

Reconceptualizing the metaphysical basis of biology: a new definition based on deistic teleology and an hierarchy of organizing entities

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Abstract

Modern biology was initially established by Darwin's Origin of Species in 1859 and fully implemented by the Neo-Darwinian synthesis of natural selection with genetics that solidified in the middle twentieth century. I will argue that this 'paradigm' is based upon fundamental metaphysical assumptions that render formally-insoluble some of the most important theoretical problems of biology. These problems include the origin of life, the major transitions of evolution, the origins of sexual reproduction and of species, and the basic mechanism behind 'group selection'. The fundamental deficit of the current metaphysics of biology is that it lacks a unified and coordinated teleology (direction, purpose, goals). I advocate a new teleological and metaphysical basis for biology that is minimally based on a 'deist' conception of reality: i.e. that everything is governed by a unified principle of purpose, order and meaning. Such a teleology suggests a definition of biology around the concept of development – that is the growth, differentiation, coordination and interactions of entities; unfolding through time through the lifespan and across generations. The local and specific implementation of teleology is suggested to be accomplished by a hierarchy of cognitive organizing entities that are located outwith biological systems. These putative organizing entities work on biological entities primarily through building-in purposiveness during development. A deistic system directed by organizing entities is, of course, not a 'biological' theory; but then, neither is natural selection a biological theory: both are metaphysical frameworks for the science of biology.



Reconceptualizing the metaphysical basis of biology: a new definition based on deistic teleology and an hierarchy of organizing entities

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Modern biology was initially established by Darwin's *Origin of Species* in 1859 and fully implemented by the Neo-Darwinian synthesis of natural selection with genetics that solidified in the middle twentieth century. I will argue that this 'paradigm' is based upon fundamental metaphysical assumptions that render formally-insoluble some of the most important theoretical problems of biology. These problems include the origin of life, the major transitions of evolution, the origins of sexual reproduction and of species, and the basic mechanism behind 'group selection'. The fundamental deficit of the current metaphysics of biology is that it lacks a unified and coordinated teleology (direction, purpose, goals). I advocate a new teleological and metaphysical basis for biology that is minimally based on a 'deist' conception of reality: i.e. that everything is governed by a unified principle of purpose, order and meaning. Such a teleology suggests a definition of biology around the concept of development – that is the growth, differentiation, coordination and interactions of entities; unfolding through time through the lifespan and across generations. The local and specific implementation of teleology is suggested to be accomplished by a hierarchy of cognitive *organizing entities* that are located outwith biological systems. These putative organizing entities work on biological entities primarily through building-in purposiveness during development. A deistic system directed by organizing entities is, of course, not a 'biological' theory; but then, neither is natural selection a biological theory: both are metaphysical frameworks for the science of biology.

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FUNDAMENTAL UNSOLVED PROBLEMS OF BIOLOGY

From more than two decades of theoretical consideration of biology, especially evolutionary biology, I have concluded that there are no satisfactory answers to some of the most important and most fundamental questions of biology. I will argue that the fundamental reason for this is the lack of any teleology (purpose) in natural selection, which is the current dominant biological paradigm. Therefore, I propose a new teleological metaphysics for biology.

Biology (including medical research and psychology) has, since the 1950s, become the most 'successful' – that is, by far the largest and most heavily-funded and most status-rewarded of the sciences (Charlton & Andras, 2005). However, it is striking that this progress has been at the proximate level of mechanisms and technologies, and not at the level of fundamental understanding.

Indeed, the triumph of biology was preceded and accompanied by a major act of redefinition of the subject itself. A little book called *What is Life?* by the great physicist Erwin Schrödinger (1944) served as a catalyst for this change, and was accompanied by an influx of physicists and chemists into biology, leading to the triumphant discovery of the structure of DNA and of the coding and transcription mechanisms by which genes make proteins (Judson, 1979).

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But in paving the way for these discoveries, the definition of biology was implicitly changed from 'The science of living things' to 'The science of things that reproduce and are subject to natural selection'. This move away from the livingness of biology was what allowed non-biologists to take-over the subject at the very highest level; and since then biology has been dominated by researchers who use physics, chemistry, engineering (i.e. big, expensive machines of various types), computers, statistics, economic theory and a range of other non-biological perspectives and technologies.

As I say, the triumphs are well known – but the major unsolved problems of biology from 1950 remain unsolved; however, mainstream attention has simply shifted elsewhere and there is currently perhaps less interest in these matters than at any time since before biology became a separate science.

Such lack of interest – and of knowledge – has meant that most people are not even aware, have not even noticed, that these problems are unsolved. Because, so long as an 'answer' to such problems is good enough to survive a couple of minutes semi-attentive and unfocused consideration by a narrowly-trained micro-specialist who is not really a biologist, and is adequate to support and sustain a program of publication and grant-getting (which are regarded as sole and the necessary requirements of modern science), then this is regarded by modern biological researchers as sufficient proof of that answer's validity (Charlton, 2012).

But the problems remain – and they are so fundamental as to cast doubt on the whole basis of the 'paradigm' that defines, controls and validates modern biology (Kuhn -1970 - popularized the idea of a paradigm governing science – but at bottom, 'paradigm' is just a new, and confusion-generating, name for metaphysical assumptions).

ORIGINS OF LIFE

An example is the question: What is life? – which is the title of that influential book by Schroedinger (1944). The current answer is, implicitly: that is 'life' which reproduces or replicates and is subject to natural selection.

But this answer includes viruses, phages and prions – which hardly seem to be 'alive' in that they lack a dynamic metabolism; and also some forms of crystal – which are usually regarded as certainly not-alive (Cairns-Smith, 1990). Furthermore, some economic theories and computational programmes explicitly use the mechanisms of natural selection - and these are not regarded as part of biology.

Strikingly, there has been no success in the attempts over sixty-plus years to create life in the laboratory under plausible ancestral earth conditions – not even the complex bio-molecules such as proteins and nucleic acids. It has, indeed, been well-argued that this is impossible; and that 'living life' must therefore have evolved from an intermediate stage (or stages) of non-living but evolvable molecules such as crystals – perhaps clays (Cairns-Smith, 1987). But nobody has succeeded in doing that in the lab either, despite that artificial selection can be orders of magnitude faster than natural selection.

Since there is no acknowledged boundary dividing biology and not-biology, then it would seem that biology as currently understood has zero validity as a subject. What are the implications of our failure to divide the living from the non-living world: the failure to draw a line around the subject? Well, since there is no coherent boundary, then common sense leads us to infer in that case *either* everything is not-alive or everything is-alive. If nothing is-alive, not even ourselves, there seems to be no coherent possibility of us *knowing* that we ourselves are not-alive, or indeed of anything knowing anything – which, I take it, means we should reject that possibility as a *reductio ad absurdum*.

Alternatively, the implication is that if *anything* is-alive, then *everything* is-alive, including the mineral world – so we dwell in a wholly animated universe, all that there is being alive but – presumably – alive in very different degrees and with different qualities of life. This inference I intend to regard as valid: it will be my working metaphysical assumption, and is one to which we will return later.

So; if life is to be regarded as universal, it seems that the presence of ‘life’ can no longer be used as definitive of biology; and since reproduction/ replication is also inadequate, then we need a new basis or principle around-which may be made a different definition of the subject ‘biology’. I will argue, below, why this new principle should be ‘development’.

SEXUAL REPRODUCTION AND THE MAJOR TRANSITIONS OF LIFE

What of sexual reproduction? How did such a massively inefficient reproductive mechanism arise in the face of its immediate short-term damage to reproductive success? The great evolutionary theorist William D Hamilton recognized sexual reproduction as a major unsolved problem, and worked on it for decades (2001) – but neither this recognition, nor his attempted solutions in terms of ways to combat parasites and pathogens, has attracted much interest or acceptance.

And indeed, even if he was correct, Hamilton did not really solve the problem of how sexual reproduction *arose* – but only clarified its advantages (mainly in terms of resistance to infection) once sexual reproduction had already arisen, and already become established. The mechanism of how natural selection managed to cross the formidable short-to-medium-term barrier of vastly reduced reproductive success (caused by the need to find a suitable member of the opposite sex with whom to reproduce, and the approximate halving of potential reproductive units) remains utterly unclear.

The same problem of short-term disadvantage tending to undermine long-term advantage also applies to the ‘Major Transitions’ of evolutionary history – which include sexual reproduction but also the evolution of the simple (prokaryotic) cell, the complex (eukaryotic) cell, multicellular organisms, and social organisms (Maynard Smith & Szathmary, 1997). Each of these transitions requires overcoming the fact that natural selection operates much more powerfully and directly upon the lower, simpler and smaller levels of organization that replicate more rapidly; so that there is a constant pressure and tendency for these lower levels to become parasitic upon higher levels (Charlton, 1996).

In sum; natural selection is much more rapidly and powerfully dis-integrative than integrative. Yet, nonetheless, these transitions did actually occur in evolutionary history. For example, in a multi-cellular organism, the dividing component cells are constantly being naturally-selected for neoplastic (e.g. cancerous) change – such that they cease to cooperate with and contribute to the organism, and instead exploit it as a ‘host’ environment (Charlton, 1996a). How, then, did multicellular organisms evolve the many integrative systems (e.g. nervous, paracrine, hormonal and immune systems) designed to impose cooperation of specialized cells and suppress non-functional and actively parasitic (e.g. mutated) cell variants; bearing in mind that all such integrative systems are themselves intrinsically subject to neoplastic evolution (as well as loss of function from cumulative damage)?

The same phenomenon and problem must (according to the theory of natural selection) apply to the genetic organelles of the complex cell (such as chloroplasts and mitochondria; Charlton et al, 1998); and also to the individual organisms in a social organization (such as human society). Yet eukaryotic cells actually did arise – despite their innate and intractable tendency to self-destruct; and there are numerous highly evolutionarily-successful social animals among (for

instance) insects, birds and mammals. Indeed, it has been calculated that ants and humans are the two groups with the greatest biomass among animals on earth, with ants dominating the tropics and humans the temperate zones – termites are also highly numerous in the tropics (Ridley, 1996).

The general problem is therefore that the net effect of natural selection is to break down the major transitions of evolution before they can be established – unless (as I will argue later) this tendency is overcome by some as-yet-unknown purposive (and indeed cognitive) long-termist, integrating and complexity-increasing tendency.

THE NATURE OF SPECIES

Darwin's first great evolution book was termed *On the Origin of Species by means of Natural Selection...* (1859); and that is a clue to the next unsolved problem – which is: 'what is a species?'

Darwin was trying to explain how 'species' (in a very general sense of the major, as well as minor, sub-divisions of living things) originated. To do this he already had to assume that he knew, more or less, what species were.

In other words, natural selection was proposed as a historical mechanism (in practice the only mechanism) which led to modern species. In yet other words; natural selection was supposed to explain species – and species was the thing that was explained (Panchen, 1993).

Unsurprisingly, therefore, there has never been a principled explanation that was based on natural selection of what species actually are and how they are divided (Hull, 1988). At root, my understanding is that *impasse* happens because species are being used both as that which explains, and as that which is explained – which is circular reasoning.

And, in practice as well as in theory, all possible suggestions for such a definition are refuted by data. For example, the idea that species cannot interbreed to yield fertile offspring is untrue with numerous exceptions - some natural and some artificially generated. And the systems of differentiating and classifying species on the grounds of 'homologous' anatomy, physiology and genetics do not map-onto the classification of species in terms of their inferred lineage (e.g. cladistics) – and the identification of homology has itself (like species) never been objectively defined (Horder, 1993).

Furthermore, there is no more evidence now than there was in 1859 that natural selection is capable of being the sole and sufficient 'explanation' for the diversity of life upon earth. I put 'explanation' in quotation marks, because it is debateable whether natural selection – being based upon contingent and variable selection acting upon undirected (a.k.a. 'random') variation (Hull, 2001) - is actually a real explanation; because then the ultimate explanation is apparently that there is no explanation. Natural selection does not say 'why', but instead 'how' evolution occurs. The nature of change is contingent upon undirected events shaped by contingent processes, and therefore is essentially non-predictable in its specifics. In some senses, therefore, natural selection does not genuinely 'explain'.

In effect, with natural selection, *at most* one can only say: Many things might have happened for many reasons, but as an historical fact 'this' is what actually happened.

Certainly natural selection can coherently describe the historical situations leading to relatively small differences between organisms – perhaps up to the level of creating new and related species. This was already known to Darwin and was indeed the basis of his evidential argument – e.g. he described the nature and scale of effects of artificial selection done by animal breeders, plus some effects on the shape and size of beaks among Galapagos finches. To this,

modern biologists could add observations on the modification of microorganisms under laboratory conditions, for instance the evolution of bacterial resistance to antibiotics. And there are also human racial differences of skeleton, teeth, skin and hair, brains and behaviours and many others – probably amounting to sub-species levels of differentiation – again these were (approximately) noted by Darwin (for instance in the mention of ‘favoured races’ in the subtitle of his 1859 book).

But all these are quantitative, not qualitative, changes; changes in magnitude but not in form. Neither natural selection, nor indeed artificial selection done by Man, has been observed creating a new genus, nor any taxonomic rank more fundamental such as a new family or phylum. There is no observational or experimental evidence which has emerged since 1859 of natural selection leading to major, qualitative changes in form – nor the originating of a novel form. Nobody has, by selection, changed a cat into a dog, let alone a sea anemone into a mouse (or the opposite); nobody has bred a dinosaur from a bird, nor retraced, by selective breeding, a modern species to its assumed ancestral form. There have, at most, been attempts to explain why such things are impossible in practice – why, for instance, the linear sequence of evolution cannot be ‘rewound’.

THE PROBLEM OF GROUP SELECTION

The final example concerns group selection. My impression is that the most thoughtful and perceptive evolutionary theorists intuitively recognized that group selection was an anomalous residue in the post-teleological paradigm of Neo-Darwinism; because true group selection (when properly understood) entails a purposive cognitive mechanism that can predict, can ‘look ahead’ several generations, and infer what is likely to be good for the survival and reproduction of the species (i.e. future descendants) rather than for the specific individual organism under here-and-now selection – and can therefore impose this long-term groupish direction to evolutionary change, in the face of evolution that benefits the individual in the short-term (Hamilton, 1998).

Whether or not it is due to the built-in ‘spooky-spiritual’ aspects of group selection, there has been and is a powerful and almost moralistic desire within biology utterly to purge group selection from Neo-Darwinian theory (Dawkins, 1976). However, it should be noted that Hamilton himself did *not* reject the significance of group selection; on the contrary, he continued to believe it was real throughout his later career as is apparent from his essays and commentaries in the *Narrow Roads of Gene Land* collections (1998, 2002). However, so far as I know, he did not suggest a distinctive mechanism for group selection.

Group selection is most often discussed in relation to ‘altruism’. Altruism is behaving such as to increase the reproductive success of others at the expense of one’s own reproductive success (for example, sacrificing a young and potentially fertile life for the benefit of the group – perhaps in defence against a predator). Altruism indeed calls-out for explanation, since it is very frequently, almost universally, observed – e.g. multicellular animals depend on it for continued existence, social animals depend upon it for the continuation of sociality. But the proposed solutions – inclusive fitness/ kin selection and various types of reciprocal benefit (Ridley, 1996) – do not explain the *origin* of altruism, but instead explain why altruism – once established, may be advantageous to sustain.

The problems are at root the same as the previous examples – favouring the long term over the short term: in this instance imposing cohesion and cooperation that benefits the whole against the tendency of natural selection to favour the part at the expense of the whole. For example, preventing the amplification of selfish, short-termist, parasitic variants and lineages (which are immediately advantageous, and much more strongly selected-for), so as to pursue the long-term

cohesion, survival and reproduction of the group. Lacking such a mechanism or tendency, any groupishness and long-termism would continually be undermined, and would tend rapidly to be undone by the strong selection pressure for individuals to exploit and parasitize the group (Maynard Smith & Szathmary, 1997).

Hence, despite half a century of exclusively selfish gene theorizing in mainstream evolutionary biology; the apparent need for some kind of longer-termist and group-favouring process remains.

THE NECESSITY FOR TELEOLOGY IN THE METAPHYSICS OF BIOLOGY

Natural selection is an inadequate metaphysical basis for biology because it lacks teleology - a goal, direction or purpose.

This lack of teleology means that the potential for meaning - for knowledge - is excluded from the system of biology, and from any other system which depends upon it.

Thus natural selection is radically too small a metaphysical frame - it leaves out so much that is so important, that what remains is not even a coherent subject. This is revealed in the un-definability of biology and the incapability of biology to understand the meaning of life and its origins, major transitions and categories. Without teleology, biology is self-destroying.

Indeed - without teleology *we cannot know*. I mean we cannot explain how humans could have valid knowledge about *anything*. No knowledge of any kind is possible. If Natural Selection is regarded as the bottom-line explanation - the fundamental metaphysical reality (as it is for biology, and often is with respect to the human condition) then this has radically nihilistic consequences. And this is a paradox – if natural selection was the *only* mechanism by which consciousness and intelligence arose then we could have no confidence that the human discovery of natural selection was anything more than a (currently, but contingently) fitness-enhancing delusion.

The reason is that natural selection is *at best* – and when correctly applied - merely descriptive of what-happened-to-happen. Since there was no reason why things had-to-be as they actually were, and there is no reason why the present situation should stay the same, then there will be no reason to suppose that the future outcome is predictable. There is no greater validity to what-happened-to-happen compared with an infinite number of possible other things that might have happened - so there is no reason to defer to what-happened-to-happen, no reason why what-happened-to-happen is good, true, just, powerful or anything else - what-happened-to-happen is just what led to greater differential reproductive success for some length of time under historical (and contingent) circumstances. Nothing more.

Therefore - if humans are *nothing more nor other than* naturally-selected organisms - then there is zero validity to: cognition, emotions, intelligence, intuitions, morality, art, or science - including that there is no validity to the theory of evolution by natural selection. None of the above have any validity - because they all are merely products of what-happened-to-happen (and are open-endedly liable to further change).

In sum - Without teleology, there can be no possibility of knowledge.

(This is not some kind of a clever paradox - it is an unavoidable rational conclusion.)

If, and only if, biology includes direction and purpose, is the subject compatible with the reality of knowledge. A new and better metaphysics of biology must therefore include teleology.

A DEISTIC AND TELEOLOGICAL METAPHYSICS

Metaphysics is the branch of philosophy concerned with basic assumptions – descriptive of the

fundamental nature of reality. Science takes place *within* metaphysics, and therefore the results of science (any possible results of science) can neither prove nor refute any metaphysical description – although some metaphysical systems will more clearly and simply make sense of (or ‘explain’) science than others.

For example, the ‘evidence’ that these fundamental problems are unsolved amounts only to the fact that they are *as yet* unsolved – failure to explain can never ‘prove’ that an explanation is impossible. Only that nobody has *yet* come up with a satisfactory explanation. Therefore, the ‘proof’ that these biological problems are insoluble is not any empirical finding but philosophical reasoning.

In this sense metaphysics (which is to say a ‘paradigm’) is not ‘testable’ by science. This is because metaphysics itself underpins the definition of science (or a specific science such as biology); metaphysics determines what counts as a test, what observations to make and also how to interpret observations. For instance, no amount of biological research can ever decide whether biology is 1. the science of alive things or 2. the science of replicating things. This is not possible since definition 1 leads to one kind of biology using one type of expertise and methods; but definition 2 to another kind of biology with very different personnel and methods, as we have seen emerge over the past 70 years.

I therefore suggest that a new paradigm – or, more strictly, a new metaphysical basis or frame - for biology is required to address these and other fundamental defects and deficiencies in modern biology; and to place biology honestly, accurately and fruitfully in context of the total field of human discourse in general. In a nutshell, I will be arguing that the overall shape of evolution across history is best explained as a directional process of development – somewhat like the metamorphic unfolding of a fertilized egg via an embryo towards sexually mature adult and parenthood. Processes of selection occur within this teleological development – but are subordinated to the overall goal and contributory, coordinated sub-goals.

Furthermore, I will suggest that a teleology of biology having the required properties entails ‘deism’; deism being belief in a single, overall, unifying - but potentially abstract and impersonal - source of order and meaning for reality.

Deism here refers to the assumption of some kind of deity; but theism refers more specifically to the reality of gods or God. It is necessary, therefore, to distinguish between on the one hand the general idea of deism, which I regard as essential for a coherent and viable definition of biology; and on the other hand the idea of theism, with theism being a particular sub-category of deism, and more specific than is required for the practice of biology.

Deism and theism may seem superficially to be identical-in practice; and perhaps both equally absurd! – at least to the usual atheistic professional biologist; but the distinction is both significant and important. I personally believe in the reality of the Christian God; but such a specific belief is *not* necessary for there to be a useful and potentially fruitful teleology of biology, as is demonstrated by the many historical examples of non-Christian biologists. (However, as a generalization, the long-term success of science as a social system, in particular its adherence to the principle and habit of truthfulness, may depend rather more specifically upon scientists having been - at least - *raised* in a Christian or Jewish *milieu*, with their somewhat distinctive doctrinal emphasis on honesty; Charlton, 2012.)

So, the adoption of deism as an assumption could be seen as constituting a *cost* entailed by providing a coherent teleology of biology; a cost which explains the sustained resistance to such a thing and which may explain why teleology has been for so long and so stubbornly resisted within professional biology. Because teleology at the price of deism is a cost that most modern

biologists would utterly refuse to pay; since they are, as a strong generalization, the most materialistic and positivistic and anti-spiritual, militantly un-religious people the world has yet known! (Indeed, I know of only two practicing Christians among evolutionary biologists - one of them being myself; and that only for the past seven years.)

It is no coincidence that so many of the best known and most effective public dissenters from Christianity and promoters of atheism since Darwin have been recruited from a tiny minority of eminent evolutionary theorists – past examples include Darwin's 'bulldog', the early agnostic TH Huxley; and his grandson, the humanist and an architect of the Modern Neo-Darwinian Synthesis, Julian Huxley; current examples include the campaigning anti-religion activists Richard Dawkins and Daniel C Dennett.

But militant atheism is not merely a product of being a scientist: biologists are typically much less spiritual than mathematicians and physicists, who often espouse deistic ideas. As examples; Einstein saw reality in this 'deist' way with an abstract, impersonal, but unifying 'God'; Roger Penrose has stated he is a Platonist; the theoretical physicist Paul Davies won the Templeton Prize for his many writings from a deistic perspective; and Freeman Dyson, also a Templeton Prizeman, is a Christian, as was Kurt Gödel.

In sum – even if I can show that deism is what biology most needs, and even though there is nothing 'unscientific' about such an assertion, deism seems very unlikely to be welcomed or accepted by the mass of currently active and dominant professional biologists.

WHY DEISM SPECIFICALLY?

So, I will assume that deism is the necessary intellectual 'cost' that must be paid to restore purpose and cohesion to biology; it is minimally-necessary to restore 'a spiritual dimension' to biology; not indeed *within* biology – but as the *framing* metaphysic of biology. That is, the spiritual dimension is located outside of biology to give it shape and bounds, meaning, and direction. Biologists needs not adopt deism as a 'religion'; but they must at least accept it as a working-hypothesis.

But the concept of deism is unfamiliar, as is its distinction from theism. I should therefore clarify that although this deistic perspective of the primacy of consciousness, purpose and ubiquitous life is indeed spiritual, it is not necessarily religious in the sense of associated with belief in any actual religion. A deist regarding ultimate reality as having the cognitive property of purpose does not need to take the further step of a belief in 'theism', theism being the belief in a specific God or gods.

The deism that is entailed by a belief in teleology *includes* many possible forms of theism, including belief in a 'god' who originally created everything (and is therefore the source of ultimate cohesion); but the deity of a non-theistic deist is not necessarily the creator, does not necessarily intervene in the 'running' of the universe, and may be a wholly impersonal and abstract god that has no specific interest in Men or specific people. Deism therefore may mean any assumption of any ultimate, but perhaps abstract, rationality, order, or overall organizing tendency.

Nonetheless, honesty compels me to suggest that abstract deism has historically, and in the lives of many individual scientists and other intellectuals, been a *metastable* state which sooner-or-later falls one way or the other: either into atheism or theism (belief in a God or gods). And in that case, I am suggesting that, in the end, an adequate metaphysics of biology must be compatible-with (if not contiguous with) theistic religion. However, this move into theism is not a formal philosophical necessity, but rather a matter of probabilistic human psychology.

At any rate, it may be useful, at this point, further to clarify *why* a teleology for biology entails deism. The reason is that teleology (purpose) in biology is based on, requires that, reality be coherent, cooperative and complementary because reality as-a-whole must have purpose. This, in turn, requires that there is a single and unifying organizing entity to *enforce* coherence, cooperation and complementarity. So, for life, for reality, to have purpose, it must hang-together - and for reality to hang-together requires some unifying conception of deity.

Deism is the assumption that the universe has just such an organizing principle or entity - which may be a personal supreme creator god among other lower gods, or one God – which is theism; or the organizing principle may be something impersonal - a 'god of the philosophers': in other words an hypothesis which is inferred and assumed (rather than believed as a matter of faith). An example would be the 'Platonic' hypothesis that there is a coherent primary reality outside of time where dwell objective and eternal values and archetypal forms – in comparison to which the earthly reality we observe is only a derived, time-bound, approximate, partial, and more-or-less corrupt version.

Biology needs a teleology, and indeed the more specific is that teleology, the more can be inferred from it. However, if biology is to be a coherent and general science, then its teleology cannot be more specific than what can be agreed-on by deism. Therefore, scientists can, and indeed must, minimally agree on a general concept of deity. But beyond that agreement, there will very probably be disagreement concerning the attributes, nature and specific purposes of deity. In sum, the teleology of biology as-a-whole seems to be based on a general and hypothetical deity, but not on any specific God.

Therefore, deism supplies teleology, but only to a limited degree. So we need to distinguish between the implications of the fact of teleology and the specific direction of teleology. The fact of teleology includes the consequences of there being an ultimate unity and an expectation of a primary and significant degree of coherence, cooperativeness and complementarity. I think the acknowledgment of teleology may also provide the basis for a coherent definition of the essential nature of biology as a subject – which I will discuss below. But what *exactly* is the *specific* aimed-at destination of teleology may be a subject of disagreement and theorizing; e.g. there will probably be different ideas of what the direction and purpose of 'everything' as a whole, and at lower levels. And there will also surely be *scientific* disagreement over the specific mechanisms by which teleology is implemented at the various levels and instances of biological organization.

There remains much that requires debate and investigation, plenty for biologists to do; but *all* biologists ought to, and need to, be able to agree that there *is* an ultimate teleology, hence coherence, to biology.

THE NATURE AND ESSENCE OF BIOLOGY AS A SUBJECT: DEVELOPMENT

When biology is defined in terms of teleology it gives an indication of how the subject may fruitfully be defined in terms of its focus; because teleology concerns direction. Teleology, as described above, entails the emergence and coordination of multiple elements over time in pursuit of purpose. In simple terms, therefore, the essence of biology as a subject has to do with *development*; that is with growth and form, with differentiation and cooperation.

In sum, the core of biology is 'life as history' – meaning here the *unfolding through time*, including functional interactions - of entities such as cells, organisms, groups and ecosystems. I would argue that this understanding of biology has priority over reproduction in general and gene replication specifically – which have been made the focus of biology for the past seventy-odd years.

Such a re-definition of biology around the theme of development would also serve to reconnect the subject with its deepest intellectual roots in natural history; to rebuild the subject around a *core* that is distinct from chemistry and physics on one hand, and medical research on the other; with organisms being of interest primarily in terms of their structure, function and interactions over their lifespan. This would surely be preferable to modern biology which has become so

narrowly focused that it sometimes seems as if the only scientifically-interesting things that organisms do is replicate or die!

(I will suggest a further reason why biology might beneficially be defined in terms of development below when I discuss the causal relationship between phylogeny (evolutionary history) and ontogeny (development.)

The history of definitions of biology can be described as beginning with the subject conceptualized as 'the study of *living* things'; then changing from about 1944 to 'the study of *reproducing* things'; and I now propose that in future biology should become 'the study of *developing* things'.

STATEMENT OF THE NEW TELEOLOGICAL METAPHYSICS: THE HIERARCHY OF ORGANIZING ENTITIES

The chronological sequence of the new metaphysics is the reverse of the usual posited in biology. Current biology usually assumes that matter precedes life; life precedes the brain; the brain precedes cognition – in other words that a solid brain comes before cognition (thinking) - including purposiveness - emerged.

By contrast, I suggest that consciousness and purpose are the starting point – and that consciousness, with its ultimate teleology, therefore operates upon matter with the proximate goal of sustaining and developing itself *via* instantiations in matter - instantiation here meaning the specific and actual realization of an abstraction: building of abstraction into solid form. Therefore, (baldly-stated) consciousness 'organized' brains.

(The above conceptualization owes much to the work of Owen Barfield, who was himself expressing ideas of Rudolf Steiner, who was in turn JW von Goethe's scientific editor for the standard collected works – so this theory has its ultimate roots in Goethe's biology; see for example Barfield, 1982; Naydler, 1996).

So that (to put things simply); initially consciousness sufficed to organize undifferentiated matter into 'physics', 'physics' into 'chemistry', and 'chemistry' into what we recognize as the emergence of biological entities in their most basic forms. And the directing consciousness which drove biological evolution was further subdivided and specialized; for example regulating the basic transitions and divisions of life, and beyond them the further groupings down to species, then particular human groups.

This system of consciousnesses can be imagined as an hierarchy of *organizing entities* – an hierarchy with its apex in deity. These organizing entities operate to shape and frame the structure of reality, including biological reality – these entities all being, ultimately, coordinated and unified by the deity. These organizing entities are inferred to have various properties including the ability cognitively to model future possibilities (i.e. to have foresight, to make conjectural predictions) and choose between possibilities on the basis of innate purpose. In essence, organizing entities can understand (to some limited but significant extent) the current situation, and look-ahead towards probable outcomes – and then organize biology to reach the preferred possible outcome.

These organizing entities are assumed to have the same kind of role as the human mind does in relation to the human body; or as a good, wise and competent human leader has in relation to the society he rules. That is, the ability to infer that if X continues then Y will probably result – which means the decline or demise of the cell/ organism/ group/ society; but that if instead we do A we should arrive at B – which offers a much better prospect of survival and continued or enhanced reproduction (and, importantly, progress towards ultimate teleology) than does Y; and then the organizing entity has significant (but not absolute) power to impose A upon the system.

What then, actually, are these organizing entities – how can we imagine them? I suggest that different people may picture them in different ways which suit the workings of their own minds. Some may understand them in a mathematical or computational way; some see them as akin to ‘laws of nature’; some may understand them to be fields of force – like Sheldrake’s morphogenetic fields (Sheldrake, 1981 & 1988) but with a primary role in imposing purpose rather than form; some may understand them as immaterial but personalized entities – rather like the medieval astrological model of angels who inhabited (or rather actually were) the planets and stars – but in a realm beyond and with different properties from worldly (‘sublunar’) place, and outside of Time, and who influenced from this realm all manner of events on earth and inside Time (Lewis, 1966).

I personally have a very literal, simple mind; and cannot for long refrain from anthropomorphic representations of any cognitive and purposive entity – in other words, I imagine these organizing entities as both personalized and material entities, localized in space and time - although imperceptible and undetectable (at least, by normal sensory observation). This is of course a child-like way of thinking about causality (although not really child-ish) – but perhaps not so uncommon as may superficially appear. After all, neuroscientists are always accusing each other of treating the brain as if it was inhabited by a ‘homunculus’ (little man) which is meant to be an error both irrational and shameful – and indeed the accusers are usually correct in this accusation; because avoiding this ‘anthropomorphism’ while yet retaining a firm and imaginative grasp of science, is all-but impossible.

Famously, Einstein reasoned about relativity by imagining a man (a homunculus perhaps!) riding in a tramcar away from the medieval clock in the Swiss city of Berne at speeds approaching the speed of light (Hoffman, 1972). If Einstein apparently needed (or, at least wanted) to do the most advanced and abstract theoretical physics by anthropomorphic metaphors, then maybe biologists should not be ashamed to follow his example?

THE PROXIMATE IMPLEMENTATION OF TELEOLOGY

In summary - starting from some large scale purposive, conscious and unified deity (perhaps envisaged as the sun, or the earth/ Gaia; Lovelock, 1989) - organizing entities direct and shape the first and most basic forms of life, prokaryotic then eukaryotic cells, followed by the major divisions or classifications of living things down to (real) species, sexual reproduction, individual organisms and social groups. (The evolution of Man may, or may not, be assumed to require a further level of organizing entity – or else the direct intervention of the deity.)

Organizing entities are located functionally-external to the biological entities that they govern – they are not a part of biology. Organizing entities are an external focus for biological entities – thus can be imagined as a point of reference: both monitoring and shaping biology. The main role of an organizing entity is to impose goals, direction, purpose – in a word: teleology. This entails imposition of form, cohesion, cooperation – and identity. Identity is the process by which the group is defined – the choice of inclusion and exclusion, the drawing of a boundary.

It is the organizing entity that make a group a real group in the true sense of the word ‘group’ – and not merely an arbitrary, temporary or expedient line drawn around a collection of autonomous entities: it is the organizing entity which makes the group a unit. Biological unity therefore derives from teleological unity.

A group of many entities (such as a collection of components in a cell, of cells in an organism, or organisms in a society) is itself a real and objective unified entity *only* when it has been organized by a single purposive, conscious entity.

If this is accepted, and some kind of general mechanism for teleology is assumed - such as the hierarchy of organizing entities - then the question arises as to how teleology is imposed? There seem to be two possibilities - purpose could be continuously imposed *from outside* a biological entity by the continuous or intermittent operation of some kind of field, force or form; or else purpose could be *built-in*.

While I think it likely that external forms/ fields/ forms have a role, especially in terms of organizing the simpler and more basic (physics and chemistry) levels of evolution (Sheldrake 1981 & 1988); something additional, more detailed and generative of *autonomy* seems to be required for biological entities. Biological purpose seems most likely to be built-in; specifically that, as an entity is formed and develops, its purposive nature is built-into the structure and organization (by the action of its organizing entity) such that there is a degree of agency and self-regulation which is also coordinated with the overall teleology (probably by means of in-built complementarity of function).

For example, in multicellular organisms there may be the mechanisms of cell-suicide or apoptosis - such that if a cell experiences a mutation that may endanger the organism - perhaps by a neoplasm such as cancer - then the cell destroys itself (for the good of the whole organism). There is, in general, considerable altruism built-in at the cellular level of a multicellular organism such that the existence of multicellular organisms is essentially an exercise in mutual altruism. Some types of motile white blood cells such as macrophages (which resemble free living amoebae) will kill themselves in the process of defending the organism against microorganism invasion (these dead warriors are found in pus): and this purpose is apparently built-into them in terms of their core functionality.

The primary reliance upon built-in teleology also makes it easy to understand the existence, indeed often at high rates, of the opposite - of behaviours which are non-functional, free-riding, and parasitic. This is explicable in the sense that teleology - including traits that are long-termist, altruistic, cooperative and coordinated - is built-into the organism during normal development, but is nonetheless vulnerable to disruption by abnormal development and subsequent, later events that disrupt or destroy these built-in mechanisms. For example, genetic damage or mutations during the lifespan of the entity: mutant mitochondria in a eukaryotic cell, cancer in a multicellular organism, the effects of mental illness in human society.

Therefore, I think it most likely that organizing entities work to impose teleology during development at the point where entities are being formed - either originally and/ or when being reproduced. The teleological behaviours are part of the design specification built into the entity. Short-term selfishness can, and does, arise in or after development - and then it is typically dealt with by built-in regulatory mechanisms found in those 'normal' entities who have experienced undisrupted development and avoided subsequent damage.

THE COHERENCE OF EVERYTHING

It is the hierarchy of organizing entities which ensures that overall and in the long run, all directions of all sub-entities are coordinated and integrated. This can be imagined on the lines of a military hierarchy of orders coming down from a General (i.e. deity) through the branching ranks of Colonels, Majors, Captains, Lieutenants, and Sergeants to the foot soldiers (i.e. the layers of organizing entities).

Vertical, multi-level coordination therefore comes from the teleology branching-out from a single locus. And *horizontal* coordination within-hierarchical-levels comes from the mutual reciprocity and complementarity of functions - imposed on groups of biological entities by organizing entities.

This is the organizing principle which enables groups under direction from organizing entities to be recognized and understood (to some significant extent); it is what roughly corresponds to intuitions that there is an underlying order to the world: notions such as 'the balance of nature', 'the circle of life', the principle of 'compensation', or the earth conceptualized in terms of a goddess or organism termed Gaia (Lovelock, 1981).

Thus the universe of reality broadly hangs-together, as we observe it does; and does not utterly collapse into a chaos of ever-smaller and faster-replicating, more mutually-exploiting purposeless entities, as we observe it does not. There is a background tendency to homeostasis and elaborated specialization and coordination – and there is, both overall and at each level and each individual unit of organization – organizing purpose and direction.

Of course, in particular times and places, natural selection may be amplified, may become powerful enough to overcome the cohesive and integrative influence of conscious, purposive entities; and consciousness diminishes, and cooperation, complexity and order begin to break down. The purpose is then not attained but instead thwarted.

It can happen at any level. Ultra-selfish genes (such as transposons or segregation distorters) may potentially lead to intra-genomic conflict with loss of informational-identity, functional corruption and cell death; rogue malignant (or selfishly non-functional) mitochondria may kill their symbiotic host cells; connective tissues may be naturally-selected to become sarcomas and kill the organism; or successful psychopaths may exploit, parasitize and lead to the destruction of their social group.

But the fact of life persisting; and the observations relating to evolutionary history; entails that the background reality is teleological and cooperative.

EXPLAINING THE NECESSITY FOR AN INTERMEDIATING HIERARCHY OF ORGANIZING ENTITIES

A teleology of biology can be accepted merely on the basis of deity, and without the kind of complex, intermediate system of organizing entities which I have proposed – and leaving aside any speculations on the more detailed way in which teleology I implemented in practice. In other words, it can be asserted that once a presiding deity has been invoked as our working hypothesis – then everything significant that happens in biology can be attributed *directly* to that deity.

Such a view is possible and coherent, albeit such a tactic might reasonably be characterised in terms of vague 'hand-waving'; so why do I take the further step of inferring the existence of a hierarchy of organizing entities; and attributing to them the role of implementing teleology in a much more direct, specific, and proximate fashion?

Essentially, the reason for introducing intermediary causes of teleology, adding to the overall deist unity as the cause of teleology, is firstly in order to explain the phenomena of *development* of the organism; which is also termed *ontogeny* or within-organism change through the life span: growth, change of form, selective cell death, differentiation and maturation. And also secondly to explain *phylogeny*; that is between-generation, within-lineage evolutionary change: the history of extinctions, and of new and changing species.

In different words, the hierarchy of organizing entities is intended to account for the *dynamic* aspects of biology: to explain why biology is full of change; creating, adapting and failing.

Ontogeny and phylogeny (as types of 'changing'), happening through time, imply that deity either cannot or will-not achieve biological form directly and finally; but either must or chooses to attain form by incremental steps from an initially very simple situations – one stage building-upon the preceding. To me, this suggests that deity works by means of intermediary causes.

Furthermore, biology itself seems to have a hierarchical and multi-branching organization – both ontogeny and phylogeny display this – that is evident both within organisms and other coherent entities in the form of development, and also across the range of biological organisms and other coherent entities in terms of the systems of biological classification. This suggests that the organization of biological teleology also has a hierarchical and multi-branching structure

analogous to the taxonomy of living things (the 'tree of life').

If this is assumed, then it seems necessary that *the hierarchy of organizing entities must pre-exist the structure of actual biological entities*, in order that it is already in-place to organize each cumulative step in phylogeny.

If so, then the broad-brush resemblance between ontogeny and phylogeny (Horder, 2008) which was noted more than a century ago by Haeckel – may have its basis not in Haeckel's formulation of ontogeny recapitulating phylogeny, with the history of evolutionary change (supposedly) being recorded in developmental sequences, nor by any modification of that idea; but the opposite. I suggest it is a matter of phylogeny recapitulating ontogeny, in the sense of evolutionary change being driven by developmental processes.

That is, the organizing entities work primarily to affect ontogeny, to build-in teleology *byshaping the process of development*; and thereby, as a consequence, these same organizing entities are also setting-up mature biological entities in evolutionary sequences and relationships. By affecting development, the organizing entities impose teleology on evolution.

To be even more specific, the first member of a new species (or level of biological complexity) has been shaped by the ordering entities – including by changing its various heritable structural features (such as genes, and non-genetic cellular structural formal features such as cytoplasmic structures and constituents, or cell membrane attributes). Thus ontogenetic change comes first, and then this is transmitted *via* heritability first to initiate, then establish, the step-wise phylogenetic changes that mark evolutionary history.

CONCLUSIONS AND IMPLICATIONS

In sum, the new deistic teleological metaphysics of biology enables the subject to re-defined around the concept of development. The scheme would not affect the perspective of biology in terms of the study of evolution specifically by natural selection, nor in terms of the day-to-day activities of most biological researchers. But metaphysics is nonetheless vitally-relevant insofar as natural selection would henceforth be assumed to operate *within* purposive cognitive processes that have foresight and are able to organize, coordinate, and either counteract or use natural selection, as means to the overall teleology. This background would be assumed – and we would not suppose that natural selection 'has the last word'.

Perhaps most importantly, the new metaphysics of biology escapes the self-refuting paradox of natural selection; because it can explain how it is that humans could have valid knowledge of biology itself – as the most relevant example: how humans might have validly discovered a true theory such as natural selection. If humans had been merely contingently evolved to optimize reproductive success, it is not formally impossible but it is *vastly* improbable that we could have valid knowledge of anything - including natural selection; since a mechanism for discovering valid knowledge could only have happened by undirected chance and when it also happened to optimize reproductive success in the immediate short term of generations. However, if by an astonishing coincidence, it happened-to-happen that humans had had naturally-selected the ability to have valid knowledge – knowledge for instance of the theory of natural selection; then we could not know we knew this for a fact, without a further astonishing coincidence of knowing that we had happened to evolve this way!

But - *if* our metaphysics posits the existence of purposively-unified, conscious, organizing entities outwith the boundaries of biology, and to that extent independent of (controlling of) the vicissitudes of natural selection; *then* valid knowledge might be assumed to originate from that external source. In other words, we can know about natural selection and that it is true, *only because we ourselves are something more than merely naturally selected*. In sum, the

suggestion is that humans have been cognitively-organized *via* our built-in teleology such that objective knowledge is possible for us.

I am, of course, fully aware that the above purposive metaphysics of biology sounds bizarre, supernatural and indeed just plain absurd from the perspective of modern biology! I have, after all, been thoroughly educated-in and acclimatized-to that world, and have worked within it for several decades, both teaching the subject of natural selection and publishing many papers; including many which metaphysically-assumed that natural selection was indeed the last word on things – the exact framing assumptions that I am here and now criticizing as radically incomplete; for example my books Charlton, 2000 and Charlton & Andras, 2003 - especially the Appendix to 2003.

However, stepping outside of that professional ghetto, I am also aware that this general type and nature of metaphysical explanation that I am now proposing has a long and continuing pedigree among mathematicians and physicists – and indeed within a strand of theoretical biologists which includes such diverse figures as JW von Goethe and his scientific editor Rudolf Steiner, D'Arcy Thompson, AN Whitehead, Conrad Waddington (and other members of the prestigious, albeit heterodox, Theoretical Biology Club of Cambridge University), and in recent years Brian Goodwin, Stuart Kauffman and Rupert Sheldrake.

Such individuals (to a variable degree) have recognized that – if it is to be coherent - the subject and methods of biology must be conceptualized within a larger (and, as I term it, metaphysical) framework or paradigm which lies outside the discipline of biology; however the above-named biologists were primarily concerned with integration, organization and the development of *form* – while my focus here is on the need for an externally imposed *purpose*. However, I would note that there is a sometimes explicit, but more often unstated and unacknowledged, teleological assumption behind much of the work in this idealist, mathematical-geometric and morphological tradition.

The axiomatic assumptions of this paradigmatic purposive framework are the basis for all scientific work. Science is always and necessarily subordinated to philosophy, even when that philosophy is unacknowledged - or even when it is denied. Many clever and successful - but unreflective - modern scientists believe themselves to be superior to metaphysics, to have transcended and replaced it with 'solid' empirical scientific 'proof'. All this really means is that they do not understand, and do not want to know about, their own metaphysical assumptions – because they want to believe that these are just-plain-true, rather than the consequence of non-scientific but instead philosophical *choices* made by actual people at some particular time and place.

But different choices yield different consequences; and the choice of natural selection as the bottom-line explanation of biology has had an intellectually stunting and transcendently crippling effect on the discipline – has indeed destroyed the cohesion and identity of biology, and made it a self-refuting paradox.

My hope is that this new, teleological metaphysics of biology will provide a framework within-which biology can operate in a coherent and contextualized fashion; rather than, as in recent decades, simply ignoring its major problems and deluding itself with assertions that its partial and incomplete explanations - based on the dogmatic assumption that natural selection is the one and only true mechanism of evolution and the bottom line reality of everything - have universal applicability and eternal validity. However, I think I have demonstrated that this is merely an assertion, and indeed an arrogant, uninformed, arbitrary and indeed utterly absurd assertion! Let us then acknowledge that there are metaphysical choices that have-been and

must-be made – and try to evaluate and compare these choices.

It is necessary to recognize and make clear that the above metaphysics of hierarchical, purposive and conscious, organizing entities is not a 'biological' theory. But then, neither is natural selection a biological theory. Instead, both of these are potential metaphysical frameworks for biology. Biology cannot exist without a metaphysical framework – and the current one may not be the best, since it has so many, such serious, failures to its name.

In conclusion, I suggest that biology requires wholesale reconceptualization based on a new set of deistic and teleological metaphysical assumptions.

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I thank Rupert Sheldrake for pointing-out that my suggested hierarchy of organizing entities bears resemblance to the scheme proposed by Alfred Russel Wallace in *The World of Life: A Manifestation of Creative Power, Directive Mind and Ultimate Purpose* (1910). (Wallace was – with Darwin – the co-discoverer of Natural Selection.) Rupert also asked me a couple of pertinent questions concerning the original draft; in the process of addressing which, I (by stages) ended-up significantly expanding and refocusing this paper.

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