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EVOLUTION : SCIENCE AND METAPHYSICS

A COMMENTARY ON MICHEL DELSOL'S ARTICLE

Mariano ARTIGAS & Colin PRICE

RÉSUMÉ : Le néo-darwinisme ressemble à une île qui serait à la fois coupée de la physique et de la métaphysique. Cet article se propose de contribuer à souligner les anomalies de cette théorie sous ces deux aspects.

SUMMARY : Neo-Darwinism does appear like an island between on the one hand physics and on the other metaphysics. The purpose of this article is to help fill out the anomalies from both sides.

Darwin's theory of natural selection (1859), has since developed as Neo-Darwinism ; largely through two factors which Darwin himself was unaware, namely genetics and the role of DNA. It is also something of an island, cut off from two mainlands. First, of the physical sciences ; by the fact that evolving biological systems "grow" (which is at variance with our understanding of thermodynamical systems, and in particular the second law of thermodynamics). Secondly with theological thought which places a special emphasis on Man as well as on the role of purpose in creation. Neither of these sides fits too comfortably around Neo-Darwinism.

In a recent article M. Delsol *et al* intends to clarify these issues¹. Their main theses (if we have correctly interpreted them) are the following two.

a. Neo-Darwinism (or the synthetic theory of evolution) provides a complete explanation of evolution at the scientific level and therefore as a scientific explanation does not need to be supplemented by other non-scientific explanations to account for the driving force directing the process.

1. Michel DELSOL, Philippe SENTIS, Roger PAYOT, Régis LADOUS, Janine FLATIN, "Le hasard et la sélection naturelle expliquent-ils l'évolution ? Biologie ou Métaphysique" in *Laval théologique et philosophique*, 50 (1994), p. 7-41. In our article we refer simply to the page number, thus Delsol (7).

b. At the same time the purely scientific explanation does leave within itself room for philosophical or theological perspectives.

While we are in agreement with this overall insight into the mechanism of biological systems, we offer a critical clarification of the points made. Neo-Darwinism does appear like an island between on the one hand physics and on the other metaphysics. Our concern is to help fill out the anomalies from both sides. In particular we select four different but interconnected dimensions of this "island" problem.

1. Complexity — the problem of progress in evolution.
2. Possibilities — the inherent potentialities of Nature.
3. Necessity — contingency or necessity of order in evolution ?
4. Direction — to what end is natural selection directed ? — a divine plan ?

Delsol's article deals very adequately with all these issues and although our conclusions do not differ greatly we hope our analysis may further illuminate some aspects of these problems.

I. PROGRESS

Any discussion on the existence of directionality in evolution should begin with an inquiry as to whether the range of biological life forms exhibit a progression in complexity and organisation, either across the species range or within a species over a long time period. Two points of view are possible. There could be said to be evidence of directionality without it implying that evolution is directed towards the emergence of Man (Delsol, p. 40). But Delsol also points to a soft kind of necessity when he refers to *possibilities* inherent in nature. Also there is equal evidence that species remain stable — "punctuated equilibrium"² rather than a progression or evolution. In this sense change is a response to changed conditions, either internal to the living environment or external, as we see below with respect to "primitiveness" :

1. Progress is implied directly in the use of the word evolution, yet we must ask is progress an implicit feature of natural selection ? It could be argued that "success" in natural selection is longevity or stability. In which case, the dinosaurs (100 million years on Earth) were not unsuccessful, whereas we, a mere 2 million years old have not yet proved ourselves. The cyano-bacteria (blue-green algae) present in stromatolites, have lasted unchanged since the start of the fossil record, 3,500 million years ago. That certain species have not had to change a lot ought not to be taken to mean they are primitive.

2. A second feature which ought to be noted is the work of recent archaeobiologists on the Burgess Shale, British Columbia and elsewhere. Gould³ presents the provocative argument that the earliest life in the Cambrian period (ie earlier than 600 million

2. B. WEBER *et al* (eds), *Entropy, Information and Evolution* (Cambridge, Mass., MIT Press, 1988).

3. S. GOULD, *Wonderful Life* (London, Hutchinson, 1990). It was Gould also who suggested the idea of "punctuated equilibrium" from evidence of the fossil record — see also reference 2.

years ago) was more diverse not less, with more than 27 orders of arthropod, rather than four as at present.

3. It is said that Man himself is the most complex product of natural selection. With this we would not disagree. Yet it has to be admitted; in biochemical terms does the order of natural selection form a ranking of complexity? Since Crick and Watson (1952) discovered the structure of DNA, DNA has been seen as the one consistent feature of all life, from the "simplest" organisms to the most "complex". But the degree of the complexity from the simplest to the most complex is quite insignificant compared to the jump from inorganic matter to that of the least significant bacterium. We are led to believe that all life shares a huge level of complexity, irrespective of order on an evolutionary scale.

4. Yet over the eons greater sophistication has occurred, for instance in visual perception, the nervous system etc. While some offer no distinct advantage over others, for instance flight in insects, birds and bats there is also a distinctive trend which leads in Man to the biological organisation that leads to the emergence of his unique characteristics such as intelligence, speech and social organisation.

II. POSSIBILITIES

That matter is capable of "complexification" (as de Chardin called it) is undeniable, in view of the fact that we are all alive, yet the "strangeness" of life remains a puzzle (Delsol, p. 39). Darwin himself once described life as "Nature prodigious in variety". But physically it is not obvious not only that life should arise but that it could arise. Physically we live in a Universe in which entropy is steadily increasing, which means an inclination to disorder not order. Yet the biological world is steadily increasing order, on the bases of what? Possibilities? A plan? Peacocke⁴ likens this to the playing of a fugue whereupon all variations and possibilities are ultimately played out as the actualities of the fabric of life. But by what means and why are possibilities played out as actualities? Why should there not be a steady decline, for instance?

Prigogine⁵ has done much to resolve this problem by making a distinction between the sort of thermodynamic system life might represent — "an open system far from thermodynamic equilibrium". At this level self-organisation is possible, seen for instance in the cyclic chemical reactions, like that of the Belousov-Zhabotinsky variety⁶.

At the macro-molecular level the work of Eigen⁷ has produced some remarkable indications of self-organisation.

However neither the work on self-organisation is sufficient in itself to explain the emergence of chemicals like the nucleotides and enzymes which possess immense

4. A. PEACOCKE, *God and the New Biology* (London, Dent, 1986).

5. I. PRIGOGINE and I. STENGERS, *Order out of Chaos* (London, Heinemann, 1984).

6. See J. TYSON, *The Belousov-Zhabotinsky Reaction* (Heidelberg, Springer-Verlag, 1976).

7. M. EIGEN and P. SCHUSTER, *The hypocycle. A principle of Natural Self-Organisation* (New York, Springer-Verlag, 1979).

complexity. Neither too is the classic work of Monod⁸ on chance and necessity also sufficient to explain how randomness alone can produce such order when it is apparent that randomness is more likely to increase disorder not order⁹. The physical sciences have still a long way to go before an understanding can be given of how complexity emerges and how complexity gives rise to life. This is not a defect of science but a real gap in our present day understanding. It is likewise, not a gap into which we propose to posit God.

III. NECESSITY

From possibility comes tendency. Possibilities might be actualised as tendencies but even as tendencies they can not be equated with necessities. What is possible might not be actual and what is actual might not be necessary but only contingent on other arbitrary factors. Salvador Luria, has said "*All that will be is the descendent of what is just as what is, comes from what has been, not from what might have been... Man... is but as small sample of all past opportunities*"¹⁰.

This is an important comment. Even if Nature had a plan, that plan would have been more often than not, thwarted. It has been estimated that in the last great meteorite disaster to hit the Earth marked geologically as the Tertiary/Cretaceous interface over 90% of all *species* were destroyed, as well as most of all life. The present life-forms on Earth including Man are descendants from those few remaining species. It is again Gould who chillingly remarks that Man might not have been.

Chance forms a large determining factor not only on how things evolve but also what evolves. If the mammals had been wiped out 65 million years ago there would be no Man today. We can not therefore say that the object of evolution was to evolve towards Man. Even so, as Delsol (p. 41) says "chance explains everything but it would explain nothing at all if living matter did not possess these possibilities whose unfathomable richness" is evident in all living things.

Given that chance has a definite role in evolution there seems also to be an inclination to explore possibilities, so is there direction?

IV. DIRECTION

The great question (Delsol, p. 41) is does evolution require a plan? Darwin proposed natural selection because he wished to distance science from current forms of teleology, such as that of William Paley¹¹. Theologians may talk of teleology, that is evidence of purpose and overall goals, but natural selection has no obvious place

8. J. MONOD, *Chance and Necessity* (London, Fontana, 1975).

9. See also, for instance: R.F. RAYMOND, J.F. ATKINS (eds), *The RNA World* (New York, Cold Harbour Springs, 1993).

10. SALVADORE LURIA, *Life, the Unfinished Experiment* (New York, Scribner, 1973).

11. C. DARWIN, *On the Origin of Species* (London, 1859, Penguin, edition 1968) "this doctrine [ie Paley's] if true would prove fatal to my own theory", *op. cit.*, p. 227.

for teleology. Yet Dawkins' work, perhaps as extreme as any, has to place a purpose in the Selfish Gene¹². Dawkins talks also of a Blind Watchmaker¹³ to emphasise his avowedly atheistic and stochastic position. To Dawkins a body (any body) is simply the gene's means of waiting — for the gene to make more genes. Yet for him life or the genes have purpose — to replicate and to survive and to incorporate any modifications that might enhance survival. These three factors must of necessity be present in the genes of every species. And if at least one set of goals why not by the same token, many goals?

From another direction but equally materialistic comes the idea of the Anthropic Principle, which again can lead to a metaphysical or a theological point of view¹⁴. Proponents of the Anthropic Principle¹⁵ argue that the emergence of life at all is remarkable given the huge complexities involved. But they then use this fact positively to argue that the Universe *must* have intended life to emerge. This is to say that life could have, more easily, *not* emerged. Indeed the actual possibilities of life emerging purely by chance is billions and billions to one, against. Reversing this argument: with so many factors needed to fulfil the basic conditions of life, and with these factors being fulfilled, life must have been intended.

It is here we meet with the cosmologist who envisage the universe simply coming into being from a singularity, the Big Bang¹⁶. Is this itself a model for how life sprang from inanimate matter? In which case we are not talking of chance, but of one definite but undefineable, single event.

Finally from considerations of the philosophy of time, (and Dollo's law) there is no doubt that the fossil record indicates that the life process is irreversible — there is a temporal direction to the sequence of evidence, though this still leaves open the question, "directional, maybe — but is it directed?"

V. CONCLUSION

Particle physics says nothing as to how macromolecules might emerge; biochemistry little or nothing of how life emerges and biology nothing as from where life came to be. There is a divinity which shapes the form of life, and it is manifest in two distinct ways. First the more we learn from biology the more we marvel at the order and complexity of Nature. We live in a truly astoundingly beautiful world, which like a Mandelbrot pattern reveals forever more, the more we look. Secondly, is the

12. R. DAWKINS, *The Selfish Gene* (Oxford University Press, 1976).

13. R. DAWKINS, *The Blind Watchmaker* (London, Longman, 1986).

14. M. ARTIGAS and C. PRICE, *Theistic notions deriving from the Anthropic problem* (in the press).

15. J.D. BARROW and F.J. TIPLER, *The Anthropic Cosmological Principle* (England, Oxford University Press, 1986).

16. See M. ARTIGAS, "Física y creación: el origen del universo", in *Scripta Theologica*, 19 (1987), p. 347-373; W.E. CARROLL, "Big Bang Cosmology, Quantum Tunneling from Nothing, and Creation", in *Laval Théologique et Philosophique*, 44 (1988), p. 59-75; C. PRICE, "In the beginning was the Bang", in *New Scientist*, England, vol. 142, n° 1924 (1994), p. 46-47.

fact of life itself. Why should it be? This is a question beyond the merely descriptive of what it is.

Physical science can offer no explanation beyond that of self organisation in certain simple systems, while biology presupposes that chance mutations can account for the variety and diversity of life. If we had only the tenets of physics and biology we would not have sufficient knowledge to suppose life were possible. The fact that there is life is by itself no confirmation that the biologists' view of what is life, is correct. On this basis any theory would be prove adequate. It is through the efforts of other disciplines such as the physicist and metaphysician that overall perspectives can be perceived. We hope that some of our remarks might prove helpful to this end.