

THEOSOPHY-SCIENCE GROUP

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This Newsletter has been somewhat delayed and I hope to do better in future but time will tell. Following the wish expressed at the end of the 2006 Theosophy-Science seminar to have another after two years rather than the usual three year interval, plans are under way for a seminar, 16-18 May 2008, with arrival 15th and departure 19th. Victor Gostin will be in charge of this seminar and I will work closely with him as he did with me last time. Would those interested in attending, please advise Victor by email victor.gostin@adelaide.edu.au with copy to me hughm@austheos.org.au. Formal registration will be required later. Please indicate any topics you think should be discussed and whether you are interested in giving a talk and tentative subject.

A Seminar : “Forefront Science and Theosophy” is being planned by the TS in New Zealand to be held in Auckland, October 21-22. Victor Gostin will be the leading speaker with other speakers from New Zealand with a range of scientific and spiritual backgrounds. Australian members are very welcome to take part: contact Murray Stentiford: nvp@theosophy.org.nz.

A group of members in Melbourne are planning a one day Theosophy-Science seminar to be held on 1 September with speakers including Dr Victor Gostin, Prof. Richard Silberstein, Dr. Alek Kwitco and Dr.Dara Tatray. Melbourne Lodge will provide lunch.

“Science, Pseudoscience and Metaphysics - exploring the boundaries”

(A talk by **Dr David Allan** at the Theosophy- Seminar, Springbrook May 21 2006)

(David is a very welcome new member of our Group who is highly qualified in Engineering Science and has a D. Eng.degree from the University of Queensland).

This talk explores the interfaces and contentious relationships which exist between Science, Pseudoscience and Metaphysics. This is an area many of us grapple with, even if subconsciously. Hopefully this talk will clarify some of the issues and let us see that these areas of human pursuit have more in common than is generally realized. Firstly to get the definitions straight, although even this is a challenge.

Science is defined in one dictionary as the systematic study of the laws and behaviour of human beings and the physical world. Another definition is tighter, seeing it as a branch of

knowledge conducted on objective principles involving the systemised observation and experimentation with phenomena, especially concerned with the material and functions of the physical universe. Science is so much a part of our lives today however that it hardly needs definition. Popularly it tends to be marketed as proven truth.

Pseudoscience is a relative newcomer in the definition stakes but in fact is as old as science itself; it is defined as pretended or spurious science; or fringe or alternative science. Its main defect is held to be a lack of carefully thought out and controlled experiments and tests that provide the foundations of the physical and natural sciences.

A definition of **metaphysics** is the theoretical philosophy of being and knowing, the philosophy of mind and the branch of philosophy that deals with the ultimate nature of things. It is not easy to precisely understand what issues are in metaphysics; but broadly it is divided into *classical* metaphysics and *popular* metaphysics. Classical metaphysics started with Aristotle and has had a rough ride at times from thinkers like Kant.

Commonly nowadays however, *metaphysics* is associated with *popular metaphysics* which includes a wide range of controversial phenomena believed by many people to exist beyond the physical. The two broad areas are *mysticism* and *occultism*, the study of which has been known as psychical research but is more respectably termed nowadays para-psychology. One reason for the present day focus on popular metaphysics may be that classical metaphysics is considered by some to have reached a dead end. By this I mean that attempts to follow the often divergent lines of thought from Descartes to Hegel and beyond involve a significant intellectual effort and can often lead to bafflement rather than enlightenment. A Theosophist might suggest that this is due to the western philosopher's focus on the thinking "I" rather than the "I" behind the thinker.

When I mentioned the contentious relationship which exists between science, pseudo science and metaphysics I was referring to the fact that formal science has been at constant war with the others since Galileo said that the Earth revolved around the Sun and not vice versa and since modern medicine dispelled the leeches and blood letters. But like the Hydra they raise their heads again and again. It is interesting to ponder why, since the triumph of science is virtually complete. The early 19th century philosopher, Auguste Comte, said that history proceeds in three stages; **superstition, metaphysics and science**. And indeed we have examples in alchemy displaced by chemistry and astrology by astronomy. Elsewhere science has conquered ailments and diseases, has sent a man to the moon and has created the internet.

Yet if you don't think that *pseudoscience* is popular then think about the phenomenal exposure of Brian Brown's book *The Da Vinci Code* and the blockbuster movie. If you don't think *popular metaphysics* has taken a broad hold then think about the number of TV programmes that have the supernatural in their storyline or the prevalence of new age magazines such as *New Dawn* or *Nexus* in newsagents' magazine racks.

Various reasons could be proposed why science's triumph is short of complete. I'll give you one that I like. I'll refer to an influential book published in 1973 called the 'Denial of Death' (1) by the US author Ernest Becker, which earned him a Pulitzer Prize. His basic premise is that the fear of death precedes most others as the driver of human behaviour. The theme may not be entirely original but his expounding of it is. To quote a few of his colourful thoughts; "Man is a creature with a name and a life history, with a mind that roams out to speculate about atoms and infinity. Yet his character is built up to deny one thing, the terror of his creatureliness --- What does it mean to be a self conscious animal? The idea is ludicrous if not

monstrous. It means one is food for the worms. This is the terror, to have emerged from nothing, to have a name, consciousness of self, deep inner feelings, a yearning for life and self expression and with all of this yet to die. It seems like a hoax.”

What does this have to do with today’s talk you may ask. Well, when this conflict surfaces in our minds, many of us must have an answer to questions as to why we are here and what happens next. The first port of call for many is probably science, which provides so many of the comforts and answers that sustain our daily lives. Science it turns out is poorly equipped to provide us with a satisfactory answer. The scientific method, which evolved through the Greeks and Arabs, as two early examples, was highly refined from the 17th century onwards in Europe and has now sent men to the moon and provided us with at least a short term immortality from the common ailments and diseases that once decimated mankind.

However, as to the question of where did we come from and where do we go, the best it can offer is the Neo Darwinism of authorities such as Richard Dawkins. But people are not always fully comforted with the assurance that they are the fittest survivors of a lengthy process of random mutations and that their immortality will be the passing on of their genes to their children, if fortunate enough to have them. However, if the human evolutionary processes can be translated into reverence of the miracle science has unveiled then science moves close to metaphysics. Some eminent scientists have adopted this position and one can even discern it in Dawkins’ writings.

Many people dispel their own Denial of Death with the thought that it is impossible to know what happens next and comfort themselves with the many things that life can offer and maybe when they have an inclination to think of it, look to a long and peaceful nothingness when their life finishes. Others are not satisfied with a hedonistic or fatalistic answer and may seek immortality in an afterlife through religion or indirectly through a philosophy. The fact remains however that formal religion or philosophy are not to the liking of many today. So there surfaces in their minds an urge to some belief. This may take many forms, from extremist political to alternative beliefs reminiscent of early mankind. Prevalent forms of such emerge in what can be termed *pseudoscience* and *popular metaphysics*.

Let us look firstly at a few battle grounds between *science* and *popular metaphysics*. Most paranormal phenomena are dismissed by mainstream science because of hoaxers. A present day example is the proliferation of crop circles in agricultural fields, eg, in the UK. The casual observer could be excused for thinking that a hoaxer could not produce such wonderfully intricate designs. However hoaxers have come forward and described their process, although the jury still seems to out on this issue. Another interesting example is Dowsing or water divining. On this subject a web search reveals considerable polarized debate, often vitriolic. So again, what is the confused layman to believe?

A special report in *New Scientist* in March 2004 stated that sceptics and believers have been struggling for more than 100 years to formally decide whether or not psychic powers exist. Theosophists would be aware of the claims and accusations that followed HPB’s demonstration of psychic powers and these are nowadays downplayed by Theosophists. However there were some interesting aspects reported by *New Scientist* that throw more light on the debate between science and paranormal phenomena. This is not about popularly reported phenomena but about rigorous scientific tests at para-psychology units in well known universities. These tests usually focus on two areas, *extrasensory perception* and *telekinesis**. (* the ability of mind to affect matter).

What continues to emerge but is dismissed as ‘unscientific’ is what is termed the ‘experimenter’ effect. This is a curious phenomena whereby the outcome of an experiment depends on the beliefs of the person running it. Believers tend to get positive results while sceptics don’t. Some parapsychologists even complained that having a doubter visiting the building seemed to spoil their day’s work!

There is another factor in this murky interface between science and the paranormal in terms of its proof. Some mathematicians in the 1930’s showed that classical probabilistic rules applied to updating belief in a theory as new evidence comes in. The rule is simple; you take your original level of belief (on a scale between zero and one) and multiply it by the strength of the new evidence. The catch is that the quantification of level of belief is quite subjective. New theories not overly rocking the established scientific boat usually get an easy passage while those on the fringe will have a hard slog.

This level of prior belief factor is glossed over by most scientists yet examples are not hard to find. Some of you would know about the recent acknowledgement by the medical/scientific establishment that stomach ulcers are commonly caused by bacterial infection, not by stress, smoking, diet or an acid stomach. They can therefore be cured by a specific antibiotic. Two Perth doctors received the Nobel Prize in 2004 for this discovery, 30 years after first investigating it and 20 years after their first formal publication in a British medical journal. In the intervening years they had to contend with entrenched medical opinion and pharmaceutical interests making millions out of antacid drugs. One researcher even experimented on himself by swallowing live stomach bacteria he isolated and taking the antibiotic to cure the violent stomach pains that followed. However, there still remain a few dissenters in the scientific establishment.

A mirror image of this is that it takes a mountain of contrary evidence to overturn a cornerstone scientific theory. The Big Bang theory of cosmological evolution is one of the most cherished scientific institutions but has had to be continually tweaked by the introduction of concepts such as inflation to accommodate anomalous findings that cannot be presently explained. It seems that scientists remain human beings as well as scientists and no human being’s objectivity can be guaranteed at all times.

This is a talk about exploring boundaries however and not a witch hunt against established science, which we indeed have much to be grateful for. So it is now time to put the spotlight on *pseudoscience* rather than *metaphysics*. Pseudoscience has to plead guilty of a level of belief in a theory or proposition it often can’t support by objective evidence. Hence the often violent hostility by established science. The strengths and weaknesses of pseudoscience are best exemplified by Immanuel Velikovsky, who could be termed the ‘arch pseudoscientist.’

Velikovsky was a well educated Russian Jew born in 1895 who migrated to the US in 1939 where he spent much time researching in libraries. Over the next 20 years from 1950 he released a series of books commencing with ‘Worlds in Collision’. This became a best seller in a post world war environment receptive to New Age ideas. It also roused the deep antipathy of the scientific establishment of the time.

‘Worlds in Collision’ was an enormous achievement in lateral thinking but in hindsight Velikovsky’s contention that the planet Venus had been cast off from the planet Jupiter in early historic times and in passing by the Earth had caused the plagues of Egypt and the passing of the Red Sea stretches the credulity just too much. Velikovsky had used the fact that Venus is supposedly not mentioned by ancient astronomers before 2000 BC. Some of his predictions

were proved to be accurate by subsequent space probes, eg the fiery heat that exists under the clouds on Venus and its direction of rotation, counter to that expected, is consistent with a maverick planet rather than one with an ordered past. The bottom line however is that Velikovsky's beliefs exceeded the bounds of probability. If his work had ended there he could be justifiably labelled, in my opinion, a brilliant junk scientist.

It did not end there however. He wrote two other books, the latter the first of a series called 'Ages in Chaos'. These are in my opinion the most impressive part of Velikovsky's work for the sheer ingenuity of his ideas. By moving forward ancient Egyptian chronology, which is more tenuously established than recognized, by about 500 years, strong parallels between Egyptian records and missing Biblical events such as the Exodus emerge. However rewriting much of the accepted textbook chronology of the ancient Near East hasn't happened – it's probably still too closely associated with the name Velikovsky, even though some respected scholars are now following his lead.

His second book 'Earth in Upheaval' is just as important. In this book he is more the conventional scientist, if a maverick one. He simply assembles a large number of anomalous finds that contradict the established and cherished geological doctrine of uniformity and gradualism in the earth's evolutionary history. This includes frozen material in Alaska that consists almost entirely of torn and broken animals and trees; whole islands in the Arctic sea whose soil is packed with unfossilized bones of mammoths, rhinoceroses and horses; unglaciated polar lands and glaciated tropical countries; coral and coal deposits near the poles; the startling youth of the world's great mountain chains judging by marine fossils found there; shifted poles, reversed magnetic polarities and sudden changes in sea level revealed in strata around the world.

The result is strong evidence to the reader for frequent great global catastrophes, some in prehistoric and historic times. Acceptance of recent frequent global catastrophes however runs counter to century old geological theories and Darwinian gradualism and moreover would also open the floodgates of credibility to Atlantis theories and the like. I have spent some time on Velikovsky, partly because he is so fascinating and partly because he typifies the adventurous risk taking side of scientific pursuit which formal science should view positively but frequently disowns.

One of the problems for formal science however is that there are so many elements of pseudoscience and popular metaphysics in the public arena that it lacks the resources to debunk them all. Some are soft targets like astrology, which is a right brained look at the universe rather than left brained astronomy and vulnerable to left brained criticism. The concept of right and left brained thinking is interesting and there is good evidence that the brain is indeed wired this way. Many scientific inspirations seem to occur out of the blue rather than from an intensive period of left brain exertion. The big question is how many right brained inspirations are over the top. Some people such as Erik Van Daniken of Chariots of the Gods fame appear to have been overly right brained.

It seems in fact that although formal science is vitally necessary to us, in some ways pseudoscience acts as its guilty conscience. It seizes on facts that science can't explain and sweeps under the carpet in a furtive manner. Some of these stare us right in the face, for example Synchronicity, a term coined by Jung to describe meaningful coincidences we feel are highly improbable due to the laws of chance probability. Many find them happening at irregular intervals, and they appear to be subject to higher laws we are not privy to. A common

one I recognize is opening a book at a certain page which provides the answer to an issue one has been wrestling with; yet on closing the book it is often hard to locate that page again.

Oddly the same science that skirts around such issues admits to the dual nature of light in the incompatible forms of a particle and a wave. This is the same science that experiments with bizarre subatomic particles and accepts the strange outcomes of Heisenberg's uncertainty principle and Quantum Mechanics. In effect one could postulate that formal science has its own forms of pseudoscience but these appear to be in its blind spot.

Coming full circle almost, this is a good point to wind up. But in conclusion, I propose one explanation for the apparently irreconcilable conflict between science, pseudoscience and metaphysics. One could take the dual nature of light as an example of this. This derives from a classic metaphysical book (2) I have a great respect for which states that reality contains an indefinite multitude of truths which can be perceived as refractions on the human intellectual plane. They have a limited area in which they are valid and outside this area they fail. The problem is that we have a human need for the universal truth to be expressed as one aspect of the multitude which it is. This concept can be usefully reflected on in connection with the subject of today's talk and in relation to religious and philosophical beliefs in general.

References;

- (1) Ernest Becker. *The Denial of Death*. New York. Free Press, MacMillan, 1973.
- (2) Hubert Benoit. *The Supreme Doctrine*. New York. Pantheon, 1955. Reprinted in 1990 as, *Zen and the Psychology of Transformation*.

GEORGE ELLIS ON "THE EMERGENCE OF MIND"

George Ellis, was one of the main Speakers at the "From Stars to Brains" Conference in Canberra in June 2005 mentioned in N59, (May 2006). He is a well known mathematician and cosmologist and a Templeton Prize winner (see N55, September 2004). He spoke on "The Emergence of Mind" both on the floor of the meeting and again giving an inspiring Dinner talk on the subject.

Some Very Brief Notes (over-simplified) and isolated points from Main Talk – *The Emerging Nature of Mind*

The brain is the most complex system known. The neurological details involving the functioning of the brain via complexly interconnected neurons are well understood, including how various brain areas correlate with various aspects of consciousness. **Nevertheless, the way consciousness itself is generated is simply not understood. Nor do we understand the relation between the mind and the brain: how matter is able to support self-transcendence.** Bottom-up and top-down action (i.e. brain on mind and mind on brain) combine to create consciousness – an emergent feature.

Psychotherapy produces changes in long-term behaviour by learning which produces changes in gene expression and hence changes in neuronal interconnection. Human thoughts can cause real physical effects. **This is top-down action from the mind to the physical world. It is not included in what physics deals with.** For example, physics cannot even characterize the possibility space for chess pieces i.e the set of allowed moves. There is no charge and force field for each kind of chess piece.

Cognition and Platonic Existence

Mathematical Reality is universal. It is explored, not created. It is causally effective by discovery and utilization in science and technology. How does the mind apprehend such Platonic existence? The cumulative understanding of the underlying features of reality is built up by humanity over centuries. Mathematics; Laws of Physics; Ethics; Meaning.

Conclusion

The brain is based in physics but can comprehend and be affected by abstract entities which develop over time in the expanding universe. Some of them are discovered, not invented. **The mind can interact with Platonic worlds, i.e with entities of a non-physical nature.**

Some Points from the Conference Dinner Talk

1. Ellis draws attention to what he refers to as **the extraordinary nature of emergence** – Stars, galaxies, planets, Life on Earth, Humanity and all its achievements, technology. He asks: In terms of the human brain, how does mind arise out of protons and electrons? How does mind develop through reading DNA? How did all this come about in historical terms from an almost featureless primeval universe? How did the context come to be right for all this to happen?

2. Ellis argues from cosmological history (see next paragraph) that the **higher levels must have real causal power**. Physics and chemistry have made tremendous progress in understanding the nature of the world around us. Molecular biology shows how complex molecules underlie the development and functioning of living organisms, while neurophysics illuminates the functioning of the brain. In the hierarchy of complexity there are links from each level to the one above. On a reductionist world view, physics is all there is. However, this view omits important aspects of the world that physics has yet to come to terms with. We live in an environment dominated by objects embodying the outcomes of intentional design. This is a simple statement of fact – there is no physics theory that explains the nature, or even the existence of football matches, teapots or jumbo jet aircraft. This situation would remain even if we had a satisfactory physics “theory of everything”. Physics would still fail to comprehend human purpose.

Can one nevertheless claim that physics causally determines uniquely what happens, even if we cannot predict the outcome? This would imply that at the time of decoupling of the Cosmic Background Radiation, the supposedly random positions and velocities of the particles were placed so precisely as to determine say the *inevitability* of the Mona Lisa or Einstein’s theory of relativity. Those fluctuations are supposed to have been random, which means they do not encode any purpose or meaning. However such meaning did indeed come into being. Ever higher levels of interaction and causality arose as complexity spontaneously increased in the expanding universe, allowing life to emerge.

It is plausible that what actually happened was the contextual emergence of complexity: the existence of human beings and their creations was not uniquely determined by the initial data; rather the underlying physics together with that initial data created a context that made their existence possible, leading to the eventual development of minds that are autonomously effective, able to create higher level order embodying purpose and meaning. Physics *per se* cannot causally determine the outcome of human creativity, rather it creates the possibility space allowing human intelligence to function autonomously. Conditions at the time of decoupling of matter and radiation 14 billion years ago were such as to lead to the eventual

development of minds, able to create higher-level order (such as, for example, the Hubble Space Telescope) embodying purpose and meaning.

On this view the higher levels in the hierarchy of complexity have autonomous causal powers, functionally independent of lower-level processes. Top-down causation takes place as well as bottom-up action with higher-level contexts determining the outcome of lower level function and even modifying the nature of lower level constituents ... physics *per-se* can't causally determine the outcome of human creativity, rather it creates the possibility space allowing human intelligence to function autonomously.

Physics by itself cannot comprehend any behaviour that is adaptive and depends on context, for example beaver dam-building and the dances of bees. It is plausible that these too emerge at late times in the expanding universe as higher-level autonomous behaviours made possible but not causally determined by the underlying physics and chemistry. The challenge to physics is to develop a realistic description of causality in truly complex hierarchical structures, with top-down causation and memory effects allowing autonomous higher levels of order to emerge with genuine causal powers. Attempts to relate physics to complexity so far – such as chaos theory, complexity theory, take us only a small step on this road.

Ellis notes that some eminent colleagues claim that the abovementioned limitations on physics could in principle be overcome with sufficiently powerful computers. However, he argues back in considerable detail that quantum uncertainty must, in the end, defeat any such attempt. The specific evolutionary outcomes of life on Earth cannot be uniquely determined by causal evolution from conditions in the early universe, or from detailed data at the start of life on Earth.

THE GOLDBLOCKS ENIGMA – Why is the Universe Just Right for Life?

Comments on the above book by Paul Davies [Allen Lane (Penguin), London, 2006]

This is the title of the latest book by Paul Davies. The theme is the nature of the universe and its seemingly uncanny suitability for life. This has been a recurring theme, in one form or another, in a number of books (and articles) by Davies over the last 20 years or so, beginning with *The Cosmic Blueprint* in 1988. Perhaps the most significant of these was *The Mind of God*, (1992) which was largely responsible for his Templeton Prize. There he came very close to concepts which ring a bell with Theosophists. He implied that, although he did not believe in a traditional creator God, he could embrace “an abstract principle or ground of being”. He even suggested that mysticism might be the only way to ultimate truth, and noted that a number of scientists (including Pauli and Schrödinger) were interested in it. He received a lot of (unjustified) flak for his outspoken views and he seems to have since tried to be rather cautious in expressing his views on such subjects.

In the Preface of the current book, Davies notes that early in his career, he came across a paper by Brandon Carter introducing the concept of the “Anthropic Principle” which was then not taken seriously by most physicists. However with the advent among physicists of the concept of a multiverse with varying laws among the individual universes, it seemed much less surprising that one universe (ours) among the multitude might just happen to have appropriate laws allowing life to develop. “At this stage atheists began to take an interest”. In 2003, Davies co-chaired a workshop at Stanford University: “Universe or Multiverse”, funded by the Templeton Foundation. A further follow-up workshop was held at Stanford in 2005. The talks were published in a book edited by Bernard Carr with the above title. (Cambridge University

Press, 2006). Davies does not mention in the current book his contributions to these conferences but see footnote 2 at the end of this item.

Davies says “in some ways, the (current) book is a sequel to ‘The Mind of God’ but in spite of the emphasis on the deep and meaningful, I intend it also to serve as a straightforward introduction to modern cosmology and physics. ... I have made no attempt to consider other modes of discovery, such as mysticism, spiritual enlightenment or revelation through religious experience”. I will try here to concentrate on those sections of the book that are most directly relevant to the question of life and mind in the universe, at the expense of more technical material. Even that limited objective is a huge task.

Chapter 1 is entitled “The Big Questions – *Confronting the mysteries of existence*”. It begins with the statement (much abbreviated): “For thousands of years, humans have sought answers to such questions as: Why are we here? How did the universe begin? How is the world put together? For all recorded human history, people have sought answers to such ‘ultimate questions’ in religion and philosophy. Today, however, many of these big questions are part of science. Arguably the most significant fact about the universe is that we are part of it. Many scientists and philosophers fervently disagree but Davies says: “**My position however, is that I take life and mind (i.e. consciousness), seriously**” [Emphasis Mine].

There are several essential ingredients for life; certain elements including especially carbon and oxygen; liquid water; a stable environment (provided for us by the Sun) over a very long time as shown by modern cosmology. There are also certain stringent requirements in the laws and numerical constants of physics (as shown, for example by Hoyle in relation to the synthesis of carbon and oxygen, and described by him as ‘a put-up job’). On the face of it, the universe *does* look as if has been designed by an intelligent creator for sentient beings. Until recently this “Goldilocks factor” was almost completely ignored by scientists but science is at last coming to grips with the enigma of why the universe is so uncannily fit for life.

Throughout history prominent thinkers have sought a deeper hidden reality and consulted shamans, mystics and priests. The word ‘occult’ originally meant “knowledge of concealed truth” and seeking a gateway to the occult domain has been a preoccupation of all cultures from the dreaming of Aboriginal Australians to the myth of Adam and Eve. Plato compared the world of appearances to a shadow on the wall of a cave. About 350 years ago, Isaac Newton, mystic, theologian and alchemist, stumbled on the key to the universe – a cosmic code that would open the floodgates of knowledge. In spite of his mystical leanings, he did more than anyone to change the age of magic into the world of science. The ancients were right: beneath the surface complexity of nature lies a hidden subtext written in a subtle mathematical code. Modern scientists, while mostly not religious, accept that an intelligible script underlies the workings of nature. We human beings have been made privy to the deepest workings of nature. Mindless blundering atoms have conspired to make, not just life, not just mind, but *Understanding*. The evolving cosmos has spawned beings who are able, not merely to watch the show, but to unravel the plot.

The work of Galileo, Newton and their contemporaries did not take place in a cultural vacuum. They regarded the laws as thoughts in the mind of God and their elegant mathematical form as a manifestation of God’s plan for the Universe. Their work was the culmination of many ancient traditions, especially Greek philosophy which believed the world could be explained by logic, reasoning and mathematics. Davies says that the existence of laws of nature is the starting point for his book.

Today the laws of physics occupy the central position in science; they have assumed an almost deistic status. Galileo said ‘the great book of nature can be read only by those who know the language in which they are written and this language is mathematics’. One of the deepest mysteries of science is: why is nature shadowed by a mathematical reality? Why does theoretical physics work? The laws of physics inhabit an abstract world and take on a life of their own. Many modern mathematicians are Platonists, (at least at weekends). Theoretical physicists also find it natural to locate the laws of physics in a Platonic realm.

There is much that scientists don’t understand such as how life began and they are almost totally baffled by consciousness. [My emphasis] Many scientists struggling to construct a comprehensive view of the universe see God as a cosmic magician and want to get rid of God altogether. By contrast, the God of scholarly theology is cast in the role of a cosmic architect manifested through the rational order revealed by science. That kind of God is largely immune from scientific attack.

The next chapter explains what we know about the universe. The age of the universe is 13.7 billion years. The big bang was everywhere. Space is *in* the universe rather than the universe being in space. There is no centre of the universe. The big bang was everywhere. The oldest galaxies are seen as they were 12 billion years ago. The furthest back in time we can see is the Cosmic Microwave Background radiation (CMB) at age 380,000 years after the origin, before galaxies began to form. Much information is contained in the tiny systematic fluctuations in temperature of the CMB. These fluctuations are the origin of all structure in the universe including galaxies and stars, planets, and hence life. There is a distance horizon set by the speed of light beyond which we cannot see, currently at 46 billion light years as calculated by Davis and Lineweaver (See N58, December 2005), not 13.7 billion light-years as often mis-stated even by professionals. (That figure ignores the fact that the universe has been expanding ever since the origin, wrongly assuming that special relativity applies). There are no doubt galaxies beyond our horizon which we cannot see. The laws of physics appear to hold as far back as we can see, otherwise “life could not emerge, still less evolve to the point of intelligence”.

The bulk of the book ranges widely over physics and cosmology with emphasis on factors relevant to the existence of life but I have room only for a few key points with emphasis on topics related to the question of life in the universe before passing to Davies’ summary of the various attitudes to the biofriendliness of the universe, giving his own personal preferred belief. The universe is very smooth and uniform, apart from the tiny CMB fluctuations, (themselves very important). It has also picked a happy compromise in expanding slowly enough for galaxies (and hence ultimately life) to form but not so slowly as to risk a rapid collapse before life could form. Furthermore the expansion rate had been decreasing long enough for life to form before relatively recently reaching what rather seems the natural state of increasing expansion rate. (John Barrow considers this a very important example of the ‘anthropic principle’ i.e. a feature conducive to the emergence of life).

Davies says; “There is one aspect that often gets left off the list of observed properties (of the universe) and that is that there are observers to observe them. The role of the observer in science is a peculiar one, and it makes scientists a little queasy”. (Note for example the special role given to observers in quantum mechanics). ... “This rather trivial example is a pointer to a more weighty consideration. Observers – at least in our experience so far – are living organisms”.

There is a reasonable argument that if the universe is **especially fit for life**, it would be surprising if life occurred only once in the universe, if indeed the whole vast universe existed just to make life possible on one seemingly insignificant planet around a particular star and nowhere else. It is this thought, I believe, which drives Davies' expectation of life existing elsewhere, a topic in which he seems to be becoming increasingly interested.

There is of course a chapter on a multiverse with each universe having its own separate set of laws as an explanation of the biofriendliness of this universe. We just happen to hit the jackpot. It is a very extravagant way out of not admitting that life is special. This is a popular idea among many cosmologists, including Martin Rees. I suggest that Davies' personal attitude to this is indicated in Note 2 below. (Of course a multiverse with each universe having the same laws would not solve the goldilocks enigma).

In a chapter "How Come Existence: - is life written into the laws of the universe?", Davies cites views among scientists ranging from Stephen Hawking's: "The human race is just a chemical scum in a moderate-sized planet" through palaeobiologist, Simon Conway Morris: "There is seeded into the initiation of the universe itself the inevitability of intelligence" to Nobel prize winning biologist Christian de Duve "who describes the universe as 'pregnant with life' and calls life a cosmic imperative"; Davies also quotes biophysicist Stuart Kauffman as echoing Freeman Dyson with "We are at home in the universe". He cites the tacit assumption of those involved in the SETI project that life is not just a freak phenomenon on Earth.

At the end of the book, Davies summarises the various attitudes held among scientists to the Goldilocks Enigma, listing 6 broad categories.

A: The Absurd Universe (his term) which he believes is held by most scientists. The universe is as it is mysteriously. There is no God, no designer, no teleological principle. Life has emerged from cosmos and mind from life purely by accident, seemingly against the odds. The fact that some minds are capable of understanding the universe is dismissed as a fluke.

B: The Unique universe. There exists a deep underlying unity in physics (a 'theory of everything') which is sought after but not yet achieved. The biofriendliness of the universe is shrugged off as an insignificant coincidence. It is unexpected good fortune that this fix is consistent with life and mind.

C: The Multiverse.

Davies has given a lot of attention to this theory. He says a growing number of scientists now support some version of a multiverse; either arising from separate big bang origins or in so-called 'pocket universes'; i.e. different regions of **the** universe, (presumably well beyond our observability horizon). Life only arises in those universes in which the laws happen to be just right for life, neatly explaining the Goldilocks enigma. As living beings we can only find ourselves in such a universe. Davies, who has given a lot of attention to this theory, notes that many, like him, see this as a very extravagant way to explain bio-friendliness.

D: Intelligent Design

The traditional monotheistic religious view is that the universe is designed and created by God to be suitable for life with sentient beings part of God's design. This, says Davies, explains nothing unless one can explain **how** God did it. It also runs into the problem of God's origin. Presumably, bearing in mind the recent claims of 'intelligent design', Davies says the designer need bear no relation to the traditional God of monotheism.

E: The Life Principle This replaces a traditional God with a more subtle purpose-like life principle. In short, it builds purpose into the workings of the cosmos at a fundamental level without an unexplained pre-existing agent to inject purpose miraculously. The disadvantage is that teleology represents a decisive break with scientific tradition in which anything goal-

oriented is seen as anti-scientific. Critics ask how the universe knows about life in order to contrive its eventual emergence. A life principle must be accepted as a brute fact along with the laws of physics.

F: The Self-Explaining Universe.

Davies notes that there are models involving causal loops or backwards-in-time causation, where the universe creates itself. Asking “why this particular self-explaining self-creating system?” he answers: “I have suggested that only self-consistent loops capable of understanding themselves can create themselves, so that only universes with at least the potential for life and mind really exist”. What a contorted long way round (reminiscent of angels-on-the-head-of-a-pin type arguments) to justify his obvious inner convictions!

Final Thoughts

Davies notes that his own inclinations clearly lie with E and F, saying: **“I do take life, mind and purpose seriously; I concede that the universe at least *appears* to be designed with a high level of ingenuity ... Many scientists will criticize my E/F inclination as being crypto-religious, betraying a nostalgia for a theistic worldview with a special place for mankind”**. He attempts to save face by saying it does not have to be precisely *Homo sapiens*. He then makes the following rather important statement: **“I do believe that life and mind are etched deeply into the fabric of the cosmos, perhaps through a shadowy, half-glimpsed life principle, and if I am honest I have to concede that this is something I feel more in my heart than in my head. So maybe that is a religious conviction of sorts”**.

He acknowledges that for most scientists, any suggestion of a teleological trend or progressive evolution towards consciousness is anathema. ... “most scientists stick with something like position A and get on with their work, leaving the big questions to philosophers and priests.”

Footnote 1. In a contribution to a book on panentheism, Davies wrote an article called “teleology without teleology” (See N54, May 2004) in which he said that he could envisage a creator who designed flexible laws which ensure the eventual development of life through the operation of complexity without the need for specific interference along the way,

Footnote 2. Davies’ contribution to the 2003 Conference: “Universe or Multiverse” was entitled: Multiverse or Design? Reflections on a ‘Third Way’. He said: “In this essay, I shall argue that both the Cosmic Designer and multiverse explanations suffer from serious shortcomings. I shall then sketch some ideas that have been germinating in my mind for some time of a ‘Third Way’ to explain the bio-friendliness of the universe”.

The corresponding presentation to the 2005 conference was entitled “Universes Galore: Where will it end”? Under the sub-heading “the Third Way,” he says: “Considerations of anthropic fine-tuning seek to explain the appearance of an otherwise puzzling link between the universe on one hand and life on the other. Why should there be a connection? What does the universe know about life? What do the laws of physics know about consciousness? The most obvious way to establish a link between life and cosmos is to postulate a ‘life principle’ (or, extending this to encompass observers, a ‘mind principle’). Indeed, many scientists have suggested just such a thing. It is often claimed by astrobiologists that life is written into the laws of physics or built into the nature of the universe.”

Regards to you all,

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