New physics and the group mind - Glaister lecture - March 2000

Introduction

I am very honoured to be giving the annual Glaister lecture in the 50th anniversary year of Braziers.

When, sometime last summer, I agreed to do this I had only the vaguest idea of what it would be. The intention was to explore further some of the issues I had raised in the paper entitled "*Relationships between Norman Glaister's ideas and recent concepts*", published in the last issue of Braziers Research Communications. Once I started to consider the content in more detail, there emerged many possible topics, and even after I had settled on the title, I was aware (very likely because of the nature of the material I was working with, as you will see!) that there were almost an infinite number of possible lectures which might emerge. This process, exploring a multitude of possibilities before choosing one, is such a well established mental phenomenon that we tend not to think twice about it. It does, however, reveal how our minds are connected with some of the insights emerging from the science of the twentieth century.

The topic which I eventually chose, New Physics and the Group Mind, seems particularly apposite given that we are now in the year 2000, as my theme begins 100 years ago at the start of the 20th century, when Norman Glaister was aged 17. At this point, it was believed that all major problems in physics had been solved. The chairman of the physics department at Harvard University discouraged post-graduate study because it appeared there was little left to explore. In a speech to the Royal Institution in the year 1900, Lord Kelvin reflected that only two problems remained - that of black-body radiation* and the Michelson Morley experiment[1] - and he foresaw that in a short space of time, these two problems would also have been resolved[i].

The physics he was referring to was, of course, the physics of Newton or classical physics, which reached its zenith in the mid 19th century. This was the physics which grew out of the Cartesian split between mind and body, between the mental and the physical. It was reductionist and mechanistic and, it has been argued, its underlying precepts have contributed to the sense of alienation and fragmentation characteristic of much of this century. However, Lord Kelvin's forecast proved very wrong. Over the next 30 years, the search for solutions to these two problems led to the discovery of the quantum nature of energy and the development of Einstein's theory of relativity. Less than thirty years later, by 1927, the foundations of the New Physics - specifically quantum mechanics and relativity - were in place. Somewhat later, in the 1970s, a third field of study entered the world of physics - that of chaos. Its advocates contend that 20th century science will be remembered for three things: relativity, quantum mechanics and chaos.

The New Physics

For the purposes of today's lecture, I wish to focus on the implications of quantum theory and chaos in understanding our mental processes. I will begin by attempting to summarise the key features of quantum theory and what they tell us about the nature of physical phenomena in general and our minds in particular.

Quantum theory derives its name from the discovery by the physicist Max Planck that all radiation from hot bodies is released in minute packets of discrete size, which he termed 'quanta'. Further work demonstrated that all action at the molecular level is in the form of these discrete quanta. An example is the orbits of electrons outside the atomic nucleus, which are not infinitely variable, but lie in 'stable' positions which relate to the energy of the electron. The input of additional energy, which again can only take place in fixed amounts or quanta, results in an electron jumping to a different orbit or energy level. Each jump must be associated with the absorption or emission of a photon of electromagnetic energy. No in between states, representing intervening energy levels, can exist.

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* The black body problem - classical physics predicted that a highly heated object should radiate infinite amounts of high frequency light, ie light with very short wavelengths. In fact at zero wavelength, the energy reduces to zero.

[1] Michelson Morley experiment - experimental evidence that the speed of light is constant, regardless of the state of motion of the observer.

This discovery conflicted with the proven interpretation of electro-magnetic radiation, such as light, as a continuous wave - an interpretation which was underpinned by considerable experimental evidence. Further experiments designed to resolve this apparent contradiction had the extraordinary result of demonstrating that light has both a wave and particle nature. It is emitted as a stream of particles; it is detected by, say, a photographic plate as individual particles, but in between it travels as a wave. It is now known that all matter and energy has this dual nature. It can behave either as a particle or a wave (or a field) depending on the nature of the experiment in which it is observed. To quote Danah Zohar, whose books '*The Quantum Self*' and '*The Quantum Society*', I have drawn on considerably in preparing this lecture: "The most revolutionary .... statement that quantum physics makes about the nature of matter, and perhaps being itself, follows from its description of the wave/particle duality - the assertion that all being at the subatomic level can be described equally well either as solid particles ... or as waves.... Further, quantum physics goes on to tell us that neither description is really accurate on its own, that both the wave-like and the particle-like aspects of being must be considered when trying to understand the nature of things, and that it is the duality itself which is most basic. Quantum 'stuff' is, essentially, *both* wave-like and particle-like, simultaneously."[ii]

In addition to this wave-particle duality, it is not possible to focus on, or measure, both aspects at once - only one can be described at any given time. For example, we can measure the position of an electron when it manifests itself as a particle, or its momentum when it expresses itself as a wave, but never both at the exact same moment. This is the gist of what is termed Heisenberg's Uncertainty Principle, after the physicist Werner Heisenberg.

Finally, stranger still, quantum reality also displays the property of non-locality. This means that particles can be connected and can influence each other over immense distances, even to the extent that two such particles at opposite ends of the universe can affect each other. This phenomenon, predicted theoretically by Einstein, who called it 'spooky action at a distance', has been verified experimentally. Recent research[iii] suggests that this is due to a phenomenon called quantum entanglement. Quantum particles can split into 'ghosts' that can move on many paths at once, to the extent of interfering with themselves. Disrupting this by observation or measurement of any kind makes the ghosts act as if they were true particles. What is even more significant is that in quantum mechanics, measurement not only makes reality, but that measurement inevitably *modifies* reality.

At the quantum level, reality, therefore, consists not of "fixed actualities we *can* know but rather of the probabilities of all the various actualities we *might* know".[iv] And this probability wave, also called quantum superposition of states, *behaves as though* it were smeared out over all space and through all time. This can be interpreted by seeing things and events, which we perceive as separated by time or distance as being, in some way, multiple aspects of some larger whole, which imparts meaning and definition to their existences. In Fritjov Capra's words "in classical mechanics the properties and behaviour of the parts determine those of the whole, the situation is reversed in quantum mechanics: it is the whole that determines the behaviour of the parts."[v]

The change from the state of multiple possibilities to a single actuality is described in the language of quantum physics as the 'collapse of the wave function'. Prior to this we have a situation where anything is possible, nothing is certain and events just happen. Afterwards we are in the 'real' world of classical physics, in which matter and energy follow rigid laws and one event will be the cause of another. This collapse of the wave function is still not understood[≈], but it is brought about through an act of observation or measurement. When we make an observation, we make the world real and it becomes real everywhere instantly or, to quote John Gribbin "Nothing is real unless we look at it".[vi]

One way of trying to understand this is to think of how we react if we hear or see the word 'note'. An economist may think of a bank note, a musician or singer of a musical note, and a writer of a written note. Or we may hold all possible meanings in our minds, until we have more information as to what kind of note is being referred to, a situation which is analagous to the quantum superposition of states. However, if we then hear the word 'book' following 'note', all other interpretations evaporate and only one meaning remains.[vii]

The implications of quantum reality are, to say the least, mind-boggling. But all experimental evidence confirms its validity, and practical work based on these laws has led to the production of computers, lasers, compact disks and many other technological devices which we now take for granted.

[≈] McFadden suggests that it is due to the phenomenon of 'decoherence', and the environment itself by causing a loss of coherence can collapse the wave function.

Furthermore, although only detectable at the microscopic level, quantum reality underlies all reality. Recent experimental work has shown that, not just particles, but a large molecule (the C_{60} fullerene with 60 carbon atoms) demonstrates wave-particle duality and can appear to travel along two routes simultaneously as a single, coherent wave/particle. There is no escaping the conclusion that quantum mechanics describes the fundamental reality of matter, including all life.

Quantum reality and our mental processes

Nearly 40 years ago, the physicist David Bohm commented on the many similarities between the behaviour of our thought processes and that of some quantum processes. He wrote: "Thought processes and quantum systems are analogous in that they cannot be analyzed too much in terms of distinct elements, because the 'intrinsic' nature of each element is not a property existing separately from and independently of other elements but is, instead, a property that arises partially from its relation with other elements."[viii] Similarly, Johnjoe McFadden wrote in his book *Quantum Evolution*, published this year, "Yet it remains curious that the closest concepts to quantum-mechanical phenomena are not in the physical world but in our own minds."[ix]

Is this just an anology, or are these parallels more than a coincidence? Living organisms are controlled by a single molecule - DNA - and the behaviour of molecules is determined by the laws of quantum mechanics. Work by a number of microbiologists and biochemists, including McFadden, suggests that adaptive mutations arise through quantum mechanical measurement effects, hence the concept of quantum evolution. The twenty-first century may see a synthesis of physical and biological sciences through quantum mechanics, with biologists exploring the way in which quantum events influence the behaviour of living cells and physicists constructing electronic devices on the nanotechnology scale, that is of a size similar to a cell. Amongst the, possibly alarming, implications may be a blurring and eventual disappearance of the distinction between biological life and artificial life.

Research on our brain cells has proved that quantum indeterminacy is built into brain functioning, through random variations in the chemical concentrations surrounding nerve junctions (neurones). Of the brain's one hundred billion (10^{11}) neurones some ten million (10^{7}) are believed to be sensitive enough to register quantum-level phenomena at any one time. The likelihood, therefore, of a quantum basis to consciousness, and even of free will, is now taken seriously by many scientists.

Danah Zohar, in *The Quantum Self*, postulates that a possible mechanism for this would be an ordered form of functioning of molecules called a 'Bose-Einstein condensate' (called after Einstein and Satyendra Bose). An everyday example of this is a laser beam. In a Bose-Einstein condensate molecules vibrate in unison to the point where the parts which make up the system not only behave as a whole, but they become a whole. Zohar gives as an analogy the many voices in a choir which merge to become 'one voice' at certain levels of harmony.[x] This merging of identities is crucial to giving any physical account of the way that consciousness draws together various 'sub-unities' within experience. In quantum language, the wave functions of the previously individual parts overlap so that each one spreads itself all over the whole, giving rise to a single coherent quantum system.

McFadden argues for an electro-magnetic (em) field basis for consciousness. There is no question that such a field is present in our brains. Em fields are generated by all electrical phenomena and neurones have massive voltage differences across their cell-membrane. The various em waves generated by electrical activity in the outer surface of the brain are recorded during EEG (electro-encephalogram) monitoring, with its characteristic rhythms. According to McFadden, the millions of em fields generated by neurone activity must overlap and superimpose, to generate an extraordinarily complex em-field inside our brain. He reviews evidence for a conscious electro-magnetic field (Cem-field), which may be localised within the cerebral cortex and thalamus regions of the brain. As well as being generated by neuronal activity, he proposes that the Cem-field may loop back and influence neuronal firing and thereby be capable of consciously willing our actions. This provides the kind of self-referral that many cognitive scientists and philosophers believe to be crucial to consciousness.[xi]

Where does this take us? Both these theories lead to the conclusion that our conscious minds have their origin in the quantum wave function, which creates a unity which we experience as the self, and which enables us to unite the billions of sensory data that bombard our brains into a single, coherent experience. The essence of quantum reality is that it is holistic, with the wave aspect of the wave/particle duality able to overlap and even merge with others into a larger whole. This conclusion has implications both for ourselves as individuals and as members of groups and wider society. I shall now consider some of these implications.

Implications for individual minds

To return to the process which led to the choice of topic for this lecture, that of exploring a multitude of possibilities before choosing one, we can now explain it using the language of quantum mechanics. At the moment of decision, I had collapsed the 'wave function' of many possibilities into one fixed actuality. The number of possible lecture topics had been replaced by the one which had been chosen. Even then, I put off writing anything down for longer than I might normally have done, being very aware that consigning any words, if not to paper, at least to the computer, might somehow 'fossilise' the text and prevent me exploring other ideas at too early a stage. Quantum reality also tells us that once a choice is made, that action in itself helps create reality, and therefore affects future possibilities. To quote Ilya Prigogine "Whatever we call reality, it is revealed to us only through an active construction in which we participate."[xii]

This is one way in which the laws of quantum physics allow us to understand better our own mental processes. Another common experience at the individual level is that we have many 'selves within ourselves'[xiii], with one self or another more in evidence at any one time or in a particular environment. We may have our 'work' side and our 'fun' side, a 'conformist' side and a 'rebellious' side. We sometimes say that a particular person is a very 'together' person, or has a well integrated personality, or, on the other hand, is 'all over the place'. The quantum self, as envisaged by Zohar, is a self of partially integrated systems of sub-selves, formed of overlapping wave functions, which shift and change constantly so that our sense of self (which is defined by the region of overlap) changes from one moment to the next. And, since particle systems can overlap both in space and time, these overlapping wave functions do not just exist in the present, but also through time. Zohar describes the self as being woven moment by moment as the wave functions of past selves overlap with the wave functions of the present self, a process she describes as 'quantum memory'.[xiv]

But if the self is formed of overlapping wave functions, can this be applied to groups? And what implications does a quantum basis for consciousness have for our relationships with others and for the concept of group identity?

Implications for group mind

Zohar argues that our relationships with others also have a quantum dimension, and that, in principal, the quantum wave mechanics of overlapping persons should be the same as that of overlapping selves within the self, though she admits the actual physics of this is less clear.[xv] Between people, the overlapping effects may be non-local, that is they maybe separated in space or time.[2] We may use the expression 'being on the same wavelength', implying that we feel in harmony at some level with another person. In quantum terminology, it means that our wave function overlaps to a perceptible degree with that of the other.

Instead of seeing a conflict between our need to hold on to our individuality, which can be called our particle aspect, and our need to have close relationships with others, our wave aspect, quantum reality shows us that both are of equal importance. However, it is through the wave aspect of our being, through our relationships with others, that growth can occur. This is because wave functions can overlap and become entangled, so quantum relationships can get inside each other to form creative, internal relationships. In a Newtonian world, in which only external relationships with others are possible, this could not happen. The relationship between ourself and others is very like the relationship between our own sub-selves, and it presents the same challenge for interpersonal relations as does the integration of sub-selves for personal identity.

In quantum terminology, a group mind would arise through the increasing overlap of the wave functions of the individual members of the group. And, as within our own minds, the degree of integration and consequent sense of group unity, will vary from one moment to the next. It might, for example, be felt very strongly in particular situations where there is strong emotion, such as in a crowd watching a football match or some form of political rally. I would suggest that a relatively recent example of such a phenomenon was that following the death of Princess Diana, with many millions of people experiencing an overwhelming shared response to the tragedy.

If we wish to foster this process in order to consciously create a more harmonious and integrated group, how should we proceed? I would like to start answering this question by recounting my

[2] This has been demonstrated by two physically separate laser beams interfering with each other across time.

experience during the time I worked as a secondary school teacher in Hull, teaching pupils aged 13 to 18 in two different comprehensive schools. As part of a programme to develop more effective relationships within the first of these schools, one timetable slot a week was given over to what was called a tutor period, which the class teacher spent with her or his registration group. This was in addition, I may add, to the daily 20 minutes registration period first thing in the morning, and a similar 10 minute period post lunch. There was much debate, and not a little dissension, about the role and purpose of these tutor periods. The programme started at the point when I was assigned an intake group, aged 13+. I had just said farewall to another group for which I had been responsible for three years, and which had been so difficult to handle that at one point, when I was away running a 6th form field trip for a few days, it had been decided that all the class would be home based as no-one else was willing to take them on! I was determined that things would be different with my next class, and set about devising a programme of activities to occupy both the morning registration period and the weekly tutor period. The activities were based on a series of publications entitled Active Tutorial Work, which combined personal development work with exercises designed to improve pupils' ability to study and learn effectively.

Although some of the activities involved the whole group, many of them required smaller groups of two, three or four people. If left to their own devices, self-selection would have merely fostered fragmentation of the group, with some less popular individuals becoming more isolated. On the other hand, I did not think it would have been productive to have arbitrarily assigned pupils to the smaller groups myself. My solution was to use a set of playing cards, which I would prepare before each session so that I had the right number of cards of appropriate characteristics. At the start of the session, I would place a card (face down, although it didn't matter if they peeked, but it added to the drama) in front of each pupil. I would then tell them to form groups based on, for example, the value or the suit of the card, or whether they had a court card or not. They had no way of knowing what the criteria would be, so surreptitiously swapping cards would have served no purpose. This approach ensured that, at one time or another, each class member had to interact and work closely with each other one.

I used this approach with three different tutor groups in two different schools, on each occasion keeping the group just for their intake year. Apart from being quite a lot of fun (I used to describe it to the pupils as 'doing silly things with miss'), the impact was remarkable. More than one member of staff in both schools told me what a pleasure my tutor group were to teach, and how well they got on with each other. One explanation, I suppose, could have been that three years in succession I was particularly fortunate in the class I had, but I think it far more likely that the shared activities, and the mixing process engineered through the use of the playing cards, developed a strong sense of group identity which facilitated the teaching process.

Looking back now, I would say what I was doing in those sessions increased the number and strength of the relationships between the pupils within the class, and indeed with myself, in such a way that it made for a more harmonious and coherent group, which was demonstrably easier to teach than other groups in both schools. In quantum terms, it increased the overlap of the wave functions of the individual pupils so that they could 'get inside each other', thereby becoming more at ease with each other, and grow together as a group.

This potential for growth, with the possibility of the emergence of some form of group mind, which both encompasses and transcends our individual minds, necessitates our suspending for a time the particle or individual side of our minds and staying with the wave side. In his development of the process of dialogue[∞], the physicist David Bohm emphasised the need to suspend our own assumptions and open our minds to the values, beliefs and opinions of others, which is not the same as surrendering to them. His view was that, "When you listen to somebody else, whether you like it or not, what they say becomes part of you."[xvi] In dialogue, everyone's ideas are held by all, and out of this can emerge a shared meaning. This is not at all the same process as attempting to convince someone else of the validity of your viewpoint. Bohm wrote, "Truth does not emerge from opinions; it must emerge from something else - perhaps from a free movement of this tacit mind".[xvii]

This view is explored by Zohar in the book she co-authored with her husband, Ian Marshall, a psychiatrist and psychotherapist, entitled *The Quantum Society*. In the chapter on Freedom and

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[∞] Dialogue comes from the Greek word dialogos, meaning through. Dialogue is akin to the flowing of a stream and the stream represents the free flow of meaning between people. Whereas the word discussion has the same root as 'percussion' and 'concussion', meaning to 'break things apart or to analyse.'

Ambiguity: The Foundations of Creative Community, she writes "To foster community, we must also nurture our internal freedom, our freedom to become through relationship with others. This internal freedom is linked to our indeterminate characteristics, to those aspects of ourselves that remain unfixed and hence free to get into a correlated relationship with others."[xviii] Furthermore, she notes that if we want to preserve the creative ambiguities which can give rise to emergent social realities, we must avoid to some extent the human equivalent of measurement. This she equates with attitude, noting that, "The attitudes that we adopt in any situation partially determine how that situation will unfold." The striking of any fixed attitude will interfere with the potential for emergence within a group. This is like people 'taking up positions' in relation to a decision or problem.

It is interesting that writers on dialogue, including Bohm, quote examples from tribal peoples. Annette Simmons in *A Safe Place for Dangerous Truths*[xix], a guide to using dialogue to overcome fear and distrust in the workplace, describes how a friend of hers was asked to consult with a tribe in Alaska that was facing big decisions on self-government. They spent the first two days just talking, often disagreeing deeply with each other. There was no agenda, no leader, no plan, which seemed strange from her point of view. On the third day, the group was ready for her to facilitate the decision making process. She was amazed at how smoothly the group reached agreement and concluded its business.

Zohar likens her ideal community or society to a free-form dance company, with each member of the troupe a soloist but moving creatively in harmony with others. The dance has an identity of its own over and above the separate, free identities of individual dancers. This contrasts with the emphasis on individuality characteristic of current Western society, perhaps crystallised by Margaret Thatcher's statement, "There is no such thing as society, there are only people", proving that she may have been a trained chemist but knew nothing about the implications of quantum physics! On the contrary, although we are individual people, we are also our relationships, and it is the relationships between ourselves and others which are critical to how we are and what we might become. "If we share our wishes, fears, dreams and images, implicitly or explicitly, we become bound together into a group that transcends any one definition of itself in actual behavioural roles."[xx] (Zohar)

Universal mind

Quantum reality itself is a nexus of unbroken wholeness. This can be understood either from the perspective of quantum integration, by which new and larger wholes are created endlessly, or from the origin of the universe in the Big Bang, which means that quantum entanglement is built in to its very fabric.

This wholeness, this linking of everything with everything else in both space and time may provide an explanation for certain phenomena, through the concept of what I shall call the universal mind. These phenomena include synchronicity, morphic resonance and the experience of past lives. In this context, I also wish to comment on the concept of 'memes', and their possible role in cultural evolution.

Jung used the term synchronicity to denote meaningful coincidence, and he postulated that it related to the space-time continuum of quantum reality.[xxi] Events bound by synchronicity are connected by similarity, by meaning, and by resonance rather than by causality. David Peat regards synchronicity as representing a bridge between matter and mind, arising from a deeper order of reality.[xxii] Synchronicities are often associated with periods of transformation; for example, births, deaths, falling in love, psychotherapy, intense creative work, and even a change of profession. It is as if the mental and emotional intensity resulting from this internal restructuring produces external resonances, propogating outwards into the physical world.

Two recent examples of synchronicity from my own recent experience are, firstly, suddenly being attracted by the notion of reading the 17th February edition of the Reading Midweek Chronicle, a free newspaper, when I was close to finishing Zohar's book on *The Quantum Society*. This is something I rarely do, even if I glance at it for details of local events. In it I found a reference to a new publication called *Quantum Evolution*, by biologist Johnjoe McFadden, which seemed extremely relevant to this lecture. On ringing up Waterstones in Reading I found that they had just a single copy in stock, which I promptly bought, and, as you will have realised, found it very pertinent.

The second occurred when I was driving along a road into the Lancashire town of Clitheroe, which I am considering as a possible place to live. I suddenly had the thought, I wonder if there is a green burial site here. Afterwards, when talking to Hilda at Braziers about Clitheroe, she suddenly said,

without any previous reference in our conversation, "There's a green burial site there." After a little bit of research and looking at maps, I realised my original thought had come while driving along the actual road running past the site, even though there were no signs to indicate this.

The concept of morphic resonance, as developed by Rupert Sheldrake[xxiii], can also be related to the unity of quantum reality. This concept states that once something has been learned by one individual of a species, it is then easier for others to learn it. Sheldrake gives examples from memory effects in nature and from experiments on human psychology. A quantum basis for this phenomenon is explored by Amit Goswami, who proposes that Sheldrake's morphogenetic fields begin as quantum possibilities, and once a form has manifested through a creative breakthrough, the probability of its repetition increases.[xxiv] Then there is the experience many people have of memories of past lives, which can occur even in young children.[xxv] One interpretation is that incorporated into our own consciousness may be patterns and experiences of people who have lived before us. Again, this could also be seen as a manifestation of the universal mind inherent in quantum reality.

I wish to spend a little longer considering the concept of 'memes', as it has implications for cultural evolution. The term meme was coined by Richard Dawkins in his book *The Selfish Gene*[xxvi]. It has now been officially blessed by inclusion in the Oxford English Dictionary, where it is defined as "an element of a culture which may be considered to be passed on by non-genetic means, especially imitation." It is a cognitive or behavioural pattern that can be transmitted from one individual to another one. In human society, almost any cultural entity can be seen as a meme: religions, language, fashions, songs, techniques, scientific theories and concepts, conventions, traditions, and so on. For example, the concept of an 'intentional community' is a meme, and the increasing use of this phrase demonstrates how memes spread.

Unlike biological genes, memes can be passed on both vertically from, for example, a parent to a child or horizontally like a 'craze' affecting school children or a particular fashion. In addition to being transmitted by traditional means, either through sound (speech, music) or the printed word, the advent of computers and modern forms of communication facilitate the spread of memes.

Elan Moritz, of the the Institute for Memetic Research, suggests that memes can act as the spatial and temporal glue that holds society together. In his view, the collective memory of our species is captured in memes of various forms and also in the human genome. He proposes that the human species could be seen in totality as a unitary organism, which he calls a metabeing, that changes composition and spatial extent (population), with groups of individuals functioning as 'organs' in a multicellular organism.[xxvii] This raises questions such as whether there is the possibility of communication between constituents of the metabeing and the metabeing itself, and whether the constituents can recognise significant organisational changes within the metabeing.

If memes have a drive to replicate and spread themselves, in the way that biological genes do, and, as Susan Blackmore argues in her book *The Meme Machine*[xxviii], there are far more memes than brains to provide them with homes, then those memes that we choose to accommodate in our own brains, and which subsequently spread, have implications for the interconnected web of human knowledge and understanding.

Although I have not found any discussion of a quantum basis to memes, the fact that they reside in our brains and in computers and other technological devices based on the principles of electro-magnetism, such a connection seems to me to be entirely plausible.

If, as suggested by these phenomena, we can conceive of some form of 'universal mind', then what we think and believe, our ideas and values, both as individuals and as a group, can feed into (and feed from) this universal mind and affect others distant from us in space and time.

Chaos and Complexity theory

I would now like to look more briefly at the other major revolution in physics relevant to today's lecture - the science of complexity theory, which studies the relationship between order and chaos within systems. Unlike quantum mechanics, this offers more direct insights into what we can see happening in the 'real' world. It has provided a greater understanding of phenomena as diverse as weather patterns, stock market trends and population dynamics.

Systems can be classified according to whether they are stable, unstable or complex. In stable systems, negative feedback operates to cancel out fluctuations, as in the thermostat of a heating system. In unstable systems, positive or reinforcing feedback accelerates the impact of changes

leading to sudden collapse. A small disturbance may quickly escalate to a 'run-away' or 'explosive' situation, in the manner of a vicious circle. A complex system operates between the other two, combining positive and negative feedback, stability and instability.

Although complexity theory has its mathematical basis in classical, not quantum, physics, the properties of complex systems have certain characteristics which are similar to those of quantum systems. One of these is their unpredictability, which is comparable with quantum indeterminacy. This property is the one illustrated by the so called 'butterfly effect'. In other words, a tiny difference in initial conditions leads to radically different outcomes. Another is the impossibility in practice of repeating a cause-effect link, which produces effects similar to the lack of causality which is inherent in quantum systems. The inherent duality of the unstable/stable quality of complex systems is similar to the wave/particle duality of quantum physics. One of the most intriguing features of complex systems is the apparently spontaneous emergence of order from disorder, a property described as self-organisation.

Self-organising systems are resilient and adaptable. This resilience is the result of maintaining a dynamic relationship with their environment. One aspect of this dynamic is a system's response to positive feedback mechanisms introducing instability into the system. Rather than collapsing as a result of growing disequilibrium, a self-organising system reconfigures itself to take account of the new information. Such systems are essentially creative, with form and function engaging in a fluid process capable of evolution.

Human groups and organisations can function as self-organising systems, capable of learning and responding to their environments. Learning and creativity take place when such systems, sometimes called complex adaptive systems, occupy what Ralph Stacey calls a space for novelty, or the edge of chaos. This is characterised by 'bounded instability', which is a paradoxical state of simultaneous stability and instability. The resultant creativity involves the destruction of established patterns and the emergence of new forms of order. This process sets up tensions within a group, which are experienced as anxiety. Stacey notes that, "A group can be creative only if it holds the tension of conformity and individualism, which is only possible if the anxieties it raises are sufficiently contained."[xxix] This tension between conformity and individualism is comparable to the wave/particle duality in quantum physics, and the anxiety experienced through the process of destruction and creation is similar to the quantum superposition of states, in which many different possibilities have to be held simultaneously.

The established patterns and structures within a group are part of the dominant, legitimate system, which is explicit and approved. The new order emerges from what Stacey calls the shadow system, which is concerned with play, fantasy or subversive activity. He discusses the role of leadership in this process, which can take two forms. The first is that of a single leader with the others in the group becoming followers. This is often the most effective way of containing the anxieties of the group, as the tension between the legitimate and shadow system is located in the leader, but it creates other anxieties as it may be experienced as the re-creation of the family structure. The second is when a member of a group has a contribution to make and manages to hold the attention of the group long enough to make it. In this instance the leader-follower roles fluctuate, shifting from one person to another according to their potentials for contributing and also according to the prevailing emotional atmosphere. This is a participative process, in which the tension between the legitimate and shadow system is borne by all or most of the group members. To quote Stacey, "This holds out a greater possibility of continuing creativity, and it is likely to make the translation from creativity to innovation easier because ..... everyone has taken part in the creative process."[xxx]

This participative process can be viewed as acting within a group mind and there are three ways in which it can be facilitated. The first is through the number and quality of relationships between the individuals within the group, with particular emphasis on trust and compassion; the second requires the group members to be able to reflect upon and discuss honestly the system they constitute; and the third is the quality of leadership and the manner in which power is exercised, avoiding authoritarianism and through sharing of insights and knowledge. If these are achieved group members can jointly occupy the space for creativity in a conscious way, and the anxiety engendered through the emergence of new forms and structures is shared within the group.

A new approach for outside consultants working with change in organisations has been explored by Patricia Shaw.[xxxi] Rather than analysis and prescription, based on the legitimate system, she describes how engaging with the shadow system of an organisation to facilite the emergence of change is more effective, although the outcome is unpredictable. In a particular instance of using this

process, when working with a UK local authority, what developed was a 'forum' which any member of staff was free to attend, and in which people were free to talk about issues which concerned them in a way that was not possible within the established, legitimate system. Complexities and structures, with various fluid sub-groups, emerged from this and eventually it acquired a quasi official status. In effect, it began to be incorporated into the legitimate system of the organisation.

A brief excursion into the realm of Star Trek (New Generation version) will help demonstrate the distinction between the legitimate and shadow systems. On the Enterprise, Deanna Troi is the official counsellor, working within the legitimate system. The bartender and lounge hostess[xxxii] is Guinan, a member of a non-earth race, the long-lived El-Aurians. She acts as an unofficial counsellor, operating within the Enterprise's shadow system. Many episodes underline the significance of her role and her effectiveness at helping change emerge within the crew and crew members, whilst not appearing to be doing much at all.

Relationships to Braziers and Braziers method

I've deliberately not made reference so far to the ideas of Wilfred Trotter and Norman Glaister, and the Braziers sensory/executive method. There is time set aside this afternoon to discuss these in the context of this lecture. However, I would like to make some points which I think are relevant to the philosophy of Braziers.

In the first place, quantum physics does provide the possibility of a physical basis for the concept of a group mind, and even, as I have attempted to demonstrate, a basis for what might be called the universal mind.

Secondly, the application of quantum principles to groups reinforces the Braziers distinction between sensory and executive. The sensory process equates to the exploration of quantum possibilities, and the executive to the resolution of these into a fixed reality. The sensory/resistive distinction relates very clearly to the difference between the wave (sensory) function and the particle (resistive) function, a point that was originally made by John Woodcock when he reviewed *The Quantum Self* [xxxiii] for Research Communications.

Thirdly, this wave/particle duality which is fundamental to quantum reality does put the final nail in the coffin, if one were needed, of there being two types of people - sensory and resistive. Quantum reality demonstrates that all of us have both wave and particle aspects, although we may operate more in one mode than the other.

Both quantum theory and complexity theory provide some insight into the role of the sensory process, as developed by Braziers. In the language of quantum physics, the sensory process should facilitate the overlapping of the wave functions of the group members, strengthening and multiplying the relationships between individuals and eventually leading to the emergence of a larger whole, that is the group mind. It also enables all options to be explored, akin to the quantum superposition of states or virtual transitions, until a decision can be made and one actuality chosen. In quantum terminology, this is the collapse of the wave function. The role of the executive is to approve this actuality and take decisions based upon it. The movement of an issue or idea between the executive committee and the sensory committee parallels the evolutionary process described by McFadden in *Quantum Evolution*, when possible evolutionary directions are explored at the quantum level as virtual transitions, and eventually one direction is 'chosen'.

From a complexity theory perspective, an effective sensory process should help a group contain the anxiety generated by the tensions of group life, facilitate learning and foster creativity. I would suggest that it should also serve to facilitate the emergence of aspects of the shadow system. The application of complexity theory to groups also provides some insight into the difficult issue of leadership, which has been a topic of concern at Braziers, and reinforces some of the conclusions from quantum reality about the importance of developing the number and strength of relationships between people and maximising opportunities for communication and information exchange.

Both approaches, quantum physics and complexity theory, emphasise the fluid nature of such relationships, both between individuals and within our own minds. It would be, I suggest, a mistake to fall into the trap of being too prescriptive - to say that a particular group of (differentiated) individuals should be capable, following a due process, of creating a group mind. I believe that what the new physics shows us is that such an emergent group mind would not be a fixed, static entity, but one that is constantly shifting, varying in strength and intensity, now encompassing some individuals, now others, and capable of adaptation and change.

Conclusions

There are two things I would like to say to conclude this lecture. One is to emphasise the essential unbroken wholeness of 'life, the universe and everything'. If quantum reality teaches us any one thing, it is that distinctions we make between ourselves as people, between groups or between nations are merely one aspect of reality - the particle aspect. We must not forget that the wave aspect connects us to everyone and everything else, not just externally but internally. We are part of them and they of us, whether 'they' are the refugees from Afghanistan, the managers of British Nuclear Fuels Limited or a group of drunken football hooligans. Social inclusion may be a fashionable phrase, but it begins, at least nominally, to address this reality. A world which ignores communities and sections of society will be diminished, just as we are diminished as people if we isolate or ignore parts of our own selves.

My other concluding point is that we cannot control or predict what will emerge from the evolutionary process of quantum reality or the creativity which exists at the edge of chaos. A multi-mental organism which is coherent over time may one day emerge either here or elsewhere in the universe or, for all we know, may have already emerged on some distant planet. However, we cannot say that this is the next stage in the evolutionary process. What we can do is explore what we understand by a group mind in the present. We can engage with the process of which we are a part, and be aware that our participation changes and shapes that process. Beyond that, we can only remain open to what might emerge.

Penny Pitty
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[i] The Dancing Wu Li Masters, by Gary Zukav, 1979, p 328

[ii] The Quantum Self, by Danah Zohar, 1990, p 9

[iii] Reported in the New Scientist of 6 March 1999, p 24 - 28

[iv] The Quantum Self, by Danah Zohar, 1990, p 14

[v] The Web of Life, by Fritjof Capra, 1997, p 31

[vi] In Search of Shrodinger's Cat, John Gribbin, 1984, p 173

[vii] An example from Quantum Evolution, Johnjoe McFadden, 2000, p 175

[viii] Quantum Theory, David Baum, 1951, p 170

[ix] Quantum Evolution, Johnjoe McFadden, 2000, p 311

[x] The Quantum Self, by Danah Zohar, 1990, p 66

[xi] Quantum Evolution, Johnjoe McFadden, 2000, p 305

[xii] Order out of Chaos, Ilya Prigogine, 1984, p 293

[xiii] The Quantum Self, by Danah Zohar, 1990, p 94

[xiv] ibid p 104

[xv] ibid p 115

[xvi] Quoted by Nancy M. Dixon in Dialogue at Work, 1998

[xvii] On Dialogue, David Bohm, 1990, p 22

[xviii] The Quantum Society, by Danah Zohar and Ian Marshall, 1993, p 100

[xix] A Safe Place for Dangerous Truths, Annette Simmons, 1999, p 14

[xx] ibid p 156

[xxi] Through the Time Barrier: p107, Danah Zohar quoting Jung: The Collected Works, Vol 8, 1960

[xxii] Synchronicity - The Bridge Between Matter and Mind, David Peat, 1987

[xxiii] A New Science of Life, Rupert Sheldrake, 1981

[xxiv] A Quantum Explanation of Sheldrake's Morphic Resonance, Amit Goswami, http://www.swep.com/~hswift/swc/members/essays/Sheldrake.html (1996 probably)

[xxv] Channel 4 series of programmes called Transformations.

[xxvi] The Selfish Gene, Richard Dawkins, revised edition 1989

[xxvii] MetaSystem Transitions, Memes, and Cybernetic Immortality, Elan Moritz, 1993 at ftp://ftp.vub.ac.be/pub/projects/Principia_Cybernetica/WF-issue/Moritz.txt

[xxviii] The Meme Machine, Susan Blackmore, 1999, p 41

[xxix] Complexity and Creativity in Organizations, Ralph D. Stacey, 1996, p 152

[xxx] ibid p 157

[xxxi] Intervening in the Shadow System of Organisations: consulting from a complex adaptive systems perspective, Patricia Shaw, 1996

[xxxii] Details of Guinan's profile on the Internet at http://www.sherylfranklin.com/trekwomen_guinan.html

[xxxiii] Braziers Research Communications 14, 1994, p 25