FROM:

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Of the Theosophy-Science Group in Australia

WHAT IS LIFE?

A precis of lecture by Sir Paul Nurse, and commentary by Edi Bilimoria, England

The full talk is available on: http://www3.imperial.ac.uk/events/theschrodingerlecture

Edi writes: "I recently attended (on 22 November 2011) this prestigious public lecture at Imperial College:

> ***What is life?*** *The 2011* Schrödinger *lecture given by the President of The Royal Society and Nobel-prize winning geneticist, Sir Paul Nurse.*

The following is a factual précis of this talk delivered, unsurprisingly, with pristine clarity and focus. My own comments are stated indented in square brackets […].

OBJECTIVE OF THE LECTURE

To respond to Schrödinger's question ***What is life?*** immortalized as the title of his book.

THE APPROACH TAKEN

To expound those characteristics of life as distinct from non-life: to discern the living from the non-living.

> [It soon became apparent that the approach would be entirely materialistic: the hylozoism principle enshrined in the esoteric doctrines would mean nothing to Sir Paul. This principle affirms that there is no such thing as dead (or non-living) matter and everything, from the smallest subatomic particle to the minutest infusoria is conscious at its own level: that what varies in the 'upward' ascent is not the fact of consciousnesses but the degree of awakened consciousness.
> Also, none of Schrödinger's profoundly metaphysical questions were touched upon. A key passage from Schrodinger's great book, also comented upon by Ken Wilber is given at the end.]

KEY CHARACTERISTICS OF LIFE

- Heredity (Schrodinger referred to the 'code script' on p. 20 and p. 60 in his book.)

  Information is implicit in the organization of the genes. Solidity and stability are vital for life.
- The gift of self-organization – self order (p. 77 in Schrodinger's book.)

ATTRIBUTES OF LIFE

1. Life Is Chemistry

Life is made of chemistry: life is built on chemistry.

> [This is more in the nature of a belief system than a considered position taking cognizance of all evidence; all very much in line with the pronouncements of Sir John Maddox, the former editor of *Nature* who used his position and influence to denounce Rupert Sheldrake's first book and denigrate the work of Jacques Benveniste on the memory of water.]

The vital processes of life are chemical processes – the notion pioneered by Lavoisier.
The basic building block of life, the chemistry of life and the natural world is carbon – the residue from decaying star systems.
The ability of carbon to form long chains of polymers is crucial for encoding information.
Silicon might be another possible contender for the building block.
Biology has expelled both Aristotle's ideas of teleology (explanation of phenomena by purposive design in the material world, rather than postulated causes) along with all concept of vitalism.

> [So the sterling work of such as Rupert Sheldrake on morphogenetic fields and Bruce Lipton's *Biology of Belief* can conveniently be ignored.]

2. Metabolism and Self-Organization

Enzymes are critical for metabolism incorporating the many 100's of chemical reactions occurring all at the same time in the space of even one single cell. This implies that the Second Law of Thermodynamics is reversed *locally.*
Viruses do not constitute life per se, but are "a subset of life" because their parasitic function survives by drawing upon the parent body in which they are embedded.
Turing's equation $dtq = \underline{D}\ \Delta q + R\ (q)$ is the governing principle whereby structures built up by spatial organization spread over distance and also in time.
Homoeostatic mechanisms serve to keep cells stable by way of regulation by negative feedback loops.

3. Heredity

Gregor Mendel was the founding father. It is the method of science to discard the insoluble and deal only with the solvable, with what we can understand. Therefore Mendel focused on pea crossing (experiments from which he deduced two generalizations which later became known as *Mendel's Principles of Heredity*).

> [This is a very convenient use of Occam's razor. Intended to pare away the superfluous, the razor is conveniently used nowadays (but not by Mendel) to slice off inconvenient evidence that stands in the way of dogma.]

Therefore a particulate theory of heredity is unchanging. Particles, i.e. genes determine the characteristics of life because particles encode information.
This point was reinforced with a diagram upholding Francis Crick's *Central Dogma of Molecular Biology* showing how information flows only one way from micro to macro: from the cell to the soma.

> [Amit Goswami in *Creative Evolution* shows very convincingly how information can also flow in the reverse direction; also how the whole organism works as a whole towards orchestrating its intended purpose and function. And in fact this central dogma is in flagrant breach of a central tenet of esoteric science affirmed by centuries of sages, ancient and modern: that downward causation (quantum consciousness in popular terms) is the primary mechanism; upward causation is also necessary but not the principle driving force.]

4. Heredity
Heredity underpins the evolution of life by natural selection. Evolution means life evolves: the mechanism is natural selection (not only Charles Darwin's idea – tribute was paid to Darwin's grandfather Erasmus Darwin). So if you have a system with heredity them evolution by natural selection is a foregone conclusion.

5. Systems and Information Management
Networks hold the key to how complex systems manage information. The double helix is a digital biological information storage device. Networks are not just linear pathways but their complexity exists in other dimensions and, like transport hubs, also display a hub characteristic. On these grounds life is not so much hardware but 'wetware' because the system can be rewired.
Living things have the remnants of everything that went before them [arguable the only comment with faint esoteric echoes. Recall the title of Sheldrake's second book *The Presence of the Past*].

NEW LIFE FORMS
The discovery of new life forms could change our perception. New forms could emerge from: 1. outer space; 2. deep inside the oceans; 3. different life principle: such as one based on silicon.
Neurobiology would be very different. It will be 100's of years before we sort out what consciousness is.

> [One recalls Krishnamurti's story that a man trying to make a polished mirror surface by rubbing together two stones may carry on for 100's of years without success. If it takes 100's of years to sort out consciousness, perhaps science should consider a new approach.]

Key extract from Erwin Schrödinger, *What Is Life?* Cambridge University Press
The scientific picture of the world around me is very deficient. It gives a lot of factual information, puts all our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us. Science cannot tell us a word about red and blue, bitter and sweet, physical pain and physical delight; it knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these domains, but the answers are very often so silly that we are not inclined to take them seriously. So, in brief, we do not belong to this material word that science constructs for us. Science cannot tell us a word about why music delights us, of why and how an old song can move us to tears? Science can, in principle, describe in full detail all that happens in our sensorium and motorium from the moment the waves of compression and dilation reach our ear to the moment when certain glands secrete a salty fluid that emerges from our eyes. But the feelings of delight and sorrow that accompany the process science is completely ignorant—and therefore reticent. And science is reticent too when it is a question of the great Unity the most popular name for which is God.
The scientific worldview contains of itself no ethical values, no aesthetical values, not a word about our ultimate scope or destination, and no God, if you please. Whence came I, whither go I? That is the great unfathomable question, the same for every one of us. Science has no answer to it.