything; their lack of freedom in the sense of initiative; their lack of individuality in the sense of unity and uniqueness (the parts of a chair such as nails, glue and pieces of wood have only a mechanical unity when stuck together) and fourthly their lack of intrinsic purpose. Pan-experientialism asserts, not that all things have mind or feeling, but that all physical things are composed of individual entities (their atoms etc) that experience.

There is a whole group of organisms, such as plants and sponges, that are not compound individuals (that act and feel as one). Yet it does not seem appropriate to class them as aggregates, though there is no evidence that they have a unified experience. They are highly organised and sustain that organisation while they are alive. In the case of plants, this maintenance is largely dependent upon the function of plant hormones. Whitehead referred to plants, sponges and the like, as 'living democracies.' It is a task for someone else, other than myself, to make a more complex classification of what I have called aggregates and living democracies. All I need to emphasise here is that there are plenty of objects in the world that have no unified experience. This is important to appreciate because some critics of pan-experientialism incorrectly accuse its proponents of supposing that rocks and solar systems have unified minds.

Pan-experientialism generalises experience (feeling) to all individual entities. Consciousness is understood as a high level experience which involves memory of past events and conscious anticipation of future events. At its highest levels it involves richness of experience with its components of zest and harmony. Experience generalised to all individual entities is conceived to have two

components, something akin to memory of the immediate past and something akin to anticipation. Together these give meaning to the phrase 'to take account of the environment internally'. We can get clues to the meaning of this generalised experience both by analogy with ourselves and from quantum physics when it conceives the individual entities, not as parts of a clockwork but as a network of relations (Birch 1990).

3. Pan-experientialism avoids 'the emergence category mistake'.

A form of dualism which poses as monism commonly asserts that mind emerges from matter. A parallel is drawn between the evolutionary emergence of wings (in birds) from scales (in reptiles) or the emergence of the pentadactyl limb from the fin to the origin of mind. To regard the two sorts of emergence as equivalent is what Griffin (1988, pp.l9, 147, 151 and 1994) calls the emergence category mistake.

The doctrine of emergent evolution was formulated by Lloyd Morgan in his book Emergent Evolution (Morgan 1923). According to Morgan, in the course of evolution there were a number of miracles that were interposed into the stream of evolutionary events. He recognised two as having special importance, the emergence of life and the emergence of mind. Their appearance were miracles in the sense that they were not to be understood and could not be understood in terms of physics and chemistry. Morgan believed that when these properties emerged in evolution, new laws besides those of physics and chemistry came into existence. This doctrine would hardly be of more than historic interest now except that the doctrine of emergence, shorn of the miracles posited by Morgan, is part of the framework of thought implicit, if not explicit, in the writings of many biologists. Dobzhansky (1967), for example, refers to the emergence of life and mind as 'emergences or transcendences, in the evolutionary process' (p.32). He made it clear that something completely new came into existence when life emerged from the lifeless and mind emerged from the mindless.

To say that this or that property emerges is to say nothing more than that from A comes B. It explains nothing. Rather the term emergence signifies a problem requiring solution. How one anatomical structure such as a wing emerges from another sort of anatomical structure such as a leg can be explained by normal evolutionary theory. But how livingness and mentality can be derived from something which totally lacks these qualities cannot.

To say that when sodium and chlorine are combined in the molecule sodium chlorine the quality of saltiness emerges is to tell us nothing about what is happening. According to classical materialism that informs the mechanistic model, the sodium and chlorine atoms are unaffected by their combination. Hence, in principle, all the properties of salt should be discoverable in sodium and

chlorine atoms investigated in isolation. But this proves impossible. Hence many scientists speak of the emergence of saltiness in sodium chlorine. But that explains nothing.

We can do better than that when we consider that the events that make up the sodium atoms and chlorine atoms are affected by their environments. When these environments include each other in appropriate ratios the atoms exhibit properties they do not exhibit in other environments. We discover something new about the nature of those individual entities we call atoms when we study them in different environments. (Birch and Cobb 1981 pp.901). This is an example of how individual entities (atoms in this case) take account of their environment internally.

The emergence category mistake is to put into the same category characteristics such as wetness, saltiness, feathers derived from scales on the one hand and, on the other hand mind, and consciousness. Feathers, limbs, wetness and saltiness are externalistic properties knowable to sensory experience. But experience itself does not belong to this category. It is what an organism is for itself, not something that is observed through the eyes or ears of another organism.

Some philosophers are sceptical of making distinctions between categories on the grounds that they cannot agree as to what criteria are to be used to distinguish between categories. Yet surely one of the important procedures in philosophy is to make judgments as to which things are similar and which things are dissimilar and the degree of difference or similarity. There would seem to be a difference in kind of a major sort between things one sees with ones eyes and that which is not visible but is experienced within. If these are not different categories one wonders if any things are different!

The confusion that leads to the emergence category mistake is one that is common in the literature of science, yet this confusion is scarcely recognised. Thomas Nagel (1979) makes the point when he says that “much obscurity has been shed on the [mind-body] problem by faulty analogies between the mental-physical relation and relations between the physical and other objective aspects of reality.” (p.202) He goes on to make the point that it is unintelligible to speak of the emergence of experience, which is something for itself, out of things that are purely physical.

The doctrine of the emergence of mind from no mind implies that there was a stage in biological evolution when mind appeared in animals for the first time. Where then, is a line to be drawn between the sentient and the non sentient? Descartes drew a line between the human soul and the rest of nature. But drawing a line anywhere is quite arbitrary, be it between humans and all other creatures, between fish and frogs or between a cell and a virus. It is more logical to argue that no line exists, just as it is logical to argue that no line exists between the living and the non-living.

4. The doctrine of internal relations has more explanatory power concerning the subjective than any alternatives known to me.

Pan-experientialism makes a distinction between external relations and internal relations. In the Newtonian universe of mechanism there are only external relation between entities. Entities either push or pull one another around. External relations are incidental to the entity. Their occurrence or non occurrence does not affect the being or character of the entity. The Newtonian universe is made of substances which by definition have an independent existence. The idea of an internal relation is of a relation which is constitutive of the character and even the existence of something.

Internal relations involve a taking account of the environment internally. They are tied up with the idea of feelings. A pen lying on a table is thought to be unaffected by that location. It is thought to be the same unchanged pen when I pick it up. The relations to the table and my hand are changed but the pen is not. An internal relation is different. To see the pen is part of my experience. If I were not seeing the pen, the experience would be different. Hence my relation to the pen is internal to my experience. The idea of internal relations is that all individual entities from electrons to human beings have internal relations. It is because of this that the mechanistic reductionist programme is deficient. If complex things, such as living organisms, can be broken down into their component parts, how is it that the whole has properties that the components do not have? One response has been to say that the whole is more than the sum of its parts. The tendency has been to interpret that in terms of the architectural arrangements of the parts. There is an element of truth in this idea but it does not go far enough.

It is not just that the whole is more than the sum of its parts. It is that parts become qualitatively different by being parts of a whole. Yet few there be who seem to understand this distinction. A carbon atom in diamond has different properties from a carbon atom in an enzyme. What could give them these different properties? The most fundamental answer to this question is in terms of the doctrine of internal relations. As Cobb (1984) has argued the most fundamental basis for rejecting reductionism as adequate to explain the physical world is the doctrine of internal relations. It is in the network of internal relations we have with the world that reality is most fully revealed (Birch 1993).

According to the doctrine of internal relations the relations of one entity to others are constitutive of the entity in question. The carbon atom in a diamond has relations to a multitude of carbon atoms around it. The carbon atom in an enzyme has relations to many different sorts of atoms in its environment, including carbon atoms. In each case the carbon atom is conceived as taking into account internally (qualitatively) those relations. It is not just a matter of architecture. The bricks that are built into an office block remain the same if that office block is torn down and the bricks are assem-

bled in a different architecture to make a cathedral. The brick is not an individual entity but an aggregate of individual entities. One brick is not influenced in its being by the presence of another brick or a rock or anything else next to it in the building. A brick is a brick! Not so for an atom in a molecule or a molecule in a cell or a cell in the liver or a cell in the brain.

The properties of a system cannot be derived from the properties of the constituent parts, that is from the properties possessed by these entities outside the system. A virus in a cell exhibits certain properties that it lacks when not in a cell. Molecules exhibit properties that cannot be derived from the properties of the atoms constituting them, when these atoms exist outside the molecular structure. As Cobb (1984) says, the effect of the doctrine of internal relations on the understanding of the nature of the physical world is radical. It destroys the notion of material physical substance and substitutes that of an event. The nature of that event is analogous to what we recognise as feelings in ourselves. The world is not made of substances. It is made of events. This concept is accepted by quantum physics but not as yet by classical mechanistic science.

5. The distinction between a machine and an organism leads to a recognition of the limitations of computers as models for understanding mind and consciousness.

The proposition of strong Artificial Intelligence is that minds with their thoughts and feelings are computer programmes. Mental states are said to be computer states and mental processes are said to be computational processes (e.g. Dennett 1991).

Computers can be programmed to outperform in some operations even the best mathematician. There is no reason, in principle, why a computer may not be programmed to beat the best chess player in the world. Even if this is so it is no more relevant to the issue of mental states than is the fact that any pocket computer can calculate faster than any human mathematician. Computers can exceed human performance in many kinds of activities.

For some advocates of AI [Artificial Intelligence] the Turing Test is the criterion of mental states. The test is whether a machine can carry on a conversation with a person in such a way that the person cannot tell whether he or she is talking to a machine or a person. But even if a machine can fool its interlocutors, this is not a conclusive test that the machine can think or feel, as Searle (1992) has argued with his Chinese room analogy.

The most complex computer designed for AI will always be a machine and not an organism in any real sense. The parts of the computer are not organisms like cells in the brain. The total computer is an aggregate and not an individual entity. Aggregates such as computers and motor cars have lots of properties, but they do not have the property of a unified experience. It is true that their ultimate components of electrons and atoms are, in pan-experientialism, said to be experiential but

these components are not organised into a hierarchy of compound individuals. A direct jump from atoms that experience in their lowly way to human like experience would be impossible. The fact that billions of years of evolution occurred before human experience arose suggests that the intervening levels of experience were necessary. From a pan-experientialist perspective even the most complex computer would not have mind and consciousness, so long as it remained an aggregate of individual entities. To attempt to make a computer by building up a hierarchy or compound entities that think and feel would be to attempt to repeat evolution from scratch! There would not be much point to such a programme in view of the fact that we are surrounded by living organisms that came into existence just that way.

6. The recognition of subjectivity as a reality leads to ways in which it can be studied.

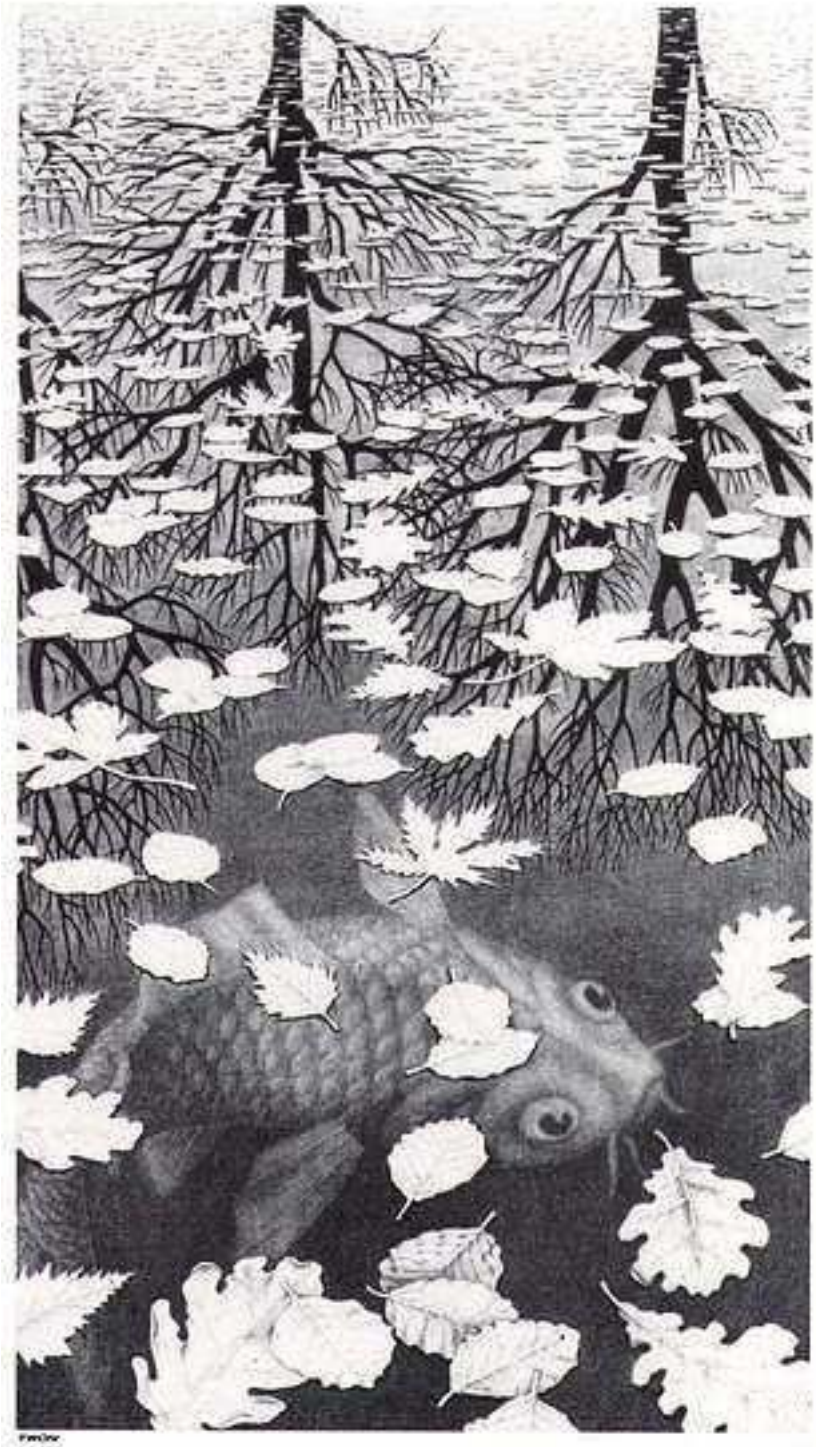
Whitehead (1978 p.173) pointed out that the subject matter of Newtonian science with its mechanistic model of reality are those objects we call aggregates. Newton, for example, derived the laws of motion by studying the movement of steel balls on inclined planes. Biologists, it is true, study compound individuals or organisms, such as cells and complex animals. But most biologists study them as if they were aggregates. The subjective necessarily eludes this sort of analysis. But why should not science include in its analysis the subjective with the objective?

Recent studies indicate that this is in fact possible. Quantum physics sees entities as momentary events and not as enduring substances. Donald Griffin (1992) and Marian Dawkins (1993), neither of whom are pan-experientialists, bring together many studies in animal behaviour that go beyond the purely behaviouristic approach and recognise subjective experience in animals. As Dawkins says: *"Some animals behave in ways that are best explained on the hypothesis that they have an internal mental world of their own and manipulate it vicariously by 'thinking' in ways that are at least partly like the ways we do it…some animals care sufficiently about their situation they are in that they will go all out to change them, or, in other cases, to prolong or repeat them, again with parallels to what we do in comparable situations when we consciously 'feel' strongly about something"*. (p.176).

Jane Goodall studied Chimpanzees in the wild, assuming that they are feeling their world. She gave us an understanding that a purely behaviourist approach would have missed. And Charles Hartshorne (1973) tested a hypothesis that birds have aesthetic experience and that their songs are so designed.

These are just a few indications that new worlds are opened up to those who accept what mechanistic science has to give, yet are prepared to move beyond the confines of its Procrustean bed. The doctrine of pan-experientialism, at least for some of us, enables us to embrace the truths of the

Newtonian worldview and yet explain a wider variety of observations and experiences. Perhaps we are, as David Griffin (1990) suggests, *"on the verge of a major revolution in the worldview associated with the natural sciences"* (p.89).



Escher – 3 worlds

7. Conclusion.

I have presented six reasons why the constraints of mechanistic biology led me to a pan-experientialist position. There were those of my colleagues who had a faith that one day the riddle of mind and consciousness would yield to the mechanistic analysis. Most of them were completely

sceptical of the possibility that philosophical study would ever lead to a solution. However, three biologist became known to me whose studies had led them to see the inadequacies of both mechanism and dualism and who had opted for pan-experientialism. These biologists were W.E. Agar, C.H. Waddington and Sewall Wright. They regarded mind and matter as two aspects of the same thing and experience in some form as a feature of entities that extend into the inanimate world. For each of them there were problems in three areas of biology that cried out for a view other than exclusive mechanism; these were developmental biology, evolution and behaviour. All of them argued that there were two sources of knowledge, public knowledge, which is revealed by the senses, and the private knowledge each of us has in our own consciousness. These two sources of knowledge lead to seeing the two aspects of nature, mind and matter, all the way down from humans to entities such as protons.

My understanding of science and my recognition of my private world of consciousness led me to see that the world is made ultimately of things that feel. However, there are things made of things that feel that themselves do not feel. There are two categories of things that feel, namely individual entities such as electrons and compound individuals such as atoms and cells. Things that do not feel are either aggregates such as rocks, chairs and computers or 'living democracies' of individual entities such as plants and sponges. These have no organising centre of sentience. The definition of an individual entity is that which acts and feels as one. To feel in that context is to take account of the environment such that the individual is at least in part constituted by such a taking account. This makes sense of the network view of electrons in the universe as well as those entities we regard as living organisms. Consciousness is understood as a high level experience and involves memory and anticipation.

Pan-experientialism avoids the emergence category mistake. This is to equate the evolutionary emergence of visible features such as feathers from scales and the so-called emergence of mind from no mind. It is the same category mistake to equate the emergence of saltiness in sodium chloride and wetness in water with the emergence of mind from no mind. To say that a property emerges is to say no more than that from A comes B. How feathers came from scales can be explained by normal evolutionary theory. But how mentality can be derived from something which totally lacks it cannot be so explained. It is to believe in miracles.

The doctrine that mind emerges from no mind implies that there was a stage in biological evolution when mind appeared for the first time. But where is that line to be drawn? In so far as any line is drawn it is completely arbitrary. The logical alternative is to propose that there is no line of demarcation any more than there is a line between living and non living in evolution. This overcomes the problem of why consciousness evolved. It would seem that an unconscious robot programmed

to avoid dangers and to appropriate its needed resources should do just as well in Darwinian evolution as an entity that was conscious. In pan-experientialism, matter and mind necessarily evolve together. One doesn't come after the other. The evolution of mind from elemental beginnings in the electron to richness of conscious mind in the human makes logical sense.

The doctrine of internal relations has more explanatory power concerning the subjective than do the alternatives. Mechanistic science studies the external relations of push and pull between things. This has led to the belief of mechanism that no other sort of relations exist. The idea of an internal relation is of a relation which, unlike an external relation, is constitutive of the character and even the existence of something. Internal relations involve a taking account of the environment. They are tied up with the idea of feelings.

Complex organisms can be broken down into their component parts but this does not explain how it is that the whole is more than the sum of the properties of the component parts into which it is broken down. It is not just that the whole is more than the sum of its parts but that the parts become qualitatively different by being parts of a whole. The difference is due to the new internal relations. The doctrine of internal relations is the most fundamental basis for rejecting reductionism as adequate to explain the physical world.

The distinction between a machine (which is an aggregate) and an organism leads to the recognition of the limitations of computers as models for understanding mind and consciousness. Computers have many properties but it is implausible to suppose that they have the property of unified experience of organisms. They are not organisms. It is true that their ultimate components are, in pan-experientialism, said to be experiential but these components are not organised into a hierarchy of compound individuals. A direct jump from molecules that experience in their lowly way to human experience would be impossible. The fact that billions of years of evolution occurred before human experience arose suggests that the intervening levels of experience were necessary.

The recognition of the reality of subjectivity leads to ways in which the subjective can be studied. Quantum physics sees entities as events and not as substances. Non behaviouristic psychology has been studying subjectivity objectively for a long time. In biology studies of behaviour that go beyond behaviourism have opened up a whole new way of studying mind and consciousness in animals. So what I am proposing involves an extension of a method that already exists. If these sorts of studies become more widespread, one might suggest that we are on the verge of a combining the fruits of mechanistic science with the much more difficult understanding of the subjective life of entities. A more complete science would include both.

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