Did Darwin initially develop a theory of evolution in the biological sense of the word?

D F M Strauss

Dean's Office
Faculty of the Humanities
University of the Free State
P.O. Box 339
Bloemfontein 9300
South Africa
dfms@cknet.co.za

Abstract

Darwin's physicalist orientation reacts to a long-standing vitalistic mode of thought of idealistic morphology and should be assessed by taking other 19th and 20th centuries biological schools of thought into account – trends that each emphasised different modes of explanation, such as mechanicism, physicalism, holism, neo-vitalism, organismic biology and pan-psychism.

Darwin's acceptance of "universal laws of nature" is consonant with Leyll's view of invariant natural laws (uniformitarianism), but at the same time, owing to their tendency towards change, living entities are considered to be without constant structures – an outcome of Darwin's nominalist understanding of living entities. Nominalism provides a starting point both for modern historicism (with its emphasis on change) and for Darwin's adherence to a nominalistic view of living entities. In the light of the fossil record, the issue of constancy and change is discussed with a focus on Gould's claim that the basic theory of natural selection offers no statement about general progress and therefore does not supply a mechanism in terms of which an overall advance might be expected.

Darwin's physicalistic orientation in 1859 made it problematic for him to claim that he has accounted for evolution in the truly biological sense of the word.

Orientation

Our argument assumes the view that theoretical thought is characterised by pointing out diverse modes of explanation from ontic reality, such as the physical aspect (delimiting the field of investigation of physics), the biotical aspect (delimiting biology), the social facet (demarcating sociology), and so on. Identifying any angle of approach requires a philosophical view of the coherence and distinctness of different viewpoints – a view that exceeds the scope of every special science. Besides features shared by scholarly and non-scientific activities (such as systematics or proceeding methodically), philosophy and the disciplines are characterised by what can be designated as *aspectual analysis* or *modal abstraction*.

Charles Darwin undoubtedly irrevocably changed the face of modern biology. Before he published his now well-known and famous "*On the Origin of Species*" in 1859, biological thought was dominated by the Platonic idea that living things are *copies* of unchanging, static, eternal (super-sensory), ideal forms, as well as the *vitalistic* Aristotelian tradition, with its emphasis on *purposefulness* (finality/teleology). The biological systematic classification of Ray (1627-1705) and Linnaeus (1707-1778) continued this Platonic legacy, against which Darwin reacted in his mentioned work.[1]

When it is attempted to argue that Darwin basically defended a *physicalistic* orientation in his *Origin of Species*, it should also be kept in mind that the subsequent emergence of diverse trends of thought in 20th century biology introduced other *modes of explanation*. We briefly list these and their main representatives before we continue. Consider

> the *mechanistic* orientation (Eisenstein 1975), the *physicalistic* approach (neo-Darwinism), *neo-vitalism* (Driesch 1929; Sinnott 1963, 1972; Rainer-Schubert Soldern 1959, 1962, 1962a; Haas 1959 1968; Heitler 1976); *holism* (Adolf Meyer-Abich 1964, 1965); *emergence evolutionism* (Lloyd-Morgan, Woltereck, Bavinck 1954; Polanyi 1967, 1968, 1969); the *organismic biology* of von Bertalanffy (1973); and *pan-psychism* (Teilhard de Chardin, Bernard Rensch 1959, 1968, 1969, 1971); More recently, the idea of intelligent design surfaced – not on the basis of lacking sufficient factual knowledge but supported by scholars with highly specialised natural scientific competencies (see Dekker, Meester, and Van Woudenberg 2005).

Biological thinking *preceding* the *Origin of Species* is embodied in the above-mentioned tradition of (a vitalistic and) *idealistic morphology* – from Aristotle up to *neo-vitalism* (Driesch and his followers).[2] This orientation was accompanied by the idea of a (supposedly) immaterial *vital force* (*entelechie*).[3] Since theory formation always explores certain *modes of explanation*,[4] the effect of elevating one mode of explanation normally results in a *monistic* theoretical orientation.

Darwin rather opted for the idea that living entities are *intrinsically changeful*, and subject to *chance* processes. But his eventual acceptance of the principle of uniformitarianism (derived from his acquaintance with Lyell's work in the field of geology)[5] did continue a feature formally similar to an element of idealistic morphology.

Between 1831 and 1836, on his world tour, Darwin discovered animal fossils in South America and discerned similarities with variations of living plants and animals found on the Galapagos Islands. In his 1859 work he developed his view of the (incre-

1 It should be noted that the legacy of idealistic morphology still has representatives in the 20th century. These include Dacqué (cf. 1935, 1940, 1948), Troll (1951 and 1973), Wolf (1951) W. Leinfeller (1966) and Heitler (1976). Troll's work in 1973 is a standard (more than 1000 page) botany textbook (see also Ungerer 1966:232).

2 Hans Jonas strikingly typifies the monistic forms of *vitalism* and *mechanicism*: *pan-vitalism and the problem of death* (Jonas 1973:19ff) and *pan-mechanicism and the problem of life* (Jonas 1973:22ff).

3 Driesch argued for his vitalistic position in terms of the remarkable regenerative phenomena found particularly in animal life (he did experimental work on sea urchins – *Echinus microtuberculatis*) (see Weber 1999:266 ff., 270 ff.).

4 Such as the numerical (the Pythagoreans with their claim that everything *is* number), the kinematical (the main tendency of classical physics from Galileo and Newton up to Heinrich Hertz), or the vitalistic trend in biology.

5 *Principles of Geology* (1830-1833) and *Elements of Geology* (1838). Henslow advised Darwin to take Leyll's first work with him to the *Cape Verde Islands* – but not to believe it.

mental) total process of becoming (change) stretching over millions of years – giving rise (through differentiation or speciation) to the rich variety of species we know today. Adaptation is the mechanism through which living things survive, and Darwin characterises the overall process as controlled by *natural selection*.

The 'Physicalism' of Darwin's "Origin of Species"

Modern philosophy is familiar with the stance of *materialism*. In the footsteps of Descartes and Hobbes, and consistent with the mechanistic main tendency of classical physics, the 18th century witnessed prominent materialist thinkers in various countries, such as Germany, France and England. Particularly well-known are the works of J. Lamettrie (published in 1745), C. Helvetius (1758), D. Diderot (1746) and P. Holbach (1770) (see Nieke 1980:842, 850). Within the context of the contemporary philosophy of science, *materialism* is seen as *physicalistic*: "Physicalism denotes what used to be called materialism, the view that the universe is ultimately an entirely physical system. … Ultimately there are no phenomena in the universe which cannot be understood in terms of the concepts of physics" (Klee 1997:99).[6]

While all processes are kinematically seen reversible (as maintained in the mechanistic main tendency of classical physics),[7] the 19th century, in the second main law (the law of non-decreasing entropy), eventually had to acknowledge irreversible *physical* processes (see Apolin 1964:440 and Steffens 1979:140 ff.) without any suggestion for the *better* or *worse* – a consequence indeed taken serious by Darwin in 1859. Therefore a *physical* understanding of the universe may serve Darwin's theory of natural selection and adaptation in the sense that the random nature of this mechanism causes changes,[8] but cannot result in any *purposeful* outcome, producing something 'better' or leading to 'progress' – for it is a *blind*[9] process without any *goal-directedness*.[10]

Of course physicalism was quite alive during the first half of the 19th century.[11] Initially Auguste Come, for example, approached human society with his *social physics* (*physique sociale*), eventually designated as *sociology* in 1838.[12] Western thought at this stage was therefore sufficiently familiar with *physicalism*.

The Emphasis on Change[13]

By and large, one may characterise the 18th century, the age of Enlightenment, in terms of its emphasis on the universality of conceptual knowledge. The scope of the law of

6 Note that *physicalism* over-emphasises the physical mode of explanation (see the previous footnote). Neurath prefers to speak of the "Vienna Circle for Physicalism" and advances the idea of "the unified language of physicalism" (Neurath 1959:282, 285).

7 Dating back to Galileo and Newton and reflected in the basic denominator chosen by Thomas Hobbes – 'moving body'. In terms of this kinematic orientation, all natural processes are reversible. In 1910, Max Planck remarks that the "irreversibility of natural processes" confronted the "mechanical conception of nature" with "insurmountable problems" (see Planck 1973:55).

8 Kitcher remarks that cautious Darwinians "may think that natural selection" is an important element of "evolutionary change" (Kitcher 1987:56).

9 Consider the title of Dawkin's 1986 book.

10 Darwin rejects the vitalistic idea of a final cause (Darwin 2005:283, 291).

11 It has already constituted an important element in the philosophical problems facing Kant (18th century), who had to restrict the application of the category of causality to sensory phenomena in order to safeguard a domain of human freedom (cf. Kant 1787-B:564).

12 See Horkheimer & Adorno (1973:11-12) and Maus (1956:7).

13 While terms like *mulltiplicity*, *successor*, and *infinity* stem from the domain of number, and terms like *magnitude* and *dimension* from the domain of space, the term *change* finds its seat within the *physical*

causality was supposed to be universal, and the same applies to Kant's categorical imperative (see Kant 1786:52). The Romantic movement accomplished a switch from universality to what is unique and individual, supported by the rise of historicism in its claim that contingent reality is irrepeatable. Meinecke discerns a balance between being and becoming in the thought of Goethe (Meinecke 1965:503), for now the importance of *historical change* sufaced (see Cassirer 1957:237 regarding Niebuhr's historicism).

The effect was that the first part of the 19th century emphasised change – consonant with the prominence of change also found in the *Origin of Species*. Darwin in fact explored the idea of *change* at the cost of *constancy*. It is not insignificant that, in his 1859 work, the term "constancy" appears only twice and the term "persistent" (or: "persistently") merely three times. By contrast, the term "change" occurs 268 times, "variation" 281 times and the plural "variations" 162 times. Darwin's acquaintance with the geological work of Leyll provided a larger time scale that opened up new possibilities. But it seems as if Leyll's uniformitarianism – with its emphasis on invariant universal laws of nature – resounded in the *Origin of Species*, where Darwin twice refers to a "universal law of nature" (Darwin 2005:176, 293).[14] It should be noted that Darwin nowhere in this work refers to the "biological laws of nature" – in conformity with the spirit of the age, "laws of nature" are meant to be *physical laws*. Even when Spencer uses the phrase "law of *evolution*" he believes that it should be deduced from the basic (physical) law of the *conservation of force* (see Spencer 1937:485 and Spencer 1937:491 ff.).

Historicism and Darwin (1859) were both influenced by modern *nominalism*. All universality outside the human mind is denied. One may call this trait of nominalism *irrationalistic*. The acceptance of universal concepts within the human mind highlights the *rationalistic trait* of nominalism.

However, what Darwin did not realise, is that *change* as such, if *separated* from the foundational meaning of *constancy* (persistence), loses all meaning. For that matter, one can establish change only on the *basis* of what is persistent or endures. Emphasising change at the cost of constancy eliminates the *relatedness* (i.e. relativity) of flux or change itself.[15] One can broaden this perspective by stating that, whatever is chosen to be merely *changeful*, loses its meaning the moment an attempt is made to conceive it in isolation from its coherence of meaning within reality. Therefore *change* can never be appreciated apart from its coherence with other (non-physical) features of reality.

The zoologist Thorpe highlights an instance of '*fixity*' (constancy) that causes problems for the one-sided emphasis on *change*, particularly when "the control system is continually changing, but the controlled system is constant, and constant over millions

aspect of reality, where *energy operation* is primary in the sense that it always causes certain effects, i.e. *changes*. It is therefore to be expected that a *physicalist* approach will emphasise *change*.

14 The phrase "law of nature" appears only 6 times throughout *The Origin of Species*.

15 Physical energy-operation entails change, but presupposes constancy. For this reason, the so-called physical law regarding the conservation of energy should preferably be formulated by combining Einstein's emphasis on the constancy of the velocity of light in a vacuum ("der Konstanz der Vacuum-Lichtgeschwindigkeit" – Einstein 1959:54) with the nature of (physical) energy – designating it alternatively as the law of "energy constancy."

of years", causing Thorpe to say that this "problem seems to me to stick out like a sore thumb in modern evolutionary theory."[16]

Owing to an enormous increase of fossil discoveries since Simpson wrote his major works, in which the "parade horse" of his gradualist, progressive theory is portrayed, paleontologists eventually falsified his view (see Gould 1996:68). At the background of these considerations, one should consider the analysis found in Chapter 12 of Gould's book on the *Grandeur of Life*. In this chapter, he draws attention to the consequences of the physicalist ('materialist') position Darwin assumed – precluding any idea of *progressive* (or 'higher') development. The central confusion concerns the notion of *progress*[17]:

> The problem that spawns this confusion within the Darwinian tradition may be simply stated as a paradox. The basic theory of natural selection offers no statement about general progress, and supplies no mechanism whereby overall advance might be expected. Yet both Western culture and the undeniable facts of a fossil record that started with bacteria alone, and has now exalted us, cry out in unison for a rationale that will place progress into the center of evolutionary theory (Gould 1996:136).[18]

In Darwin's work of 1859. his physicalism translates into the idea of *gradual changes* – embodying an expectation directed at future fossil findings. Unfortunately, the opposite occurred.

Stark quotes Gould as follows: "The extreme rarity of transitional forms in the fossil record (the professional secret of paleontologists) is the most prominent problem for Darwinism" (quoted by Van den Beukel 2005:105). The words of Eldredge in this context are even more significant: "We paleontologists have said that the history of life provides support for the interpretation of gradual development through natural selection, while all the time we knew that it was not true" (see Van den Beukel 2005: 105).[19]

Dawkins, by contrast, strictly continues the epistemic ideal of Enlightenment rationality (see Sterelny 2001:14) – the scientific description of the universe is "true ...

16 A discussion comment after the contribution of Ludwig von Bertalanffy (Change or Law) in the collection edited by A. Koestler and J.R. Smythies (1972:77).

17 It should be kept in mind that the optimism of the Enlightenment era was reflected in the idea of unbridled *progress*.

18 However, in the thought of Simpson, after almost a hundred years, an ambiguity is found in respect of the randomness and purposelessness of the long history of life. It is "a slow interplay of material processes from which new configurations of matter and energy gradually emerge" and that human beings were "not planned." But at the same time, it is asserted that "man" represents the "culmination of this sort of progress" (see Simpson 1953:155 ff.).

19 The abrupt appearance of new fossils displaying stasis (constancy) as their most striking feature inspired Gould's idea of punctuated equilibria, formulated in the seventies. But even before this, paleontologists attempted to come to terms with the discontinuity of the fossil record. Particularly the German paleontologist, Schindewolf, famous for his standard work *Grundfragen der Paleontologie* (1980), developed a distinct theory. He employs the presupposition of a discontinuous macro-mutation, the notion that nature is able to bring forth truly new types, which he then elaborates in his theory of *typostrophism* that appeals to paleontologically determined trends. Schindewolf calls the emergence of new structural types *typogenesis*. In the typical development of different levels, typogenesis is generally followed by a period of steady differentiation and transformation, which leads to a directed (orthogenetic) development of the particular structural type, which Schindewolf calls *typostasis* (the flourishing of the type). Eventually, a period of degeneration and eventual extinction follows – *typolysis* (cf. Schindewolf 1950:79-80, where he discusses *Grossmutationen* – "macro-mutations," and Ungerer 1966:235-236).

beautiful and complete" (as Sterelny formulates it – 2001:13). Dawkins adheres to the orthodox Darwinian view, believing that slowly and incrementally the power of selection builds the exquisite and intricate outfit of living organisms. However, Sterelny remarks:

> This standard story seems to run slap-bang into a nasty fact. About 530 million years ago, the fossil record seems to show that most major animal groups appeared simultaneously. In the 'Cambrian explosion', we find segmented worms, velvet worms, starfish and their allies, mollusks (snails, squid and their relatives), sponges, bivalves and other shelled animals appearing all at once, with their basic organization, organ systems, and sensory mechanisms already operational. We do not find crude prototypes of, say, starfish or trilobites. Moreover, we do not find common ancestors of these groups" (see Sterelny 2001:89-90).

Add to this Darwin's own statement: "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down" (Darwin 2005:109).

Random adaptation versus general progress – the effect of a cultural bias

While Darwin's main intention in his *Origin of Species* was to advocate random change through natural selection, without suggesting in any way general progress, those who absorbed his ideas did introduce the idea of *biotic development* in the sense of "progressive development" into their views. Darwin initially introduced the phrase "struggle for existence", but mentions that "the expression often used by Mr. Herbert Spencer of the Survival of the fittest is more accurate" (Darwin 1859:36).

Already Thomas Hobbes (1588-1679), in his *Leviathan* (1651), taught that the original (hypothetical) *state of nature* in which humankind prevailed was marked by a battle of everyone against everyone (*bellum omnium contra omnes*). The work of Malthus (1766-1834) from the year 1798 – *An Essay on the Principle of Population and its Effects of the Future Improvement of Society* – provides the bridge to Darwin's thought.[20]

However, when Darwin invokes a combination of natural selection and his "struggle-for-existence" idea in order to make room for progress otherwise not supposed to be inherent to natural selection, the one-sidedness of a "struggle" view of nature was challenged by Kropotkin and other critics. In 1903, P.A. Kropotkin (1842-1921) published a book on *Mutual Aid: A factor in Evolution*. In this work, he argues that next to "struggle for existence" phenomena there are just as many examples of meaningful and harmonious co-existence and even *symbiosis* in nature.

Gould mentions the following words by Darwin in this regard:

> The inhabitants of the world at each successive period in its history have beaten their predecessors in the race for life, and are, in so far, higher in the scale, and their structure has generally become more specialised; and this may account for

Grene provides a penetrating analysis of the diametrically opposed approaches of Simpson and Schindewolf (see Grene 1974:130, 132).

20 However, Sober remarks that "the degree to which Malthus *changed* the direction of Darwin's thought remains controversial" (Sober 1987:15).

> the common belief held by so many palaeontologists, that organisation on the whole has progressed (Darwin 1859: Chapter XI [2005: 233]).

In response, Gould remarks:

> Darwin had just devised an argument against progress – that the 'bare bones mechanics' of natural selection yields only local adaptation, not general advance – and he had reveled in the radical character of this claim. Why, then, did he bother to smuggle progress back in through the rear door of a complex and dubious ecological argument about the predominance of biotic competition in a persistently full world? (Darwin surely recognized the shaky character of his necessary premise. He provided no clear rationale for biotic predominance – and Kropotkin and other critics would nail him on this point later (Gould, 1996:143-144).

Darwin was indeed well aware of the shortcomings of the fossil 'record'. He asks: "But, as by this theory innumerable transitional forms must have existed, why do we not find them embedded in countless numbers in the crust of the earth?"

Gould had to mention that the fossil record strongly opposes the idea of a persistently full world and that this "crucial issue" indeed "caused Darwin no end of trouble" (Gould 1996:144). He continues:

> Life's history has been punctuated with several episodes of mass extinction; the largest, at the end of the Permian period, 250 million years ago, wiped out some 95 percent of the species of marine invertebrates. Clearly, habitats could not have been full after such episodes. Therefore, any buildup of progress between mass extinctions should be undone by the next dying. Darwin feared this argument greatly, and could extract himself only by claiming that mass extinctions were artifacts of an imperfect fossil record, an idea that can now be disproved with hard evidence for the triggering of at least one great dying by impact of an extraterrestrial body – the Cretaceous event that wiped out dinosaurs and gave us mammals a chance (Gould 1996:144).

Gould continues: "We may identify our assumption that evolution must entail progress as a cultural bias, and we may recognize that no good scientific argument for expecting progress exists, no more so in our own time than in Darwin's day" (Gould 1996: 145).

The explanation suggested by Gould in this regard is that on the one hand, Darwin advanced a theory of change through natural selection, precluding any idea of *progress*, but at the same time revealed his indebtedness to a conservative layer of society by at once also advocating the idea of progress. Gould argues that Darwin's "strained and uncomfortable argument for progress arises from a conflict between two of his beings – the intellectual radical and the cultural conservative":

> The society that he loved, and that brought him such reward, had enshrined progress as its watchword and definition …. Darwin could not bear to fail his own world by denying its central premise. Yet his basic theory required just this opposition. So he forged an escape, and concocted a tenuous resolution by scaffolding a separate argument about ecology onto an edifice that could not support the required proposition by its own unique and different strength. … I know no better illustration of the cultural power that progress holds over us

> than this story of Darwin's own unresolved intellectual struggle, this tug-of-war between the logic of his theory and the needs of his society (Gould 1996: 144-145).[21]

What Gould appreciates as Darwin's radical intellectual stance, is what he also wants to pursue in a radical and uncompromised manner – without falling into the trap of the idea of progress. His rejection of the progress idea does take into account the fact that the fossil record fails to support the idea of increasing ('progressive') complexity.

Van den Beukel mentions that Gould and his friend, N. Eldredge, claimed that *stasis* (immutability, constancy) is the dominant theme in the fossil record, for once a species appears, the fossil record reveals its tendency to continue existing through a long period of time without change. As we have seen, Eldredge confesses that, as paleontologists, we have said that the history of life supports the interpretation of gradual development through natural selection, although we all the time knew that this was not true (Van den Beukel 2005:106; see Eldredge 1989:65). Likewise Gould says that he believes "that the most knowledgeable students of life's history have always sensed the failure of the fossil record to supply the most desired ingredient of Western comfort: a clear signal of progress measured as some form of steadily increasing complexity for life as a whole through time." To this he adds: "The basic evidence cannot support such a view, for simple forms still predominate in most environments, as they always have. Faced with this undeniable fact, supporters of progress (that is, nearly all of us throughout the history of evolutionary thought) have shifted criteria and ended up grasping at straws" (Gould 1996:167).[22]

To this, we may add a more recent remark:

> The clear predominance of an empirical pattern of stasis and abrupt geological appearance as the history of most fossil species has always been acknowledged by paleontologists, and remains the standard testimony … of the best specialists in nearly every taxonomic group. In Darwinian traditions, this pattern has been attributed to imperfections of the geological record that impose this false signal upon the norm of a truly gradualistic history. Darwin's argument may work in principle for punctuational origin, but stasis is data and cannot be so encompassed (McGar 2006:242).[23]

Artificial selection and modern nominalism

Selection (intelligence)

A contemporary of Darwin, Alfred Russell Wallace, has already brought it to his attention that the idea of 'selection' presupposes a choosing intelligence and can therefore not be appreciated as a purely *natural* factor. Darwin himself is explicit in ac-

21 When Darwin, on the last page of the *Origin of Species*, formulates the idea of *progress* and *perfection*, it once more underscores this tug-of-war: "… and as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection."

22 Earlier in his work, Gould remarks: "We may also acknowledge that all standard attempts, including Darwin's own, lie mired in social presupposition for the impetus, logical weakness for the argument, and factual inadequacy for the evidence" (Gould 1996:145).

23 At the time when Gould and Eldredge started to emphasise 'stasis', another paleontologist categorically stated: "Evolution requires intermediate forms between species and paleontology does not provide them" (Kitts 1974:467). He points out that Darwin hoped that continuing fossil finds would fill the gaps, and then remarks: "But most of the gaps are still there a century later and some paleontologists were no longer willing to explain them away geologically" (Kitts 1974:467).

knowledging that his use of the term 'selection' derives from the *human* capacity to select: "I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection, in order to mark its relation to man's power of selection" (Darwin 1968:115).

With reference to Darwin's appeal to agriculturalists and horticulturalists, McGrath refers to Wallace, who accused Dariwn of *personifying* nature in his use of terms such as 'selecting', 'preferring', and 'seeking' (McGrath 1999:172). It may therefore be correct to point out that Darwin incorporated an element of human behaviour in his notion of 'natural selection'. However, Sober argues that one can also say that, if artificial selection can produce significant changes within a short period of time, one may expect even more significant alterations when natural selection operates on a large time scale (see Sober 1987:17-20). In addition, Sober argues that another anticipation of the idea of natural selection is found in the thought of Adam Smith and the Scottish economists (the competition present in a *laissez-faire* market) (Sober 1987:20).

Structure – the influence of nominalism

We have referred to nominalism with its hybrid character – being rationalistic and irrationalistic at once. Perhaps it represents the most pervasive influence on Darwin's thought (and on neo-Darwinistic thinking).

Since early modern nominalism, human reason no longer *accepts*, but rather *logically controls* nature as an object in service of the human spirit, with its own experience of its power and freedom (Beck 1999:3). Nominalism stripped reality of its *order-determination* and its *orderliness*, i.e. from every instance of *universality* (both as *universalia ante rem* and *universalia in re*).[24] Nominalism only accepts universality *inside* the human intellect – as *concepts* or as *words*. The world is merely populated by *individuals*. Truth is no longer given in a correspondence between *thought* and *being*,[25] since it is merely "attached to the names and their comparison as they are employed in statements" (see Cassirer 1971:56).[26] Kant drew the ultimate conclusion of the rationalistic leg of nominalism when he elevated human understanding to become the formal (a priori) law giver of nature: understanding does not derive its laws *from* nature but *prescribes them to nature* in an *a priori* way (Kant 1783:320; § 36).[27]

The irrationalistic preference in the nominalistic starting point of Darwin does not allow constant, universal structures. Therefore all general names, such as those designating a species, are considered to be mere artificial constructions of human understanding. Darwin writes: "In short, we shall have to treat species in the same manner as those naturalists treat genera, who admit that they are merely artificial combinations made for convenience" (Darwin 2005:315; 1968:456). The well-known neo-Darwinist, G.G. Simpson, writes in the same spirit: "organisms are not types and they do not have types" (Simpson 1969:8-9).

24 *Universalia ante rem* are replacing the *law for* things while the *universalia in re* replaced the *orderliness* of things.

25 Greiner (2003:67-70) argues that the classical metaphysical correspondence theory of truth – *adequatio intellectus et rei* – is burdened by multiple problems.

26 "Die Wahrheit haftet nicht an den Sachen, sondern an den Namen und an der Vergleichung der Namen, die wir im Satze vollziehen: veritas in dicto, non in re consistit" (cf. *De Corpore*, Part I, Chapter 3, Par.7 & 8).

27 "[D]er Verstand schöpft seine Gesetze (*a priori*) nicht aus der Natur, sondern schreibt sie dieser vor" (Kant, 1783:320; § 36) ["Understanding creates its laws (*a priori*) not out of nature, but prescribes them to nature"].

In his view of physical entities, Simpson adheres to the *rationalistic* view of classical physics, according to which physical entities are "invariant types" (compare Darwin's universal laws of nature). According to Simpson, biology cannot employ a typological method, because in the case of individual organisms, "no two are likely ever to be exactly alike" (Simpson 1969:9). In other words, Simpson's view that biology proceeds in a non-typological way requires a *typological* foundation, given in his distinction between two *types* of intellectual disciplines: physics (operating with invariant types) and biology (rejecting the idea of invariant types).

Concluding remarks

The core of Darwin's argument in the *Origin of Species* is physicalistic in nature, without any claim to progress or perfection (although contradicted by those instances where his cultural bias surfaced). 'Nature' 'selects' at random, being 'blind' to what is 'better' or 'worse'. Within a material (physical) universe, biotic terms are avoided – implying that, strictly speaking, there is no room for the idea of organic development (evolution) within such an approach. In this strict (biotic) sense of the term, Darwin therefore initially did not advance a theory of (biotic) *evolution* – explaining why he does not specify any "universal law of nature" as being a *biotical* law[28] [see Darwin 2005:143 (2x), 147, 268, 427, 445].[29]

Darwin's ideas concerning *struggle*, *radical change*, and *selection*, derived from a nominalistic denial of *constant structures* (in the sense of *laws for*),[30] are embedded in his naturalistic *physicalism*. The irony of Darwin's original 1859 position is therefore that the entire account of *change* presupposes something *constant* – and the only constant Darwin accepted was his incidental reference to a *universal law of nature*. Since such (physical) laws of nature are never specified as being 'biological', his ultimate orientation remained physicalistic – and physics alone does not speak of evolution (development) in a biotic sense. For this reason, we may conclude that, in his *Origin of Species*, Darwin in fact only developed a theory of (physical) change, but that he did not develop a truly *biological theory of evolution*.[31] This is an instance of the *irony* of reductionism – it achieves the opposite of what it aims for.

Literature

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28 Normally designated as *biological laws*.

29 It should be noted that Gould actually intends to uphold Darwin's strict physicalist position, rejecting any notion of improvement or (biotic) evolution. For this reason, he says that he argues for "trends as changes in variation rather than things moving somewhere" (see Gould 1996:168-169).

30 Eldredge provides a lucid discussion of this issue (see Eldregde 1989:96 ff.).

31 Neo-Darwinism also had to postulate a universal and constant basis for its idea of "evolution," in the joint operation of *mutation* and *natural selection*. These two elements serve as the encompassing and conditioning *order for* all changes in nature. Dobzhansky remarks: "Mutation alone, uncontrolled by natural selection, could only result in degeneration, decay and extinction" (Dobzhansky 1967:41). Mutation alone embodies *devolution*. What transforms it into *evolution* is *natural selection*. However, it falls outside the scope of this article to analyse the position of neo-Darwinism and the way in which it explores genetics (for a critical stance based upon a specialised knowledge of genetics, see Scheele 1997 – not to mention the challenge from biochemistry to the "idea" of "Darwinian evolution" – see Behe 2003).

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