Nietzsche, Biology and Metaphor

Gregory Moore

CAMBRIDGE
UNIVERSITY PRESS

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, UK
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, VIC 3166, Australia
Ruiz de Alarcón 13, 28014 Madrid, Spain
Dock House, The Waterfront, Cape Town 8001, South Africa

http://www.cambridge.org

First published 2002

Printed in the United Kingdom at the University Press, Cambridge

Typeface Plantin 10/12 pt. *System* LaTeX 2ε [TB]

A catalogue record for this book is available from the British Library.

Library of Congress Cataloging in Publication data
Moore, Gregory, 1972–
Nietzsche, Biology, and Metaphor / Gregory Moore.
p. cm.
Includes bibliographical references and index.
ISBN 0 521 81230 5
1. Metaphor. 2. Human evolution – Philosophy. I. Nietzsche, Friedrich Wilhelm, 1844–1900. II. Title.
B3318.M4 M66 2002
193 – dc 21 2001043121

ISBN 0 521 81230 5 hardback

Contents

1 The physiology of power

Was Nietzsche a Darwinist? Or was he, as he himself often claims, an 'anti-Darwinist'? It is typical of the misunderstandings, misreadings and misappropriations that have plagued the reception of Nietzsche's thought that he has been so frequently identified with one of the very nineteenth-century figures whose theory of evolution he repeatedly sought to challenge and whom he dismissed as an intellectual mediocrity. In *Ecce Homo*, Nietzsche himself was sufficiently irritated by those who insisted on reading his work – and in particular his proclamation of the *Übermensch* – in Darwinian terms to complain: 'learned cattle caused me on its account to be suspected of Darwinism' (*EH* III, 1). And yet there can be no question that Nietzsche adopts a broadly evolutionist perspective: he believes in the mutability of organic forms; he sees morality, art and consciousness not as uniquely human endowments with their origin in a transcendental realm, but as products of the evolutionary process itself. In *Human, All Too Human*, he suggests that the question of how our conception of the world might differ from the 'true' nature of the world will be relinquished to 'the physiology and evolutionary history of organisms and concepts' (*HA* 10). And in *The Gay Science*, Nietzsche rebukes Schopenhauer for rejecting all evolution as chimerical and dismissing Lamarck's insight as 'an ingenious but absurd error' (*GS* 99). But does all this make him a Darwinist? One of the more recent writers to discuss the issue of Nietzsche's supposed 'Darwinism' certainly thinks so. Werner Stegmaier argues that Nietzsche was, 'as far as the scientific content of Darwin's theory of evolution is concerned, and despite several objections, a resolute Darwinist in all phases of his creative life'.[1] This seems an odd verdict to reach given

[1] Werner Stegmaier, 'Darwin, Darwinismus, Nietzsche: Zum Problem der Evolution', *Nietzsche-Studien* 16 (1987), 269. Nietzsche's relationship to Darwinism has also been discussed by, among others: Oskar Ewald, 'Darwin und Nietzsche', *Zeitschrift für Philosophie und philosophische Kritik*, Ergänzungsband 1 (1909), 159–79; Claire Richter, *Nietzsche et les théories biologiques contemporaines* (Paris: Mercure de France, 1911); Ludwig Haas, 'Der Darwinismus bei Nietzsche', Ph.D. thesis, University of Gießen (1932); Alwin Mittasch, *Friedrich Nietzsche als Naturphilosoph* (Stuttgart: Alfred Kröner Verlag, 1952), pp. 168–88; Pieter Mostert, 'Nietzsche's Reception of Darwinism',

that, like the majority of educated Germans of his time, Nietzsche appears never to have read a single work by Darwin himself. As with a host of earlier commentators, Stegmaier is led to this fallacious conclusion because he fails to differentiate between evolutionism in general and the specifics of Darwin's theory of evolution by natural selection. This is not merely a dispute about terms; the lack of sharp distinctions here elides the complex historical framework within which Nietzsche expressed his ideas on evolution and without a knowledge of which any serious attempt to evaluate his 'anti-Darwinian' statements is impossible.

The myth of the 'Darwinian Revolution' can sometimes foster the belief that the publication of *The Origin of Species* had an effect rather like the one Nietzsche hoped his critique of Christian morality would have – that in marking a traumatic shift from the creationist paradigm underpinning natural theology to full-blown Darwinian evolutionary thought it broke 'the history of mankind into parts' (*EH* XIV, 8). But the idea of 'transmutation' was of course hardly novel, and long before Darwin there had been numerous attempts to understand how the diversity of species had been established and whether changes had occurred through time. In later editions of *The Origin of Species* Darwin listed over thirty predecessors and was still accused of a lack of generosity. Greek thinkers had held the view that life had developed gradually out of a primeval slime – an idea to which Lorenz Oken, perhaps the greatest of the German Romantic biologists, would later return. In the eighteenth century, Diderot, Buffon and Maupertuis all expressed some degree of commitment to the mutability of organic forms. Charles Darwin's own grandfather, Erasmus Darwin, postulated in his work *Zoonomia* (1794–6) the progressive development of all warm-blooded animals from 'one living filament', arguing that each one possesses 'the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity'.[2] But perhaps the most significant and influential pre-Darwinian theory of species change was advanced by the French naturalist Jean-Baptiste Lamarck in his 1809 treatise *Philosophie zoologique*. For Lamarck, conscious endeavour and reflexive habit are agents of evolutionary change. He supposed that an organism's needs, imposed upon it by the environment, determine the development and modification of its physical structure. These needs dictate the way the organism will manipulate its body, and the effect of exercise, of use and disuse, causes some organs to expand, while others atrophy. The characteristics acquired by

Bijdragen tot de Dierkunde 49 (1979), 235–46; Alistair Moles, *Nietzsche's Philosophy of Nature and Cosmology* (New York: Peter Lang, 1990), chapter 3.

[2] Erasmus Darwin, *Zoonomia; or, the Laws of Organic Life*, 2 vols. (London: Johnson, 1794–6), vol. I, p. 505.

the result of such effort are transmitted directly to offspring. Lamarck's best-known example involves the giraffe: ancestors of the modern giraffe stretched their necks in order to reach the leaves of tall trees; the effect of this stretching, inherited over many generations, accumulated to produce the long neck which now distinguishes the species.[3]

But although Darwin did not originate the idea of organic evolution, he was certainly responsible for its widespread acceptance. The chief objections to the pre-Darwinian evolutionary theories were based partly on the assumption of a short geological time span, which did not allow gradual evolution time to operate, and partly on the speculative and puzzling explanations of how the process worked. The persuasiveness of *The Origin of Species* derived not so much from Darwin's assemblage of evidence from natural history and paleontology showing that evolution *had* taken place, but largely from his construction of a plausible theory of *how* it occurred. Darwin's own attempt to explain 'the changing history of the organic world' and the process by which organisms adapt to their environment rests on two main premises. He begins in a deliberately minor key with a discussion of generally accepted and uncontroversial facts: the vast changes in domestic animals which can be obtained in a relatively short period of time through selective breeding by human beings. Having established the flexibility of nature introduced by the occurrence of variation in offspring and the power of what he terms 'artificial selection', Darwin asserts that individual organisms in a state of nature also exhibit a tendency to variation, a tendency induced largely through reproduction, but to some extent also by the effects of use and disuse of organs and the direct action of the environment. His second claim – famously inspired by Thomas Malthus's *Essay on the Principle of Population* (1797) – is that organisms are everywhere engaged in a struggle for life, a conflict which inevitably arises because of the high rates at which all organic beings tend to increase and their ensuing competition for the limited resources available to sustain them: 'as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life'. Any variation in the structure of an organism – no matter how small – which confers on it an advantage over others in this struggle will ensure that it meets with success – as measured by its survival and ability to produce offspring. Useful variations are then inherited by descendants, and the cumulative effects of this process enable the organisms involved to mutate into varieties, species or even genera. This principle 'by which

[3] Peter J. Bowler, *Evolution: The History of an Idea*, 2nd edn (Berkeley, CA: University of California Press, 1989), pp. 81–9.

each slight variation, if useful, is preserved' Darwin calls, by analogy with the activity of human breeders, 'natural selection'. While the struggle for existence does not create the initial variations, it acts upon the probabilities affecting survival and reproduction. Hence, in conjunction with heredity, it supplies the dynamic of evolutionary change, always ensuring the preservation of those organisms best adapted to a given environment: 'The theory of natural selection is grounded on the belief that each new variety, and ultimately each new species, is produced and maintained by having some advantage over those with which it comes into competition, and the consequent extinction of less favoured forms almost inevitably follows.'[4]

The very presupposition of Darwin's argument is a well-established fact which he was nevertheless unable to explain satisfactorily: the tendency to variation in offspring, for it is only by such random variations occurring and being heritable that natural selection has any material upon which it can work. But how and why do these variations arise? The absence of any understanding of the nature and vehicle of heredity until the rediscovery of Gregor Mendel's laws of genetics in 1900 would seriously affect the way in which Darwin's theory was interpreted and received by his contemporaries. For there were many staunch evolutionists who, like Ernst Haeckel, hailed *The Origin of Species* as 'epoch-making' and yet harboured doubts about the sufficiency of natural selection as a means of accounting for organic change. Though most biologists accepted that natural selection could and did cause heritable change, many believed that it was not nearly as powerful as Darwin claimed, and that it played only a secondary role in evolution – or at the very least needed to be supplemented by other, more efficacious forces. This strangely ambivalent response to Darwin's work, together with the further confusion surrounding the concept of struggle, the genealogy of organisms, and the patterning of the evolutionary process, is symptomatic of what Peter Bowler has called the 'non-Darwinian revolution' in biology.

For Bowler, the paradigmatic shift in science which nineteenth-century evolutionism represents centres not on Darwinism as it is recognised and understood today, but on what he calls the 'developmental' model of evolution, with its roots in pre-Darwinian theories like Robert Chambers' *Vestiges of the Natural History of Creation* (1845) and Karl von Baer's work in embryology. By stressing the orderly, teleological, and usually progressive character of evolution, often through the perceived analogy between the growth of a species (phylogeny) and that of an individual embryo (ontogeny), developmental evolutionism preserved certain

[4] Charles Darwin, *The Origin of Species* (Harmondsworth: Penguin, 1985), pp. 151, 117, 115, 323.

aspects of the traditional view of nature.[5] It was this version of evolution which, in one form or another, continued to dominate late nineteenth-century biology. In contrast, Darwin's 'variational' model posited natural selection and adaptation as the sole driving agent of evolution, whereby species change because they must adapt to new environments or because they become too specialised for existing lifestyles. The bolder, more materialistic and dysteleological aspects of *The Origin of Species* – precisely those aspects which appeal to modern biologists – were not typical of Darwin's own time. The theory of natural selection had little impact on late nineteenth-century biology, not only because its explanatory power was less convincing without a genetic model of heredity, but also because it was formulated in an intellectual climate that offered better support to rival concepts of organic development – such as those of Lamarck – which circumvented and subverted Darwin's more radical proposals. Darwin's theory, Bowler argues,

> should be seen not as the central theme in nineteenth-century evolutionism but as a catalyst that helped to bring about the transition to an evolutionary viewpoint within an essentially non-Darwinian conceptual framework. This was the 'Non-Darwinian Revolution'; it was a revolution because it required the rejection of certain key aspects of creationism, but it was non-Darwinian because it succeeded in preserving and modernizing the old teleological view of things.[6]

Darwin, in other words, succeeded – and this despite all the scientific (and extra-scientific) controversy sparked by *The Origin of Species* – in converting the vast majority of biologists to some form of evolutionism, but not to Darwinism as such. This conversion was achieved remarkably quickly. The Darwinist philosopher Michael Ruse concurs with Bowler when he proposes that the alacrity with which Darwin's contemporaries accepted evolutionism in the wake of *The Origin of Species* and their concomitant scepticism vis-à-vis the efficacy of natural selection were not unconnected: 'one suspects that even those who objected to selection found evolution made more credible by selection: a suggested mechanism, even if untenable, helped establish the plausibility of evolution'.[7]

[5] Indeed, the term 'evolution' originally referred to embryonic growth and was seldom used by Darwin himself to denote the transformation of species. In Germany, the term 'Entwicklung' was used to denote both ontogenetic and phylogenetic development, because it was widely assumed that both processes were intimately related. 'Evolution' was understood literally, as an 'Ent-wicklung' or unfolding of preformed characteristics.

[6] Bowler, *The Non-Darwinian Revolution*, p. 5. Even Darwin himself, in later editions of the *Origin*, came increasingly to concede a role to Lamarck's notion of the inheritance of acquired characters.

[7] Ruse, *The Darwinian Revolution: Science Red in Tooth and Claw*, pp. 229–30. Other commentators to have cast doubt on the received view of Darwin's revolutionary impact include: Adrian Desmond, *The Politics of Evolution: Morphology, Medicine and Reform in*

Even though some biologists openly proclaimed themselves to be 'Darwinians', their thought often turns out to be little more than what Bowler calls 'pseudo-Darwinism', a blend of Darwinian rhetoric – usually the evocation of the struggle for existence – with attitudes that are in reality a legacy of the pre-Darwinian view of nature. It was in Germany that such attitudes were most visible. It has often been said that Darwinism, though born in England, 'found its spiritual home in Germany'; it was here more than any other country that evolutionary theory achieved the status of 'a kind of popular philosophy'.[8] But until the early 1860s, when Ernst Haeckel began his crusade on behalf of evolutionism with all the zeal of a recent convert, the response to *The Origin of Species* in Germany had been cautious. In the words of T. H. Huxley, Darwin's chief apostle in England, Germany 'took time to consider'. The initially muted reaction to Darwin's theory in Germany may have been due to the fact that many German naturalists – particularly amongst the morphologists – were already evolutionists in the sense that they accepted the gradual unfolding or *Entwicklung* of a purposeful trend in the history of life, ideas which had their roots in the dynamic view of nature fostered by Romantic and pre-Romantic *Naturphilosophie*.[9] This is certainly borne out by Huxley's remark that the 'curious interval of silence' which preceded the enormous outpouring of German writings on *Darwinismus* could be explained by the fact that German biologists were divided between those who doggedly adhered to the notion of the fixity of species and those who were 'evolutionists, *a priori*, already, and they must have felt the disgust natural to deductive philosophers at being offered an inductive and experimental foundation for a conviction which they had reached by a shorter cut'.[10] Heinrich Bronn, for instance, who published his own developmental view of nature in 1858 before translating *The Origin of Species* in 1860, certainly belonged to the latter category. Thus, while there were some German scientists who followed Darwin in holding that natural selection – or

Radical London (University of Chicago Press, 1989); Robert J. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (University of Chicago Press, 1987).

[8] Emanuel Rádl, *The History of Biological Theories* (London: Humphrey Milford, 1930), p. 42; Alfred Kelly, *The Descent of Darwin. The Popularization of Darwinism in Germany, 1860–1914* (Chapel Hill, NC: University of North Carolina Press, 1981), p. 5. See also William Montgomery, 'Germany', in Thomas Glick (ed.), *The Comparative Reception of Darwinism* (Austin, TX: University of Texas Press, 1974), pp. 81–116; Pietro Corsi and Paul Weindling, 'Darwinism in Germany, France and Italy', in David Kohn (ed.), *The Darwinian Heritage* (Princeton University Press, 1985), pp. 638–729.

[9] Oswei Temkin, 'The Idea of Descent in Post-Romantic German Biology: 1848–1858', in Bentley Glass, Owsei Temkin and William L. Strauss, Jr. (eds.), *Forerunners of Darwin, 1745–1859* (Baltimore, MD: Johns Hopkins University Press, 1968), pp. 323–55.

[10] T. H. Huxley, 'On the Reception of *The Origin of Species*', in Francis Darwin (ed.), *The Life and Letters of Charles Darwin*, 3 vols. (London: John Murray, 1887), vol. II, p. 186.

at least some combination of external, environmental factors – was the mechanism of species mutation, a significant number of prominent biologists either wholly rejected Darwin's theory of natural selection or attached less importance to it. In its place, many articulated a *pre-Darwinian basic commitment to non-adaptive models of evolutionary change*. Loyal to the vitalistic traditions of their science, nineteenth-century German biologists resurrected Blumenbach's concept of the *Bildungstrieb*, the *nisus formativus*, and held an intra-organic directive or transformative force to be the main engine of evolution. This is not to deny that the concept of a 'struggle for existence' deeply penetrated German culture, becoming, like 'the will to power' after it, one of the watchwords of the day. But many nineteenth-century Germans – Haeckel among them – could not accept that the ubiquitous conflict entailed by Darwin's theory was entirely without purpose, something that becomes even clearer when the idea was applied by them to human society. The struggle for existence was commonly understood as the means through which a more fundamental Law of Progress manifested itself.[11]

These very same attitudes and prejudices underpin Nietzsche's own evolutionism, and in particular his anti-Darwinian statements from at least the mid-1880s onwards. For a start, he did not regard Darwin as the originator of a new world-view; rather, the theory of evolution is for him merely an 'after-effect', an echo of the philosophy of becoming first expounded by Heraclitus, Empedocles, Lamarck and, tellingly, Hegel – a sign of how widespread already was the notion of 'development' or *Entwicklung* in pre-Darwinian German *Naturphilosophie* (VII 3, 34[73]). In *The Gay Science*, Nietzsche even suggests that Hegel anticipated Darwinism when he introduced the idea that 'the species concepts [*Artbegriffe*] develop *out of each other*... without Hegel there could have been no Darwin' (*GS* 357). More importantly, and in common with the vast majority of his contemporaries, Nietzsche insists that adaptation is 'a second-order activity' (*GM* II, 12), and is therefore not sufficient to account for the development of the individual organism or the species as a whole. Instead of emphasising the organism's relationship to its environment or the influence of the struggle for existence, Nietzsche locates the primary motor of evolution in an endogenous creative force: 'The influence of "external circumstances" is *exaggerated* by D[arwin] to a ridiculous extent; the essential thing in the vital process is precisely the tremendous shaping force which creates forms from within and which

[11] On the social application of Darwin's ideas, see: Richard Weikart, 'The Origins of Social Darwinism in Germany, 1859–1895', *Journal of the History of Ideas* 54 (1993), 469–88; Mike Hawkins, *Social Darwinism in European and American Thought, 1860–1945* (Cambridge University Press, 1997).

utilises, *exploits* the "external circumstances" ' (VIII 1, 7[25]). This vital energy, of course, is what Nietzsche calls the 'will to power'. Some of the earliest outlines which he drew up for his projected major work, *The Will to Power*, clearly show that, from the very beginning, he intended this agency to explain not only 'the evolution of organic beings' (VII 3, 39[13]), but also *all* organic processes: 'With the animal it is possible to derive all of its drives from the will to power: likewise, all functions of organic life can be derived from this one source' (VII 3, 36[31]). It is Nietzsche's 'physiology of power' – his attempt to formulate a non-Darwinian biology and theory of evolution – that I want to explore in this chapter.[12] This narrow focus means that I am not concerned with tracing the development of pseudo-Darwinian concepts and imagery in his work from the earliest instances around the time of *The Birth of Tragedy* right up to his last productive year, 1888; this shortcoming will to some extent be made good in the following two chapters. Here I shall be concentrating on the brief years of Nietzsche's intellectual maturity, during which time he became acquainted with the theories of a number of non-Darwinian biologists. Some of these had a considerable impact not only on his attitude towards evolution, but also on his formulation of the will to power itself (although it is worth pointing out that, without exception, *all* of the biologists with whose work Nietzsche was familiar – and not only those mentioned below – articulated either a pre-Darwinian or non-Darwinian theory of evolution).

I am not suggesting that Nietzsche advances a plausible or systematic refutation of Darwinism, let alone a consistent alternative theory of evolution. The ideas which I shall discuss here, for the most part drawn from his unpublished notes and written over a period of years, are tentative, often contradictory. I am aware, too, of the provisional nature of his theory of the will to power – after all, his planned *magnum opus* was never completed – and of the dangers of imposing an artificial structure upon these disparate notes. Nevertheless, I believe that it is possible to focus on several aspects of Nietzsche's ideas on evolution and the will to power which reveal both the original idiosyncrasies and time-bound limitations of his thought. In the first section, I shall discuss his attitude towards the progressivism that is characteristic of non-Darwinian theories of evolution and the nineteenth century more generally, and suggest how he envisages the direction and locus of organic change. Next, I shall explore his concept of the organism as a plurality of mutually antagonistic parts, and situate it within the context of contemporary theories of the 'cell state'. Finally, I shall turn my attention to Nietzsche's rejection of an

[12] Nietzsche planned to include a chapter entitled 'The Physiology of Power' in *The Will to Power*. See e.g. VIII 1, 2[76]; 2[82].

instinct for self-preservation and his consequent repudiation of Darwin's struggle for existence.

The problem of progress

The article on 'progress' in the 1875 *Larousse* dictionary concludes with the words: 'Faith in the law of progress is the true faith of our century.'[13] It has since become a commonplace that the unshakeable belief in moral and political betterment, buttressed by the technological improvements engendered by the Industrial and Scientific Revolutions, was one of the characteristic and dominant ideologies of the nineteenth century. Just as the history of human civilisation seemed to reveal a gradual and seemingly inevitable advancement over previous epochs, so biologists, as they looked back over the history of life as a whole, believed they could discern the same pattern of progressive development in the evolution of organic forms. This deep-seated belief in a law of progress resolved the potential crisis in Western thought provoked by the emergence of Darwin's theory: evolutionism need not be threatening, so long as the supposedly blind and random operations of natural selection could be portrayed as a process leading inexorably towards moral, social and intellectual improvement. The non-teleological character of modern evolutionary theory encourages the view that Darwinism helped to undermine the general faith in the ordered and inevitable progress of nature. But while Darwin was feted in his time for banishing speculative teleology from the biological sciences, this mode of thinking was so deeply ingrained that those very same biologists who trumpeted his name most loudly continued to adhere to a model of evolution that stressed a necessary, determined and wholly predictable movement, and consistently failed to differentiate between 'evolution', 'development' and 'perfection'. The Swiss botanist and cytologist Carl Nägeli, whose 1884 work *Mechanisch-physiologische Theorie der Abstammungslehre* (*Mechanico-Physiological Theory of Descent*) Nietzsche owned, even introduced as the chief driving force of evolution a 'perfection principle' (*Vervollkommnungsprincip*), whereby organisms are impelled to develop increasingly sophisticated forms independently of the environment and of natural competition.

Even Darwin's views on progress and teleology were ambivalent. While Darwin operated with a branching model of evolution, he was in many crucial respects ensnared in the prejudices of his day. Darwin *did* believe in evolutionary progress: evolution was for him progressive in the sense that it pushed each form toward a higher level of organisation within the context of its own peculiar kind of structure, with the result that

[13] Quoted in Pick, *Faces of Degeneration*, p. 12.

its descendants were better prepared than their ancestors to cope with particular conditions of existence. In the closing pages of *The Origin of Species*, he even declares that natural selection 'works by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection'.[14] But Darwin stopped short of a law of progressive development. He repeatedly criticised Lamarck and Nägeli, contrasting their position with his own view that evolution results not from an inherent developmental tendency, but from incremental adaptive changes 'selected' by environmental pressure. Yet for all Darwin's attempts to dissociate himself from the legacy of traditional biology, vestiges of the earlier, neo-Platonic concept of nature as the Chain of Being persist in his work. His metaphor of the 'Tree of Life', which he uses to illustrate his model of branching evolution,[15] appears to suggest a hierarchical order of natural forms. The trunk of the tree, of which all organic forms are off-shoots, represents an ascending series of gradations from the lowest, simplest organisms to the highest, serving as a means to identify the place of each type of living creature with relation to all the others. Though Darwin refused to distinguish absolutely between higher and lower organisms in his more guarded moments, he did not always exercise such caution in practice. He repeatedly lapsed into the old teleological ways of thinking, referring to species as 'higher' or 'lower'.

Given this almost universal commitment in nineteenth-century biology to some form of progressionism (although, as we shall see in later chapters, the belief in the inevitable advancement of organic nature was by no means irreconcilable with a conviction that this process could be interrupted by periods of decline), it seems inevitable and wholly justifiable that Nietzsche should complain that Darwinism – at least as it was understood in the nineteenth century – is one of the last attempts to project 'reason and divinity' onto nature (VIII 1, 2[131]); that in modern concepts like 'nature', 'progress', 'perfection', 'Darwinism' and 'selection', he sees merely the persistence of Christian ideas of providential Design (VIII 2, 9[163], 10[7]). Nietzsche had always mistrusted the ideology of progress, and was convinced that the nineteenth century represented a decline rather than a high point of cultural evolution. He is equally suspicious of notions of biological improvement. Human beings do not, for Nietzsche, represent any significant advance over other species of organisms. Nor is evolution, human or otherwise, an unfolding towards a predetermined *telos*: 'Humanity has no goal, just as little as the dinosaurs had one; but it has an *evolution*: that is, its end is *no more important* than any point on its path!' (V 1, 6[59]) This antipathy towards the

[14] Darwin, *The Origin of Species*, p. 499. [15] *Ibid.*, pp. 171–2.

idea of progressive perfection in evolution means that Nietzsche, especially in his later notes, often denies that 'higher' organisms – by which he means simply 'the richest and most complex forms' (VIII 3, 14[133]) – necessarily evolve from 'lower' ones. Or at least he treats this claim with extreme scepticism: 'that the higher organisms have evolved from the lower ones has so far not been demonstrated in a single case' (VIII 3, 14 [123]).

Darwin believed that variations occur in all directions, and that natural selection is always relative to a particular environment; yet he portrayed evolution as proceeding along one dominant axis, represented by the main trunk of the Tree of Life. Given his assumptions, a more accurate model would present evolution as developing along a multiplicity of divergent axes, spreading and branching as each individual shoot advances along the lines of whatever variations are most suitable to the particular circumstances of its own environment. Ironically, this is more or less how Nietzsche describes the pattern of organic change. Since the 'entire animal and plant world' does not evolve in a straight, continuous line 'from the lower to the higher', Nietzsche argues, all organisms and forces evolve simultaneously, 'chaotically, on top of one another and in conflict with one another [*übereinander und durcheinander und gegeneinander*]' (VIII 3, 14[133]). Evolution is neither progressive, nor is it a linear development. It is a movement which is random, confused and conflicting, continually oscillating between both synthesis and dissolution.

Yet Nietzsche does not dispense with the concept of perfection altogether; he seeks only to redefine it. In common with most biologists, Carl Nägeli, in a passage underlined by Nietzsche in his own copy of the botanist's *Mechanisch-physiologische Theorie der Abstammungslehre*, characterised 'perfection' as a tendency to greater organisational complexity and specialisation in the organism: 'Perfection in my sense is therefore nothing other than the progression towards a more complex structure and to greater division of labour.'[16] Nietzsche accepts – to a degree – this definition of perfection. Thus he describes the 'principle of life' in the following way:

> greater complexity, sharp differentiation, the contiguity of developed organs and functions with the intermediate members disappearing – if that is *perfection*, then a will to power manifests itself in the organic process, by virtue of which *dominating shaping commanding forces* continually increase the limits of their power and continually simplify within these limits: the imperative *grows* (VIII 1, 7[9]).

[16] Carl Nägeli, *Mechanisch-physiologische Theorie der Abstammungslehre* (Munich: Oldenburg, 1884), p. 13. Nägeli's influence is visible in a number of Nietzsche's late notes. See Andrea Orsucci, 'Beiträge zur Quellenforschung', *Nietzsche-Studien* 22 (1992), 371–88.

However, he does not understand organic perfection solely in terms of increasing structural complexity and quantitative expansion. The concept of 'perfection' entails '*not* only greater complexity, but also greater *power* (– does not need to be only greater mass –)' (VIII 1, 2[76]). Nietzsche sees both power *and* complexity as indices of perfection; or, rather, greater organic complexity is the result of a more fundamental will to power in the organism: ' "*Perfection*": reduced to *the type's increase in power*' (VIII 1, 6[26]). In other words, Nietzsche replaces Nägeli's *Vervollkommnungsprinzip*, or any other such endogenous *Bildungstrieb*, with his own will to power. (Strangely, he does not seem to be aware that to redescribe perfection in terms of a will *to* power does not make evolution any less teleological.) As an instance of the activity of the will to power in nature, he cites the creative impulse and assimilation of nutrients necessary for embryonic development: 'It is the *shaping* force which desires an ever new supply of "material" (even more "force"). The masterpiece of the construction of an organism from an egg' (VIII 1, 2[76]). Significantly, this example illustrates the creative force of the will to power in ontogenetic development, rather than in the evolution of the species (phylogenesis). For Nietzsche understands Darwin (and Herbert Spencer) to be exclusively concerned with the origin, formation and preservation of *species* (even though, as Nietzsche was clearly unaware, Darwin presented selection as a process acting upon individuals). The focal point of Nietzsche's evolutionary thought, on the other hand, is *not* the group, but rather the solitary organism: '*Fundamental errors* of biologists hitherto: it is *not* a matter of the species, but of *bringing about stronger individuals*' (VIII 1, 7[9]). For Nietzsche, evolution is a process of differentiation taking place within particular individuals. The species as a whole does not advance.

As early as 1881, Nietzsche was already suggesting that most, if not all, extant species have achieved such a high degree of adaptation to their particular environment that variation no longer occurs: 'The animal species have, like the plants, mostly *achieved* an adaptation to a certain continent, and their natures now have something permanent and fixed about them; they are *no longer* subject to fundamental *change*' (V 2, 11[274]). In his final notes attacking Darwin, Nietzsche reiterates his insistence on the present fixity of organic forms. There he writes that the idea that species progress, that they are constantly evolving, represents 'the most foolish claim in the world'; they represent, rather, 'one level' (VIII 3, 14[123]). Evolution takes place only within the limits of the type, limits which are gradually fixed as the species as a whole tends towards stability: 'One asserts the increasing evolution of beings. All grounds are lacking. Every type has its *limits*: beyond these there is no evolution. Absolute regularity

up to that point' (VIII 3, 14[133]). This process of fixation or levelling is deleterious, he seems to argue, because it promotes biological mediocrity, the reduction of the members of a species to the lowest common denominator capable of adaptation.

What makes Nietzsche's apparent commitment to the stability of organic forms all the more astonishing is the fact that less than a year previously he had actually argued against the notion of the immutability and essentiality of species. As part of his critique of the concept of the 'individual', he holds that the erroneous and misleading term 'species' refers to nothing more than the fact that a number of superficially similar life-forms arise simultaneously, and that 'the tempo of further growth and transformation is retarded for a long period of time: so that the actual minute continuations and additions do not really come into consideration' (VIII 2, 9[144]). What biologists describe as speciation is simply the result of a seeming hiatus in evolutionary change, an error arising from our inability to discern the very real, but infinitesimal differences obtaining between organisms, whose structure, like all things, is permanently in flux. On the basis of this imprecision, careless biologists infer that, since gross variations are no longer visible amongst the members of a population, the potential for further change has been exhausted and that evolution has run its course. That is, they assume that a goal or end has been reached in the development of these organisms; that, consequently, evolution as a whole unfolds according to some preordained pattern. Yet while Nietzsche here attacks the Cuverian idea of species as invariable, absolute categories, he later perversely resorts to the old Idealist concept of 'type' to resist the idea of progressive evolution and argue that species change is not the most fundamental process in evolution. According to the teachings of traditional biology, each species possesses certain essential, immutable characteristics. Although a number of less typical attributes may vary among members of the same species, the extent of possible variation is limited. The Darwinian assumption that new species evolve by branching off from parent species was therefore rejected by the biologists of the older Idealist tradition. That crossing between species results in either total failure or sterile hybrids was seen as proof of the distinct nature of species and indicated a physiological basis for these limits. New divergent forms cannot become established: crosses with original types would quickly erase them; variants would inevitably revert back to type upon exposure to crosses with members of the same species (as domesticated varieties produced by artificial selection had frequently been observed to do). Nietzsche makes precisely this same point: that types are distinct units and that consequently there can be no interspecific breeding, no common ancestry: 'Different species traced back to one. Experience

says that union condemns them to sterility and one type becomes master again' (VIII 3, 14[133]). It is for this reason that, like those who pointed to the infertility of hybrids as evidence against gradual species transmutation, he declares: 'There are no *transitional forms*.' For such intermediate structures would be simply wiped out without a trace, like a tiny drop of water in a vast ocean.

But that does not mean that Nietzsche rules out altogether the possibility of further evolution. While he contends that animal species have attained a high degree of adaptive stability within their environment, he adds: 'It is different with man, who is always inconstant and does not want to adapt to one climate once and for all' (V 2, 11[274]). When Nietzsche speaks of evolution, he has in mind principally human evolution. Or, rather, the evolution of exceptional, individual human beings – for he is by no means interested in the future advancement of the species as an entirety: 'That there is an *evolution* of the whole of humanity, that is nonsense: and not even desirable' (VII 3, 34[179]). What he said about the development of animal species applies equally well to the human species as a whole, or what he calls the 'herd': 'the herd seeks to maintain a type . . . The herd tends towards standstill and survival; there is nothing creative in it' (VII 2, 27[17]).

Thus, within a given species or population, Nietzsche distinguishes two conflicting loci of evolution. First, there is the strong, solitary, 'higher' (that is, more complex) individual, for whom, and only for whom, there exists the real possibility of evolution in the truly Nietzschean sense: the limitless expansion and development of life's creative energies. Second, there is the type or 'herd' – the groupings of individually weak centres of power which persist in an 'apparent unchangingness' (VIII 3, 14[133]). On the one hand, then, Nietzsche conceives evolution as individual leaps beyond the ambit of the type which have no influence on phylogeny, on the history of the species. For while higher forms evolve, they do not – and cannot – maintain or perpetuate themselves; only the 'type' is heritable. What is more, their existence is more precarious than that of the herd. Like the genius or the 'Caesar' in human evolution, they represent a brief, ephemeral flowering; as a result, the 'level of the species is *not* raised' (VIII 3, 14[133]). On the other hand, Nietzsche envisages slow, regular progress towards morphological stability in the herd, that is, in the greater mass of weaker, yet more fecund and durable organisms.

The aristocracy of the body

To declare that Nietzschean evolution is centred on the individual begs the question as to what he understands by 'individuality', for that very

concept is one of those which he subjects to a radical critique. Indeed, for Nietzsche the human organism is not an homogeneous whole, but rather a plurality, a 'tremendous synthesis of living beings and intellects' (VII 3, 37[4]). While this claim at first appears extravagant and counter-intuitive, it is hardly original: it was one of the insights into nature offered by the new biology, providing a novel solution to one of the most fundamental problems in the philosophy of biology: that of individuality. Leibniz had placed the discrete, indivisible, unchangeable monad at the centre of his system and, in his wake, the older Idealist biology conceived individuality in qualitative terms; the parts of each individual were assumed to be woven together into a uniform, harmonious whole. It was not until the birth of cytology in the 1840s and the advent of modern evolutionary biology that, as the neo-Kantian philosopher Friedrich Lange put it, 'the question of the nature of the organic individual' was once more opened up. With the abolition of metaphysical essences from biology and the discovery of microscopic individual cells as the elementary building blocks of animal and vegetal life, biological individuality was redefined. An organism was now held to differ only qualitatively from others; each organism is merely the expression of the sum of its qualities.[17]

Nietzsche probably first became aware of these debates through Friedrich Lange's *Geschichte des Materialismus* (*History of Materialism*), a work that exerted a considerable influence on Nietzsche's thought; it also contains a lengthy discussion of the theory of evolution, and probably provided Nietzsche with his first introduction to the main issues in the controversies surrounding Darwin's ideas.[18] In his chapter entitled 'Darwinism and Teleology', and in a passage later underlined by Nietzsche, Lange also discusses the forerunners of the modern conception of the organism, the earliest of which, he claims, was Goethe: ' "Every living thing," he teaches, "is not a single thing, but a plurality; even in so far as it appears to us as an individual, it still remains a collection of living independent beings." '[19] However, it was the pioneering work of the cytologist and pathologist Rudolf Virchow, which, as Lange points out, really opened the way to analysing organisms as multicellular composites. Virchow, who viewed the cell as the fundamental unit of life, described aggregates of individual cells as autonomous 'citizens' forming a 'cell state' (*Zellenstaat*). The analogy between the organism and the state is of course an ancient one, and has been drawn by political thinkers in every

[17] Rádl, *The History of Biological Theories*, pp. 293–9.

[18] See Jörg Salaquarda, 'Nietzsche und Lange', *Nietzsche-Studien* 7 (1978), 236–53; George J. Stack, *Lange and Nietzsche* (Berlin: de Gruyter, 1983).

[19] Friedrich Lange, *History of Materialism*, trans. by E. C. Thomas, 3 vols. (London: Trübner, 1877–81), vol. III, pp. 37–8. This passage is marked in Nietzsche's copy of the third edition (1887) of the work.

age from Plato to the Romantics. But with the rapid advances in biology in the nineteenth century, the comparison between the interdependency of systems of organs within the organism and the relationships between social structures gained in detail; the metaphor became increasingly concrete. For sociologists such as Albert Schäffle (*Bau und Leben des sozialen Körpers*, 1875–8) and Paul von Lilienfeld (*Die soziale Physiologie*, 1879), the social organism was a stage – perhaps the ultimate stage – in the evolution of the natural world. But if sociology resounded with biological metaphors, then biology was rife with imagery drawn from an expanding and industrialising society, such as cellular production, cultures, colonies, cellular migration and the division of labour. And while contemporary sociologists likened society to an organism, biologists compared the organism itself to a community. Virchow's model was perhaps the first and most significant – not least because his own political views demonstrably influenced his biology (he pursued a double career as biologist and as Reichstag deputy for the Progressive Party). Ideologically opposed to hierarchical concepts of controlling substances or regions, he conceived the organism as an egalitarian republic, 'a free state of individual organisms with equal rights, if not equal talents, which holds together because the individuals are dependent upon one another and because there exist certain centres of organisation'.[20]

In stark contrast to Virchow's brand of physiological liberalism, Haeckel, whose politics became increasingly conservative with age, formulated a more hierarchical concept of the organism. For him, cells only formed republics in plants; in animals, however, aggregates of cells evolved into a monarchy – that is, into a supposedly higher form of bio-political organisation.[21] Although contemptuous of the new German Reich whose absolutist pretensions Haeckel sought to vindicate through his biological theories, Nietzsche develops a similarly hierarchialised model of the organism as an 'aristocracy in the body' (VIII 1, 2[76]). Radically opposed to what, in *On the Genealogy of Morals*, he disparages as the 'idiosyncratic democratic prejudice' prevalent in contemporary biology, he complains that such egalitarianism traduces nature as will to power and denies 'even the dominating role of the organism's highest functionaries, in which the vital will [*Lebenswille*] manifests itself actively and in its form-giving capacity' (*GM* II, 12). While the rhetoric of the cell state usually stressed accommodation and co-operation between an organism's constituent parts, Nietzsche emphasises the command structure and competitive *struggle* that necessarily takes place within organisms.

[20] Rudolf Virchow, *Cellular-Pathologie*, quoted in Mann, 'Medizinisch-biologische Ideen und Modelle', 5.

[21] Paul Weindling, 'Theories of the Cell State in Germany', in Charles Webster (ed.), *Biology, Medicine and Society, 1840–1940* (Cambridge University Press, 1981), p. 119.

The human being is for him a 'plurality of living beings which, partly struggling with one another, partly adjusted and subordinated to one another, unintentionally affirm the totality by affirming their individual existence' (VII 2, 27[27]).

In formulating this model of the organism, Nietzsche drew heavily on the work of the embryologist Wilhelm Roux, who had been a student of Haeckel.[22] Like Lange and Nägeli, Roux was convinced that Darwin's theory of natural selection was not sufficient to explain the manifest functional harmony of an organism or the myriad correlative changes that must occur in each phylogenetic step, and located the primary process of evolution in the internal activity of organisms. In his 1881 treatise *Der Kampf der Theile im Organismus* (*The Struggle of the Parts in the Organism*), Roux proposes that organs, tissues, cells and even molecules of organic matter are found in an unceasing struggle for existence with one another for food, space and the utilisation of external stimulation. This struggle arises as a result of the excessive growth (*Uebercompensation*) of individual parts (analogous, in orthodox Darwinism, to the overproduction of offspring by organisms) and the disequilibrium which necessarily results. Again in analogy with Darwin, Roux asserts that only those parts which are better adapted to the obtaining conditions of existence can survive, i.e. can themselves produce 'offspring'. As a result of this selection, a temporary equilibrium is established. For, just as in orthodox Darwinism even the best-adapted organisms cannot reproduce without constraint (only within the bounds of what is possible in their particular conditions of existence), so the overcompensation of parts is limited in so far as the function of the dominant structure must not be impaired – for that would threaten the destruction not only of the organ in question, but of the entire organism. Because the internal environment (like the external one) is not constant, because it is always changing, causing new selective pressures to arise, intra-organismic equilibrium is temporary and must also be constantly adjusted. It is for this reason that Roux posits the capacity of self-regulation, together with overcompensation, as one of the fundamental properties of life. Self-regulation is the mechanism by which the random variations produced by overcompensation are ordered or selected by the functional requirements of the whole. In consequence, the most adapted parts of the organism prevail, producing the most efficient structure.

As the copious entries in Nietzsche's notebooks attest, Roux's physiology had a profound effect on his thinking, both on his 'anti-Darwinism'

[22] Wilhelm Roux, *Der Kampf der Theile im Organismus* (Leipzig: Wilhelm Engelmann, 1881). Roux's influence on Nietzsche has been discussed in detail by Wolfgang Müller-Lauter in 'Der Organismus als innerer Kampf: Der Einfluß von Wilhelm Roux auf Friedrich Nietzsche', *Nietzsche-Studien* 7 (1978), 189–223.

and his formulation of the will to power more generally. Nietzsche makes his own Roux's conception of the organism as a spontaneously self-organising complexity, a nexus of antagonistic forces, a 'struggle of the parts (for food, space, etc.)' (VIII 1, 7[25]). Developing Roux's own militaristic metaphors (he speaks of 'victory', 'mastery' and 'autocratic rule'), but eschewing the mechanistic paradigm favoured by him, Nietzsche envisages the internal struggle for existence as leading to the establishment of a hierarchy (*Rangordnung*), and describes higher and lower structures within that hierarchy as 'commanding' and 'obeying' units respectively. Just as Nietzsche claims that every peak of cultural evolution has been the work of an aristocratic civilisation, a society which believes in a 'great ladder of hierarchy and value differentiation between people and that requires slavery in one sense or another' (*BGE* 257), so he links biological evolution to an aristocracy of the body. The development of such 'aristocratic' hierarchies, in which the strongest parts within the organism direct and subdue the weaker ones, is for Nietzsche – and here he is again following Roux – the means by which specialisation of function takes place, with a more complex organic structure emerging through the subsumption of lower forms by higher ones: cells by tissues, tissues by organs and so on. Once again, Nietzsche distances himself from the prevailing model of the physiological division of labour as a devolution of central power to outlying regions; he prefers to describe this process as a form of 'slavery', involving the '*subjugation*' of a subordinate form so that it becomes a 'function' (VIII 1, 2[76]). The drives, for example, the highest and most powerful structures within the organism, bind together simpler organs to create 'higher organs': 'The hand of the piano player, the connection to it and a region of the brain together comprise one organ.' Using what was in his day a common metaphor to describe the relationships between organs within the cell state, Nietzsche suggests that discrete parts of the organism are 'telegraphically connected' by virtue of their being functions of the same drive (VII 1, 7[211]). This telegraphic link consists in an elaborate chain of command. The execution of a 'command', which originates in a higher structure, typically a drive, depends on the collusion and enforced co-operation of an 'enormous number of individuals', the 'obedient' elements that constitute the lower levels within the hierarchy:

> they must understand [the command] and also their special task; that is, there must be commanding (and obeying) all over again right down to the smallest units, and only when the command is dissected into a vast number of tiny subcommands can the movement take place, which commences *with the last and smallest* obeying structure (VII 2, 27[19]).

This conception of the aggregate structure of the will expressed here is by no means as outlandish as it might at first appear. Nietzsche is again simply employing metaphors prevalent in contemporary biological theory. For example, in his *Text Book of Physiology* (1877), a book which Nietzsche owned in German translation, the distinguished Cambridge physiologist Michael Foster describes how automatism and irritability are defining characteristics of all living matter, even in its most primitive form.[23] The movement of protoplasm is the result of a stimulus triggering an explosion of previously latent energy. This automatic activity means, of course, that 'the activity of contractile protoplasm is in no way essentially dependent on the presence of nervous elements'.[24] In other words, volition is not a product of complex organisation, something that emerges only in more highly evolved structures, but is present even in unicellular organisms. Seeking to explicate this automatism, Foster lapses into, as he puts it, 'simpler but less exact language'. The anthropomorphism which this entails cannot have failed to make an impression on Nietzsche. A mass of protoplasm such as an amoeba, he says, 'though susceptible in the highest degree to influences from without, "has a will of its own" '. Furthermore, a more complex organism like a hydra

> has also a will of its own; and seeing that all the constituent cells (beyond the distinction into ectoderm and endoderm) are alike, we have no reason for thinking that the will resides in one cell more than in another, but are led to infer that the protoplasm of each of the cells (of the ectoderm at least) is automatic.

Foster concludes, then, that, like the organism, volition itself is an aggregate structure, a compound of myriad minor 'wills': 'the will of the individual being the coordinated wills of the component cells'.[25] Nietzsche appeals to this self-consciously anthropomorphic language in his own attempts to express his conception of the organism. Even the most rudimentary life-form, he often claims, possesses both consciousness and will. As he considers more highly evolved organisms to be a synthesis of an original plurality of relatively simple parts, there must consequently be a '*mass of consciousnesses* and wills in every complex organic being' (VII 2, 25[401]). The 'will' is for Nietzsche, as it was for Foster, in reality an extended, interlocking chain of 'underwills'. Volition, he writes in *Beyond Good and Evil*, is a 'matter of commanding and obeying, based on a social structure of many "souls" ' (*BGE* 19). As with Foster, Nietzsche's preference for such overtly anthropomorphic language to describe apparent

[23] Michael Foster, *A Text Book of Physiology* (London: Macmillan, 1877). Nietzsche annotated his copy of the German translation of this work, which was published as *Lehrbuch der Physiologie* (Heidelberg: C. Winter, 1881).
[24] Foster, *Text Book*, p. 35.
[25] *Ibid.*, p. 74. These passages are heavily marked in Nietzsche's copy of Foster's book.

volitional behaviour in primitive organisms masks a more familiar (but no less anthropomorphic) explanation in terms of the automatic accumulation and discharge of 'force'.

But what does he mean when he speaks of countless 'souls' or 'undersouls' inhabiting each organism, or when he claims that 'the entire organism thinks, that all organic forms participate in thinking, feeling, willing – that the brain, therefore, is only an enormous centralising apparatus' (VII 2, 27[19])? The simple answer is that the soul is for Nietzsche not an intangible, ethereal essence. Like the 'will', it is a ubiquitous biological phenomenon: '*Self-consciousness* [*das Ich-Geistige*] *itself* is already present in the cell. Before the cell there is *no self-consciousness*' (VII 2, 26[36]). He even characterises the inorganic world as 'consciousness without individuality'; all that differentiates the organic from the inorganic world is that the former has developed a degree of subjectivity, a 'perspective of egoism' (VII 2, 26[37]). One example of such primitive, 'pre-organic' thought that he cites is the creation of forms in the process of crystallisation (VII 3, 41[11]). Consciousness, then, is not the exclusive prerogative of human beings, or even of highly developed organisms, but is rather an amplification, an evolution of patterns and processes present in the inorganic world as well as the most basic organic material: 'That which is commonly attributed to the *intellect* [*Geiste*] *seems to me to constitute the essence of the organic*: and in the highest functions of the intellect I find only a sublime kind of organic function (assimilation, selection, secretion, etc.)' (VII 2, 25[356]). These ideas are reminiscent of the widespread hylozoism in nineteenth-century German biology, and it is instructive to compare Nietzsche's thought with that of, say, Ernst Haeckel. For Haeckel, too, the 'soul' is not a supernatural entity, but merely the outgrowth of the rudimentary sensibility (*Empfindlichkeit*) of undifferentiated protoplasm, or what he preferred to call 'psychoplasm'. Accordingly, the single cell is the basic unit of mental life, although, in contrast to Nietzsche, he denies that each cell possesses a 'developed self-consciousness [*Ichbewußtsein*]'.[26]

[26] Ernst Haeckel, *The Riddle of the Universe at the End of the Nineteenth Century*, trans. by Joseph McCabe (London: Watts, 1900), p. 182. He does concede, however, that cytologists were split on the issue of whether cells could be credited with 'a certain degree of consciousness, and even self-consciousness' (p. 157). In a later work, *The Wonders of Life*, Haeckel also quotes from several authors to underline his thesis that 'spirit' or 'soul' is present throughout nature, including Carl Nägeli ('The mind of man is only the highest development of the spiritual processes that animate the whole of nature') and Albrecht Rau ('perception or sensation is a universal process in nature') (*The Wonders of Life*: *A Popular Study of Biological Philosophy*, trans. by Joseph McCabe (London: Watts, 1904), pp. 467–9). Nietzsche also claims that there is 'perception' in the inorganic world; see VII 3, 35[53].