Pli 9 (2000), 6-35.

Nietzsche's Brave New World of Force

Thoughts on Nietzsche's 1873 'Time Atom Theory' Fragment & on the Influence of Boscovich on Nietzsche

KEITH ANSELL PEARSON

We see force more and more materialized, the atom more and more idealized, the two terms converging toward a common limit and the universe thus recovering its continuity. We may still speak of atoms; the atom may even retain its individuality for our mind which isolates it, but the solidity and inertia of the atom dissolve either into movement or into lines of force whose reciprocal solidarity brings back to us universal continuity.[1]

Introduction

In an article in *Nietzsche-Studien* G. J. Whitlock has sought to demonstrate that Nietzsche's 1873 fragment is a reworking of ideas the of Ruggero Giuseppe Boscovich (born in Ragusa, now Dubrovnik, lived from 1711 to 1787).[2] There are definite clues in the fragment that this is indeed

---

[1] H. Bergson, *Matter and Memory*, authorized trans. by N. M. Paul & W. S. Palmer (New York: Zone Books 1991), p. 200.

[2] G. Whitlock, 'Examining Nietzsche's "Time Atom Theory" Fragment from 1873', *Nietzsche-Studien*, Band 26, 1997, pp. 350-60. See also his earlier essay, which I shall treat below, 'Roger Boscovich, Benedict de Spinoza and Friedrich Nietzsche: The Untold Story', *Nietzsche-Studien*, Band 25, 1996, pp. 200-220. There is an instructive account of Boscovich;s influence on Nietzsche in P. Poellner, *Nietzsche and Metaphysics* (Oxford: Clarendon Press, 1995), pp. 48-57, although the 1873 fragment is not mentioned or treated. See also his essay 'Causation and Force in Nietzsche' in B. Babich (ed.), *Nietzsche, Epistemology, and Philosophy of Science* (Kluwer Academic

the case.[3] Nietzsche first read Boscovich's *Theoria Philosophiae Naturalis redacta ad unicam legem virium in natura existentium* in March 1873, borrowing the copy from his University library in Basel. This was around the time he also took out on loan books such as Herman Kopp's *History of Chemistry* (1844) and Friedrich Uberweg's *Outline of a History of Philosophy from Thales to the Present* (3 vols., 1867). It was in working through Lange's *History of Materialism* (first published 1866) that Nietzsche came across Boscovich and to a reference to the more recent work of T. Fechner on the doctrine of atoms (*Ueber die Physikalische und Philosophische Atomenlehre*, Leipzig 1864). It is clear that Nietzsche also carried out his own independent study of Boscovich's great text. He was reading Boscovich alongside other texts that played a formative role on his intellectual development, such as Afrikan Spir's *Thought and Reality* (*Denken und Wirklichkeit)* (volume 1, 1873) and Johann Carl Friedrich Zollner's *On the Nature of Comets* (1872) (this reading would be supplemented in the coming years by, among other texts in the natural sciences, A. Geikie's 1877 text *Geologie* and J. G. Vogt's 1878 work, *Die Kraft: eine real monistische Weltanschauung*). Nietzsche's encounter with Boscovich was an important one and may have proved decisive for the later articulations of the doctrines of will to power and eternal return. The fragment has never been translated into English before and to my knowledge Whitlock is the only English-speaking scholar to have produced serious work on it. It is important for two main reasons: one, it shows that as early as 1873 Nietzsche had a well-developed theory of forces (as Whitlock points out) and that he was struggling to articulate a novel conception of time; two, if Nietzsche's thinking on time was mediated by Boscovich, which in turn was an attempt to take further and refine the insights of Leibniz and Newton and, perhaps most significant of all, to go beyond various kinds of *Zenonism*, then it affords us valuable

---

1999), pp. 287-97, esp. pp. 293-6. One should also consult G. J. Stack's study, *Lange and Nietzsche* (Berlin & New York: Walter de Gruyter, 1982).

[3] In an 'excursus' on the 1873 fragment in an unpublished dissertation Martin Liebscher of the University of Vienna has sought to show that the fragment bears the stamp of the influence of Schopenhauer's metaphysics on Nietzsche's thinking at this time, notably the emphasis on 'Empfindung' and 'Vorstellung'. That this philosophical framework is important to Nietzsche at this point and informs his thinking of time in the fragment is evident in the fragment - 26 [11] - which precedes the time-atom fragment (26 [12]), and the reason for including it in our translation. I am indebted to Martin Liebscher for letting me examine a copy of his work.

insight into understanding the nature and limits of Nietzsche's own thinking on this issue.

Nowhere in the extensive commentaries on eternal return and Nietzsche's thinking on time are the crucial issues and important contexts discussed, including Nietzsche's reception of Boscovich and his extensive engagement with the natural scientists of his day. It suggests to me that Nietzsche commentary on the whole, and for far too long, has been too much informed by an ignorance of the theoretical contexts he was working in. His ideas have been decontextualised and over-determined as part of some general history of metaphysics (in Heidegger's reading he is bestowed with the dubious honour of being the 'last metaphysician of the West'). For example, we know that Nietzsche's elaboration of the teaching of will to power in terms of *die gestaltenden Krafte* is derived from Wilhelm Roux's 1881 text on embryology, *The Struggle Between Parts of an Organism*. These examples can be readily multiplied. Nietzsche's texts remain fertile sources of thinking but an ignorance concerning their specific contexts and actual engagements condemns them to remaining unnecessarily enigmatic.

Nietzsche and Time Atomism

The 1873 fragment provides a fascinating, if ultimately frustrating, series of insights into how Nietzsche was attempting to work through Boscovich's thinking of force and produce a novel conception of time (time with a big 'T' is a reification and does not exist, there are only time moments or points). It strikes me that this is an early moment in Nietzsche's reception of Boscovich, simply because throughout - and a translation of the preceding paragraph has been provided to show this (26 [11]) - the emphasis is placed on sensation and imagination or representation (*Vorstellung*) and how they present limits for any thinking of matter and of time and space. They are the means through which matter is disclosed to, and perceived by, us. In this fragment Nietzsche could be read as suggesting that they provide the means that enable us to adapt to *macroscopic* experience, rather than forming *a priori* transcendental conditions of *all* possible experience. This would be to suggest that their transcendental domain covers only a quite specific and limited field of experience and knowledge. In Boscovich's text itself, as we shall see, the stress is on the need to go beyond the senses and perception in order to

develop an adequate philosophy of science. This aspect of Boscovich - where he can appear as an early exponent of 'critical rationalism' - becomes crucial to Nietzsche's utilization of him in the 1880s. In 1884/5, for example, Nietzsche reads the significance of Boscovich in terms of his 'destruction' of materialistic atomism. In this early piece, however, Nietzsche is using Boscovich to arrive at a *time atomism*. Let me to try unravel the limits of this early thinking of time, which is done in the context of a theory of forces. We shall then proceed to Boscovich himself and to the reception of his project in the later Nietzsche.

As should be evident from the fragment, Nietzsche is not coming up with a straightforward atomistic conception of time, which would involve the reduction of time to a series of unconnected 'now' points. For two time-points, A and B, to be effective there must be a time-distance, however small the distinct moments can be conceived to be. For Nietzsche this leads to the view that 'force' cannot persist in any absolute sense, there can only be change. This is what is at stake when he writes that 'All forces are only a *function of time*'. He then rightly states that 'all laws of space' are thought of as timeless (simultaneity being the chief concept here, as succession is for time). If the whole world could be thought in terms of a 'stroke' then there would be no movement. This means that either we subsume movement within the category of space, in which case its effects are nullified, or movement is related to time, in which case the laws of space would be challenged. It is at this point in the fragment that for the first time Nietzsche introduces his conception of a time-atomism. The key part of the fragment runs as follows:

> …as time is infinitely divisible, the whole world is possible as a purely temporal phenomenon, because I can occupy every time-point with the one space-point, thus being able to place it an infinite number of times…Between each time-interval there is still room for infinite time-points; therefore one could imagine a whole corporeal world, all furnished from one point, but in such a way that we bodies dissolve into interrupted timelines.

There are two principal problems with this passage that need addressing. The first concerns the working assumption that time is infinitely divisible, which is to already think time in terms of space and quantity. It is interesting to note that in *Philosophy in the Tragic Age of the Greeks*, also composed in 1873, Nietzsche, in a section on Parmenides and his pupil

Zeno, notes that if time is supposed to be real then it *cannot* be infinitely divisible. The paradoxes of Zeno, such as the mysterious flying arrow which at any single point is motionless, are generated from the reduction of the flow of time to *atomistic* moments (see section 12). The second problem concerns the idea that between distinct time-intervals one can posit in the interval that separates them an infinity of time-points. As we shall see, this is a thinking of time that characterizes and runs through the text of Boscovich, and Nietzsche is simply replicating its tensions in this fragment. That it is a spatialized and mathematical model of time that is stake in Nietzsche's argument (which is not to say he wishes to endorse it) is clear when he writes: 'Translation of all laws of movement into time proportions'. The question to be asked is whether Nietzsche is able, in this fragment and in his later work, notably with the doctrine of eternal recurrence, to translate the thinking of time into *another* language, such as the 'becoming' mentioned in the 1873 fragment.

In the 1873 fragment Nietzsche is working through one of the most important problems that have characterized all modern thinking on time and which continue to characterise thinking today. This problem comes to the fore in his treatment of sensation and imagination/representation in relation to the problem of time. The question which continues to bedevil thinking can be expressed as follows: is duration, involving the prolongation of the past into the present and the virtual movement of time, a subjective phenomenon of consciousness? Or can we also say that external things endure too, in other words, that duration is a phenomenon of the material universe itself? If time is conceived in terms of instants - a preference that characterizes one major strand of philosophy from Leibniz to Bachelard[4] - then there are two options: (a) that of generating a conception of temporality or temporal processes from points or parts (instants) that are devoid of time or temporality, or (b) maintaining that time is in the instant (as opposed to the instant being in time), but also claiming that time does not exist and so the need for generating a notion of temporality is rendered superfluous (an option most recently favoured by Julian Barbour).[5] Nietzsche follows Boscovich in pursuing the first option.

---

[4] G. W. Leibniz, 'Correspondence with Clarke, 1715-16', in *Philosophical Writings* (London, Dent, 1973), p. 233. G. Bachelard, 'Duration, Instants, and the Absolute: Bergson or Einstein?', in Mary McAllester Jones, *Gaston Bachelard. Subversive Humanist: Texts & Readings* (University of Wisconsin Press, 1991), pp. 32-8.

[5] In *The End of Time* (Weidenfeld & Nicolson, 1999), Barbour offers a new theory of timelesness that seeks to marry some of the insights of Leibniz with quantum physics and which centers on a strange new world he calls 'Platonia'. Barbour begins by

The difficulty, as Nietzsche sees it, is that of establishing a 'time-law'. In order for there to be a synthesis of time there has to be, Nietzsche correctly observes, a being capable of holding together 'earlier moments of time beside the present'. This is the role of the imagination which constructs space and deduces 'coexistence'. The notion of 'multiplicity' (*Vielheit*) arises through the existence of such a being, which is able to think the 'persisting point' 'repeatedly in the smallest moments of time'. Moreover, such a being would 'not assume the point to be identical at different time-points' but would accept the points as being 'simultaneous'. Nietzsche then goes on to declare that the 'essence of sensation would consist in gradually sensing and measuring such time figures ever more finely'. The imagination would think them in terms of coexistence and then

---

rejecting the idea of space and time as 'containers' of the universe, arguing that the world does not contain things since it is things. These things are 'Nows'. He thus resurrects in his theory of timelessness, one that he thinks will characterize the next revolution in science, the notion of time as *instants*: 'As instants, rather than an invisible river, time becomes concrete' (p. 18). For Barbour this is, in fact, to relinquish time altogether since there is no movement 'of ' time on his model. 'Nothing changes in Platonia. Its points are all the instants of time, all the Nows; they are simply there, given once and for all' (p. 44). The 'nows' of this time - a so-called timeless 'time' - are infinite and each one is different. Barbour has, I believe, been led to abandon the notions of change and movement - in short, time - because he believes that this is to presuppose a fiction, namely, the fiction of an enduring *substance* or a subject of change and time. He tries to overcome such an idea by thinking of changing states in terms of 'movement' from one atomic position to another (although the movement is an illusion generated by us), so, for example, to speak of the cat that leaps and the cat that lands is not to speak of an enduring substance that undergoes this change (an actual cat), but rather of different 'nows' that are occupied by the atoms that make up the cat and which, he says, 'are in a constant state of flux'. The same can, of course, be done to rework Zeno's paradoxes: '…in my timeless view the paradox is resurrected, but the arrow never reaches the target for a more basic reason: the arrow in the bow is not the arrow in the target' (p. 49). The error Barbour remolds is the classic one of reducing duration - especially when conceived as invention or generation - to space. It is not that he thinks change involves nothing more than movement in space (from one 'now' to another 'now'), since movement is an illusion that presupposes a subject (which is a highly contestable assumption in itself). It matters little whether one posits a substance of change or jettisons such a notion, the problem persists: how does one account for the generation of the new? Barbour thinks he has got rid of the need to pose this question but this is fantasy on his part. In his view the 'nows' are all already 'there', and the illusion of time arises from thinking that substances endure in passing from one from state to another, in which the world of appearance is responsible for generating the illusion of a time-movement. But this Platonic fiction of the 'nows' amounts, I believe, to reinstating the miraculous into a theory of time.

explain the progress of the world in accordance with a law of coexistence. Furthermore, the 'order of the world' would consist in 'the regularity' of these figures of time. On this model time itself would need to be thought as working in terms of a 'constant force'. The problem, however, is that this would still leave us only with a 'translation into the spatial', with the 'existing world' being little more than the 'coming into being' of proportions of force. It is precisely this limited and macroscopic conception of time, established by our sensation and habits of representation (time reduced to scale and measurement), that needs to be overcome.

The next and final part of the fragment seeks to outline a more dynamical conception of force and of time, beginning with the critique of the Parmenidean-inspired physics that posits unchangeable forces. If forces are to be 'effective' then they have to be seen as a 'function of time'. But what kind of time is this? Nietzsche moves to a notion of relative speeds and slownesses in which forces lie in degrees of acceleration and retardation. As a function of time, forces 'express themselves in the relations of near or distant time-points…' We should then, Nietzsche concludes, no longer speak of 'time' but only of 'time-points' and their dynamical relations.

We have in this fragment several key notions which will continue to inform Einsteinian and post-Einsteinian thinking of time, such as simultaneity and coexistence (relative motion is an established feature of Newtonian physics of space and time; in fact, according to Bergson we find the radical relativity of motion affirmed more in Descartes than in any system of modern science).[6] We also have the presentation of a dynamical theory of time and of a notion of multiplicity that will not be clarified and radicalized until Bergson in his inaugural text *Time and Free Will* (1889), as well in *Matter and Memory* (1896). Bergson is relevant in this regard for two principal reasons. Firstly, *Time and Free Will* shows the extent to which so much of our thinking of time is derived from spatial images and configurations. For example, in thinking time *qua* duration it is not simply a question of positing an order, or even arrow, of time, and neither is it a question of simple succession. This is because our conception of an order and direction of time ('before' and 'after') *already presuppose* a faculty of space. If time speaks of an 'evolution', 'duration' opens up and directs us to an involution and a convolution. This is why for Bergson duration

[6] See H. Bergson, *Duration and Simultaneity,* trans. L. Jacobson (Manchester, Clinamen Press, 1999), p. 22.

cannot be conceived in terms of the notion of *points*, no matter how dynamically conceived. Instead, it becomes necessary to think time, *qua* duration, non-spatially, involving, for sure, a succession but this is 'a succession of qualitative changes, which melt into and permeate one another, without precise outlines, without any tendency to externalize themselves in relation to one another, without any affiliation with number'.[7] This is to think duration as 'pure heterogeneity'. Contemporary thought still has great difficulty in thinking this (points are by definition mathematical abstractions, while 'intervals' are homogeneous).

Secondly, there is the innovation of a theory of multiplicity in Bergson, resting on the distinction between *types* of multiplicity, namely 'actual' and 'virtual'. The former refers to a numerical and quantitative kind, the latter to a non-numerical and qualitative kind. The first is represented by means of space and is little more than a multiplicity of an homogeneous order (juxtaposition, simultaneity, exteriority), while the second cannot be reduced to numbers since it is a multiplicity of fusion and interpenetration. As Bergson notes: 'In space, and in space only, is distinct multiplicity possible: a point is absolutely external to another point'.[8] The 'evolution' of life, however, does not proceed in terms of the externality of points since it is 'an immensity of potentiality, a mutual encroachment of thousands and thousands of tendencies which nevertheless are "thousands and thousands" only when once regarded as outside each other, that is, when spatialized'.[9]

In the text from which this argument has been taken, *Creative Evolution*, Bergson is insistent that 'the universe endures', and by duration is meant, 'invention, the creation of forms' and 'the continual elaboration of the absolutely new'. So the duration that we ourselves live is one that is 'immanent to the whole of the universe' and it is bound up with *novelty*, with invention.[10] Bergson is fond of using psychical life, with its enfolding of a plurality of interpenetrating terms, as an example of the life of duration (a virtual multiplicity), but this should not be taken to mean that he holds that the duration of the universe is reducible to the psychological

[7] H. Bergson, *Time and Free Will*, trans. F. L. Pogson (New York: Harper Torchbooks, 1960), p. 104.
[8] H. Bergson, *Creative Evolution* (1907), authorized translation by A. W. Mitchell (Lanham MD, University Press of America 1983), p. 259.
[9] Ibid., p. 258.
[10] Ibid., p. 11.

level. So, 'whether it is a question of the internal or the external, of ourselves or of things, reality is mobility itself'.[11]

Deleuze has argued that only when movement is grasped as belonging to things as much as to consciousness does it cease to be confused with psychological duration: 'If qualities exist in things no less than they do in consciousness, if there is a movement of qualities outside myself, things must, of necessity, endure in their own way'.[12] Bergson is astute in showing that the reason why both common sense and the science of his own day have such a problem in thinking duration lies in their preoccupation with detached objects and isolated systems, in which the concern is 'with the ends of the intervals and not with the intervals themselves'. The flow of time can now assume an infinite rapidity, with the entire past, present, and future of material objects or isolated systems spread out all once in space. On this model the number *t* always stands for the same thing, counting the same number of correspondences between the states of these objects and systems and the points of the line which has been drawn in order to measure 'the course of time'.[13] Bergson does not rest content, however, with merely reporting on these habits of the mind, he also desires to provide an evolutionary account of them, showing how they are the result of the deepest tendencies of the adaptive intellect, and, furthermore, how they mirror actual tendencies of matter itself: 'We shall see that matter has a tendency to constitute *isolable* systems, that can be treated geometrically. In fact, we shall define matter by just this tendency. But it is only a tendency. Matter does not go to the end, and the isolation is never complete'.[14]

Returning to Nietzsche: what we observe in this early fragment is Nietzsche trying to break free of some deep-rooted prejudices about the reality of time. It is only our imagination and sensation that establish the world as one made up for us of solid objects and persistent forces (a point identical to the one Bergson is making about the habits of the adaptive intellect). For Nietzsche force has to be seen as a function of time. The impasse is reached, however, when this time is then conceived in terms of a broken line of time points. From the time of the 1873 fragment up to his later attempts to present a cosmology of eternal recurrence Nietzsche is

[11] Bergson, *Creative Mind*, p. 150.
[12] G. Deleuze, *Bergsonism*, trans. H. Tomlinson & B. Habberjam (New York; Zone, 1988), p. 48.
[13] Bergson, *Creative Evolution*, p. 9.
[14] Ibid., p. 10.

caught up in some of the most persistent problems with regard to the thinking of time. G. Whitlock has produced the first commentary on the 1873 fragment and it contains much valuable instruction. But on the question of duration it is silent.

Boscovich & Natural Philosophy

Boscovich's *A Theory of Natural Philosophy* was first published in Latin in 1758 with a revised and enlarged edition published in 1763 (this was the 'Venetian' edition Nietzsche read).[15] The work consists of 558 'articles' and is divided into three main parts: an introductory part 1, part II on 'application of the theory to mechanics', part III on 'application of the theory to physics', an appendix on the soul and God, and six further supplements including two on 'space and time'. In his 'synopsis' of the text Boscovich presents an outline of the chief articles of the work, pointing out the relation of his theory to Newton and Leibniz, what it shares with them, where it departs from them and how it attempts to chart new ground. His system offers a 'midway' between those of Leibniz and Newton and has both much in common with them and much that is different. He holds it to be simpler than either and so marvellously suitable for 'deriving all general properties of bodies, and certain of the special properties also, by means of the most rigorous demonstrations' (p. 19, part 1). With Leibniz it shares the idea that matter is composed of simple non-extended primary elements, and with Newton it shares the idea of the universe as composed of mutual forces that vary as the distances of the points from one another vary. There are two kinds of forces, attractive and repulsive.[16] The contention is that any particle of matter is connected with every other particle no matter how great the distance between them, so that with a change in the position of one the factors determining the motion of all the rest will be altered. A departure is made from Newton who held that his indivisible and extended atoms touched on another; a departure is

[15] I have used the following English translation, cited by page number: Roger Joseph Boscovich, S.J., *A Theory of Natural Philosophy*, English edition from the text of the first Venetian edition published under the personal superintendence of the author in 1763, with a short life of Boscovich, Cambridge, Mass., MIT Press 1966.

[16] On this point we can note that Boscovich claims to have departed from Newton in admitting forces that at very small distances are not positive or attractive, as Newton supposed, but repulsive. See article 4, pp. 19-20 & article 81, p. 43.

made from Leibniz who thought there was no void and that non-extended points were at rest.

In essence, Boscovich's work offers a specific theory of forces built from what today one might call a philosophy of nature founded on the principles of a 'critical rationalism'. Matter is conceived in terms of simple, non-extended and indivisible points that are separated from one another:

> …that each of these points has a property of inertia, and in addition a mutual active force depending on the distance in such a way that, if the distance is given, both the magnitude and the direction of this force are given; but if the distance is altered, so also is the force altered; and if the distance is diminished indefinitely, the force is repulsive, & in fact also increases indefinitely; whilst if the distance is increased the force will be diminished, vanish, be changed to an attractive force that first of all increases, then decreases, vanishes, is again turned into a repulsive force, and so on many times over; until at greater distances it finally becomes an attractive force that decreases approximately in the inverse ratio of the squares of the distances. (p. 10)

Two key ideas presented in the book, but not elaborated upon in the synopsis, include 'compenetration' and the 'Law of Continuity (a law Boscovich insists is unassailable). There can be no perfect rest anywhere in nature, and neither can there be at all times any perfect analogy between time and space. For Boscovich the advantage of his conception of matter - simplicity, indivisibility, and non-extension - is that it does away with the ideas of a passage from a continuous vacuum to a continuous matter through any sudden change or leaps in nature. From this he adduces the conclusion: 'nothing infinite is found actually existing: the only thing possible that remains is a series of finite things produced indefinitely' (p. 12). By doing away with the idea of an *actual* infinity in existing things, notes Boscovich, 'truly countless difficulties can be got rid of' (p. 46).[17]

[17] Further: 'The theory of non-extension is…convenient for eliminating from Nature all idea of a coexistent continuum - to explain which philosophers have up till now laboured so very hard & generally in vain. Assuming non-extension, no division of a real entity can be carried on indefinitely; we shall not be brought to a standstill when we seek to find out whether the number of parts that are actually distinct & separable is finite or infinite. For if the primary elements of matter are perfectly non-extended & indivisible points separated from one another by some definite interval, then the

As Peter Poellner has pointed out, Boscovich's forces are actualised accelerations or propensities of accelerations.[18] The corpuscular doctrine of matter - the conception of matter as made up of extended and rigid particles moving about in empty space and interacting through pressure and impact - has to be abandoned on account of it being internally inconsistent. It implies that the particles of matter are accelerated instantaneously and discontinuously by finite increments upon impact. This discontinuous change of velocity violates for Boscovich the law of continuity and entails that a system of interacting particles can be in two different states at one and the same 'instant' of time. Such a state also requires an *infinite* force. Poellner summarizes the technical details of Boscovich's own position as follows:

Boscovich concludes that change does not take place instantaneously and discontinuously upon contact between moving particles, but rather continuously, on account of a repulsive force acting asymptotically as the distance between them decreases. Since the magnitude of this repulsive force approaches infinity with diminishing distance, it makes direct contact between the elements impossible. Hence the ultimate constituents of matter must be assumed to be perfectly simple and at some distance from each other, for they must be indivisible *in principle*…The upshot of Boscovich's theory of matter is that matter consists of unextended point centres surrounded by fields of "force".[19]

Boscovich insists that his 'forces' are nothing mysterious and that they contain a 'readily intelligible mechanism'. The difficulty we have thinking of them in terms of non-extended points arises from our inability to perceive them by the senses. It is thus necessary to build up a more adequate conception of matter through a process of reasoning (throughout the text Boscovich negotiates a position in relation to induction and champions the rights of deduction; on the use made of induction in the book see p. 30). This attack on the senses is what Nietzsche will comment on around 1884-5 as one of the most significant aspects of Boscovich (it means for him, as we shall see, giving up on materialistic atomism). This attack on sensualist epistemology has been a principal feature of modern philosophy of science since Descartes, and the attempt to go beyond perception plays a crucial role in more contemporary attempts to 'think

---

number of points in any given mass must be finite; because all the distances are finite' (article 90, p. 46).

[18] Poellner, 'Causation and Force in Nietzsche', p. 293.

[19] Ibid., pp. 293-4.

beyond the human condition' (one of the best examples of this being the work of Bergson).[20]

Now Boscovich is fully aware that this conception of matter is not novel or peculiar to him. He mentions Leibniz's monads as coming close to his notion of indivisible and non-extended points. However, he argues that Leibniz remained a Zenonist (articles 138 & 139, p. 59).[21] In order to escape the snares of Zeno's paradoxes it is necessary to give up the idea of continuous extension (such extension cannot be generated from things without extent):

> Those arguments that some of the Leibnizian circle put forward are of no use for the purpose of connecting indivisibility & non-extension of the elements with continuous extension of the masses formed from them … *Those who say that monads cannot be compenetrated, because they are by nature impenetrable, by no means remove the difficulty. For, if they are both by nature impenetrable, & also at the same time have to make up a continuum, i.e., have to be contiguous, then at one & the same time they are compenetrated & they are not compenetrated; & this leads to an absurdity & proves the impossibility of entities of this sort. For, from the idea of non-extension of any sort, & of contiguity, it is proved by an argument instituted against the Zenonists many centuries ago that there is bound to be compenetration; & this argument has never been satisfactorily answered.* (article 139, p. 59)

We will return to this crucial aspect of Boscovich's theory shortly. For now, a further point needs noting: the primary elements of matter are not only indivisible they are also immutable: 'these are quite simple in composition, of no extent, they are everywhere unchangeable, and hence are splendidly adapted for explaining a continually recurring set of

---

[20] See, for example, H. Bergson, 'The Perception of Change', in *The Creative Mind* (Totowa, New Jersey: Littlefield, Adams & Co, 1975), pp. 130-59, p. 132: 'The insufficiency of our faculties of perception - an insufficiency verified by our faculties of conception and reasoning - is what gives birth to philosophy'.

[21] For Leibniz on Zeno see Leibniz's letter attempting to explain certain difficulties in Bayle, in G. W. Leibniz, *Philosophical Texts*, trans. and edited R. S. Woolhouse & R. Francks (Oxford, Oxford University Press, 1998), p. 201-8, p. 207, & *Leibniz's 'New System' and Associated Contemporary Texts*, trans. and ed. Woolhouse & Francks (Oxford Clarendon Press 1997), p. 85, p. 120, p. 123.

phenomena' (p. 16). Boscovich does allow for a principle of divisibility but admits it only to the extent that any existing mass may be made up of real points that are only finite, 'although in any given mass this finite number may be as great as you please'. For him this is to substitute 'infinite divisibility' with 'infinite *multiplicity*' (my emphasis).

The divergence from Leibniz centres on Boscovich's commitment to simplicity and homogeneity. The oppositions to Zeno can never be answered, he claims, with regard to the issue of 'compenetration of all kinds with non-extended consecutive points', and this applies with the same force he holds to the system of Leibniz. If we admit homogeneity among all the elements then any distinction between masses can be seen to depend only *on relative position and different combinations of these elements*. Chemical operations are an example of this, Boscovich claims, and their analysis is beginning to show that the enormous variety of different materials are composed of a relatively small number of elements which can be explained in terms of an even smaller number of ultimate constituents, perhaps just the one. If we maintain these principles of simplicity and homogeneity then key aspects of Leibniz's teaching, notably, the principles of indiscernibles and sufficient reason, can no longer prevail. The principle of sufficient reason is for Boscovich a false one, 'calculated to take away all idea of true freewill'. Moreover, all possible reasons are not known to us. If we are to decide in favour of one sufficient reason over another then it would be necessary to know precisely what we do not know (article 93, p. 47; see also articles 94-6). Nature is to be built up then out of the most simple principles in which everything is shown to depend on the *composition of the forces with which the particles of matter act upon one another* (on Boscovich's departure from Newton see the discussion on pp. 19-20, and the treatment of the law of gravitation on p. 24).

What does Boscovich understand by 'compenetration'? We have on his schema a conception of matter as composed of indivisible and non-extended points *combined with* the idea of a vacuum in which they are 'scattered' which ensures that the points are separated from one another by definite *intervals*. An interval can be indefinitely increased or reduced but can never vanish altogether, except in cases where there is 'compenetration' between them:

> …I do not admit as possible any immediate contact between them. On the contrary I consider that it is a certainty that, if the distance

> between two points of matter should become absolutely nothing, then the very same indivisible point of space, according to the usual idea of it, must be occupied by both together, and we have true compenetration in every way. Therefore indeed I do not admit the idea of vacuum interspersed amongst matter, but I consider that matter is interspersed in a vacuum and floats in it (pp. 20-1).

Boscovich's 'law of continuity' is simply the idea that any quantity (mass) in passing from one magnitude to another has to pass through 'all intermediate magnitudes of the same class'. This idea he develops in a discussion of Maupertuis (1698-1759). The latter thought that the law of continuity was violated by any sudden change no matter how small (whether of a lesser or a greater degree, and where large and small are relative terms). Thus any passage is made up of intermediate stages or steps which Maupertuis understands as involving small additions made in an instant of time. Boscovich argues that this should rather be interpreted as follows: 'single states correspond to single instants of time, but increments or decrements only to small intervals of continuous time' (p. 28).

Let me now address explicitly the thinking of time that is informing Boscovich's philosophy of nature. Boscovich is troubled by the notion of an *instant* of time simply because 'there is need of time…'. Time has a continuous nature, however short, in order for things to happen. In the case of water flowing from a vessel, for example, the velocity is generated not in a single instant but within a 'continuous interval of time', passing through 'all intermediate magnitudes'. Boscovich is novel in the attempt to think the interval. The difficulties he reaches stem from his inability to give up on the 'fiction of instants'.[22] We end up with the curious conception of time as made up of not simply of intervals existing between instants but as finite intervals conceived as infinitely divisible through the interpolation of 'other points and still others':

> There cannot be two instants…contiguous to one another; but between one instant & another there must always intervene some interval of continuous time divisible indefinitely. In the same way, in any quantity which lasts for a continuous interval of time, there

[22] For a deft treatment of this fiction see Milic Capek's essay, 'The Fiction of Instants' in Capek, *The New Aspects of Time: Its Continuity and Novelties* (Dordrecht: Kluwer, 1991), pp. 43-55.

> must be obtained a series of magnitudes of such a kind that to each instant of time there is its corresponding magnitude; & this magnitude connects the one that precedes with the one that follows it, and differs from the former by some definite magnitude (article 49, p. 33).

What a massively revealing passage this is! Its key components merit careful unfolding. It is interesting to note that in the previous article (48) Boscovich refers to a 'metaphysical argument' that he believes supports his law of continuity and which he has addressed in his dissertation *De Lege Continuitatis*. This 'metaphysics' draws in part on Aristotle, and Boscovich cites Aristotle as claiming that 'there must be a common boundary which joins the things that precede to those that follow; and this must therefore be indivisible for the very reason that it is a boundary'. On Boscovich's model, then, we have an interval of continuous time intervening between instants. But this interval is itself indefinitely divisible. The key question is this: if it is impossible to generate continuous extension from non-extended points, how is to possible to generate a conception of noninstantaneous time on the basis of indivisible boundaries and actual instants? Is this any more an adequate resolution of the Zenonism that Boscovich identifies as afflicting Leibniz's theory of monads? (articles 138 & 139, p. 59). The notion of continuous intervals of time is designed to fill in the black holes that characterise any attempt to arrive at a continuous extension from non-extended and indivisible points. But Boscovich retains an attachment to the idea of the instant and the theory of compenetration that is fully implicated in Zenonist paradoxes. The notion of intervals is a genuine innovation in Boscovich's work and it plays a key role in his argument against the sense and in favour of new modes of thinking and knowing the universe:

> Intervals, which in no wise came within the scope of the senses, were considered to be nothing; those things the ideas of which were always excited simultaneously & conjointly, were considered as identical, or bound up with one another by an extremely close and necessary bond. Hence the result is that we have formed the idea of continuous extension, the idea of impenetrability preventing further motion only on the absolute contact of bodies; & then we have heedlessly transferred these ideas to all things that pertain to a solid body, and to the matter from which it is formed (pp. 66-7).

An instant is, by definition, devoid of duration (p. 197). As Boscovich himself appreciates there is a close resemblance between the notion of 'points' (of position) and that of 'instants' (of time). The latter cannot provide us with a thinking of *duration*:

> …a point is not a part of a continuous line, or an instant a part of a continuous time; but a limit & a boundary. A continuous line, or a continuous time is understood to be generated, not by repetition of points or instants, but by a continuous progressive motion, in which some intervals are parts of other intervals; the points themselves, or the instants, which are constantly progressing, are not parts of the intervals (p. 198)

Whereas time has one progressive motion only (duration), analogous to the single line, space has extension in three dimensions (length, breadth, and depth). Boscovich then decides in favour of time being generated from the instant: 'in the threefold class of space, & in the onefold class of time, the point and the instant will be respectively the element, from which, by its progression, motion, space & time will be understood to be generated' (p. 199).

Boscovich and Modern Science & Nietzsche on Boscovich

Karl Popper gives an absurdly clear and typically incisive introduction to the significance of Boscovich in an essay entitled 'Philosophy and Physics: The influence on theoretical and experimental physics of some metaphysical speculations on the structure of matter'.[23] He construes Boscovich as carrying out in detail a research programme bequeathed by Leibniz, namely, to explain the Cartesian extension of bodies with the aid of a theory of forces. This is a programme that he regards as being anticipated by a few years in Kant.[24] The 'Kant-Boscovich theory', as

[23] To be found in K. R. Popper, *The Myth of the Framework* (London: Routledge 1994), pp. 112-20.

[24] Popper is referring to a text of Kant's of 1756 known in English as *Monadology*. And he makes this remark: 'Though the essential idea of Boscovich's monadology is to be found in Kant…Kant's work is rather sketchy as compared with Boscovich's' (note 6, p. 119). Of course, any treatment of Kant on this issue must engage with his later

Popper names it, attempted to give a new synthesis to the ideas of Democritus, Leibniz, and Newton, in which extended matter is explained by something that is *not* matter, the unextended entities such as forces and monads - the unextended points - from which forces emanate. This is a 'dynamic theory of extension' which explains both extension equilibrium and extension non-equilibrium (extension changing as a result of external pressure, impact, or push). This Kant-Boscovich theory is for Popper a significant moment in the development of modern science, since it anticipates not only the modern theory of extended matter (elementary particles invested with forces of attraction and repulsion) but can also be seen as a direct forerunner of the Faraday-Maxwell theory of fields as well as the ideas of Einstein, de Broglie, and Schrodinger (Jennifer Trusted extends this list to include Heisenberg).[25] Popper reads the theory of Boscovich in terms of an anti-positivism within modern philosophy in the sense that, in contrast to the trajectory that connects Berkeley and Mach[26] and which contends that there can be no physical theory of matter (it is construed as a metaphysical substance, and hence meaningless), the stress is placed on the speculative character of theory in which the meta-physics (the need to go beyond the senses and perception) is made '*susceptible to criticism*' and experimental testing. On this view the human intellect can transcend its limitations and make the attempt to understand the world.

What is extraordinary about the reception of Boscovich in Nietzsche is that it corresponds closely to the reading we find in Popper. It thus has a resonance with some of the specifics of the latter's critical rationalism. This is especially the case, as we shall see, in the only treatment of Boscovich in Nietzsche's published writings, *Beyond Good and Evil*. Whitlock summarises succinctly the significance Boscovich had for Nietzsche, which 'lies in his rejection of the massy corpuscular atom of the Newtonian natural philosophy and in his discovery of atomic point particle theory'.[27] Boscovich also played a crucial role in exposing Nietzsche to a chemistry of *relations*, as opposed to the chemistry of substances which

---

texts, notably his *Metaphysical Foundations of Natural Science* (1786), trans. J. W. Ellington (Hackett 1985).

[25] See J. Trusted, *The Mystery of Matter* (Basingstoke: Macmillan 1999), p. 32. For important insights into Faraday see also Bergson, *Matter and Memory*, pp. 200-201.

[26] A copy of Ernst Mach's *Beitrage zur Analyse der Empfindungen* (Jena 1886 edition) was in Nietzsche's library.

[27] G. Whitlock, 'Boscovich, Spinoza, and Nietzsche: The Untold Story', p. 204.

had dominated the chemical tradition since Aristotle (the chemical substance is the subject whose reaction expresses a quality).[28]

There are five references to Boscovich in the *Kritische Studienausgabe* (this is excluding the references made in the editors' commentary on volumes 1-13 in volume 14). Only one of these refers to a published text (*JGB/BGE*). Before looking at the single reference to Boscovich in the published writings, let me look briefly at these other references. The first one appears in the *Nachlass* of Autumn 1881 (*KSA* 9, 15 [21], p. 643), in which Nietzsche refers to Copernicus and Boscovich (the two will be linked together again in *BGE*) as 'great enemies' of 'visual evidence' (*Augenschein*) and Boscovich is mistakenly named, like Copernicus, as a Pole.[29] The remaining three unpublished references all appear in the Summer-Autumn of 1884, thus being contemporary with the drafting of *BGE*. In the first of these Nietzsche lists four items of metaphysics that have to be eliminated: will, the thing in itself, purpose, and matter (*Stoff*), and the elimination of the latter he associates with Boscovich (*KSA* 11, 26 [302], p. 231). In the second reference there is a comparison between the 'mechanistic-atomistic world-view' and Boscovich's 'dynamical' theory (ibid., 26 [410], pp. 260-1). The third and final one is the longest passage and I translate it here as follows:

> When I think of my philosophical genealogy I feel I am related to the anti-teleological, i.e. the Spinozistic movement of our age but with the difference that I consider 'purpose' and 'will' in us to be illusory, as well; likewise, I feel related to the mechanistic movement (all moral and aesthetic questions traced back to physiological ones, all physiological ones to chemical ones, all chemical ones to mechanical ones), but with the difference that I do not believe in 'matter' (*Materie*) and consider Boscovich one of the greatest turning-points, like Copernicus: I consider unfruitful everything that takes the self-reflexion of spirit as its point of departure, and believe that no research which does not take the

[28] On this aspect of Boscovich's significance see I. Stengers, 'Ambiguous Affinity: The Newtonian Dream of Chemistry in the Eighteenth Century', in M. Serres (ed.), *A History of Scientific Thought* (Oxford: Blackwell, 1995), pp. 372-400, p. 378.

[29] It is well known that Nietzsche liked to declare a Polish ancestry for himself, which he speaks of in *Ecce Homo*, and where he writes the following: 'When I consider how often I am addressed as a Pole and by Poles themselves, how rarely I am taken for a German, it might appear that German has only been *sprinkled on* to me', 'Why I am so wise', *Ecce Homo*, trans. R. J. Hollingdale (Harmondsworth, Penguin 1979), p. 41.

> body as its guiding thread can be good. A philosophy not as dogma, but as a provisional regulative of research (*vorlaufige Regulative der Forschung*) (*KSA* 11, 26 [432], p. 266)

The ending to this passage is highly Kantian. The stress on regulative principles of research is also part of Nietzsche's commitment to a certain kind of philosophy of nature and of science, one that he outlines in the opening chapter of *BGE* (section 36 of that text has to be closely linked to this), and which for the most part has been poorly treated in the literature to date. It is one based on the 'conscience of method' which has a commitment to an economy of principles. Nietzsche recognizes the need for 'invention' to precede 'discovery' (*BGE* 12) and posits as an experimental test of how much 'truth' a free spirit that is, a spirit emancipated from the need to link truth with virtue or happiness, can endure - 'or, to put it more clearly, to what degree one would *require* it to be thinned down, shrouded, sweetened, blunted, *falsified*' (*BGE* 39, my emphasis). [30]

Let us turn to section 12 of *BGE*, which contains the only reference to Boscovich in Nietzsche's published writings. The relevant parts of this section, which I do not cite in full, run as follows:

> As for materialistic atomism, it is one of the best refuted theories there are, and in Europe … Perhaps no one in the learned world is now so unscholarly as to attach serious significance to it, except for convenient household use (as an abbreviation of the means of expression) - thanks chiefly to the Pole Boscovich:[31] he and the Pole Copernicus have been the greatest and most successful opponents of visual evidence (*Augenschein*) so far. For while Copernicus has persuaded us to believe, contrary to all the senses, that the earth does *not* stand fast, Boscovich has taught us to abjure the belief in the last part of the earth that 'stood fast' - the belief in 'substance' (*Stoff*), in 'matter' (*Materie*), in the earth-residuum and particle-atom (*Klumpchen-Atom*): it is the greatest triumph over the senses that has been gained on earth so far. One must, however go still further, and also declare war, relentless war unto death, against

[30] On 'invention' compare K. R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge, 1989), p. 46.

[31] Kaufmann has corrected this to 'Dalmatian', but the original German has 'Pole' and so repeats the earlier error.

> the 'atomistic need' which still leads a dangerous afterlife in physics where no one suspects it, just like the more celebrated 'metaphysical need': one must also, first of all, give the finishing stroke to that other and more calamitous atomism which Christianity has taught best and longest, the *soul atomism*.

Significantly the next section of *BGE* introduces the notion of 'will to power'. It does so in terms of the 'demands' of a method, one that must be based on an 'economy of principles'. The demands of this method are those of thinking 'life', and to think it in a way that avoids 'superfluous teleological principles', such as the 'instinct of self-preservation' (and he famously attributes an inconsistency to Spinoza precisely on this point; as far as Nietzsche is concerned even in the great anti-teleologist there are still residues of the old God and the old metaphysics). The section after this (14) explores the issue of 'sensualism' - the use of visual and tactile evidence to formulate a physics of the world, and contains a complex and important contrast between the noble way of thinking to be found in Plato (and his attack on the senses) and the 'Darwinists and anti-teleologists among the workers in physiology'. It is not until section 36 that Nietzsche elaborates upon the 'conscience of method' with regard to the speculative and regulative idea that 'all efficient force' can be thought univocally as will to power: 'The world viewed inside, the world defined and determined according to its "intelligible character" - it would be "will to power" and nothing else.' [32]

Nietzsche's search for an 'economy of principles', which centres on the hypothesis of the will to power, is heavily inspired by the example of Boscovich and his response to Leibniz. As a non-teleological *and* non-mechanical principle it is also designed to counter the Darwinian emphasis on conceiving evolution as the passive adaptation to external circumstances (a view which for Nietzsche deprives life of its most important dimension which he names '*Aktivitat*', and so theory overlooks the primacy of the 'spontaneous, expansive, aggressive, form-shaping forces' that provide life with new directions and new interpretations).[33]

---

[32] See the insights offered by Popper on the nature of Kant's 'self-critical rationalism' in *Conjectures and Refutations*, pp. 193-201.

[33] See especially F. Nietzsche, *On the Genealogy of Morality*, trans. C. Diethe (Cambridge: Cambridge University Press, 1994), essay two, section 12; and for further insight into Nietzsche in relation to Darwin and to the likes of Roux see K. Ansell Pearson, 'Nietzsche contra Darwin' in D. W. Conway, *Nietzsche: Critical Assessments* (London: Routledge 1999), volume III, pp. 7-37.

There is one further reference to Boscovich in Nietzsche that we have not yet discussed, but which may be crucial for determining the details of the fate of the 1873 fragment in the history of the editions of Nietzsche's collected works and their reception. This is to be found in a letter to Peter Gast, Nietzsche's close associate and follower from 1876 onwards, dated March 20, 1882 and written from Genoa. He writes saying that he has read the book on the *Mechanics of Heat* by Robert Mayer which Gast had recommended to him and firmly tells Gast that Mayer is only a 'great specialist - and nothing more'. He also finds him naïve and coarse and contrasts him unfavourably with Boscovich in this regard:

> Boscovich and Copernicus are the two greatest opponents of optical observation. With effect from him there is no 'matter' (*Stoff*) any more - except as a source of popular relief. He has thought the atomistic doctrine through to the end. *Gravity* is certainly not a 'property of matter', simply because there *is* no matter (*Materie*). The *force of gravity* is, like the *vis inertiae*, certainly a manifestation of force (*Kraft*), simply because force is all there is! Now the *logical* relation between these phenomena and others - for example, heat - is still not at all clear. But if one goes along with Mayer in still believing in matter and in solid corporeal atoms, then one cannot decree that there is only *one* force. The kinetic theory must attribute to atoms, besides motional energy, the two forces of cohesion and gravity. And this is what *all* materialist physicists and chemists do! - and Mayer's best adherents as well. *Nobody* has abandoned the idea of gravity! Ultimately even Mayer has a second force in the background, the *primum mobile*, God, - besides motion itself. And he certainly needs God![34]

Whitlock has suggested that when Gast became the editor of the *Grossoktav-Ausgabe* he may have remembered this altercation with Nietzsche over Mayer. Although the fragment found its way into the first edition of the *GA*, which was hurriedly put together, it was excised from future editions and did not show up until Karl Schlecta and Anni Anders

[34] Nietzsche mentions Boscovich again in a letter to Gast dated 'Sils Maria, end of August 1883', a time when he was checking the page proofs of 'Zarathustra II'. Here Nietzsche states to Gast that Boscovich 'was the first man to demonstrate mathematically that, for the exact science of mechanics, the premise of *solid corporeal* atoms is an *unusable* hypothesis: an axiom which has now *canonical* validity among natural scientists trained in mathematics'.

reprinted the text along with photocopies of the hand-written manuscript in 1962. Whitlock proffers the speculation that once Gast realized that the 1873 fragment was a Boscovichian-inspired piece of writing, he took the decision to expunge it.[35] While this story may or may not be fanciful, it is the case that this fragment was not known by readers and commentators of Nietzsche for many decades, and its enigmas remain to be unravelled.

A fundamental part of Nietzsche's relation to metaphysics, old and new, and a key component of his philosophy of nature and science, is the ambition to 'think beyond the human condition', that is, beyond the senses (beyond sight and touch)[36] and beyond the habits of language which lead us to think the world in terms of the notion of substance (we assume that in order for there to be motion or change there has to be a *thing* which moves or changes), subject-object dualities, the abstract and artificial separation of doer and deed, the attachment to unities at the expense of multiplicities, etc. As Nietzsche points out, the 'mechanistic concept of "motion" is already a translation of the original process into the sign language of sight and touch' (*KSA* 13, pp. 302-3; *WP* 625), or, a translation into the 'sense language of man' (*KSA* 13, pp. 258; *WP* 634). Our comprehension of the world is based on the need to calculate a world (this is 'the human condition', a condition which in this context has nothing to do with an existential predicament). For this, various notions and fictions are required: constant causes such as atoms being a prime example. This gives rise to the illusion that something is known once we posses a mathematical formula for an event; when, in effect, it has only become designated and described (Nietzsche gives the example of music - one repeatedly deployed by Bergson in strikingly similar terms - to counter the idea that a thing or an event is understood once it has been reduced to a formula and broken down into components that can be calculated). He elaborates upon this and then offers his own dynamical conception of the world in a *Nachlass* passage from 1888:

---

[35] Whitlock, 'The Untold Story', p. 206.

[36] Compare Bergson, 'The Perception of Change', p. 147: 'It is difficult to picture things in this way, because the sense "par excellence" is the sense of sight, and because the eye has developed the habit of separating, in the visual field, the relatively invariable figures which are then supposed to change place without changing form, movement is taken as super-added to the mobile as an accident…The sense of sight contrives to take things in this way as an advance-guard for the sense of touch, it prepares our action upon the external world'.

> The *mechanistic* world is imagined as only sight and touch imagine a world (as 'moved') - so as to be calculable - thus causal unities are invented, 'things' (atoms) whose effect remains constant (- transference of the false concept of subject to the concept of the atom). The following are therefore *phenomenal*: the injection of the concept of number, the concept of the thing (concept of the subject), the concept of activity (separation of cause from effect), the concept of motion (sight and touch): our *eye* and our *psychology* are still part of it. If we eliminate these additions, no things remain but only dynamic quanta, in a relation of tension to all other dynamic quanta: their essence lies in their relation to all other quanta, in their 'effect' upon the same. The will to power not a being, not a becoming, but a *pathos* - the most elemental fact from which a becoming and effecting first emerge (*KSA* 13, pp. 259; *WP* 635).

The movement that marks the creative development of Nietzsche's thought can be condensed into the following schema: from matter to forces and from the 'victorious notion of force' to the speculative and regulative positing of an 'inner will' which can be designated as 'will to power' and conceived as 'an insatiable desire to manifest power' and as a 'creative drive' (*KSA* 11, p. 563; *WP* 619).[37] The idea of a 'creative' evolution lies at the heart of Nietzsche's critical engagement with mechanism and Darwinism. The problem remains, as ever, one of reconciling Nietzsche's commitment to nonmechanical 'evolution' with the various doctrines of time found in his work, the most notorious being that of eternal recurrence. The precise difficulty of this thought, and its relevance to the issue of mechanism and its limits, we shall encounter shortly.

This figuration of Nietzsche as a thinker who attempts to think beyond the human condition merits more serious treatment than it has received to date. My hope is that the mini-treatment carried out here will serve to demonstrate, in the context of Nietzsche's reception of Boscovich, including his advocacy of a method of economy and championing of

[37] It is interesting to note in this regard some remarks Bergson makes on the usage of the notion of force in science: 'The physicist may speak of *forces*, and even picture their mode of action by analogy with an inner effort (*un effort interne*), but he will never introduce this hypothesis into a scientific explanation. Even those who, with Faraday, replace the extended atoms by dynamic points, will treat the centers of force and the lines of force mathematically, without troubling about force itself considered as an activity or an effort', *Time and Free Will*, pp. 218-19.

interpretation over explanation,[38] that his philosophy of nature and science has little to do with the vacuous relativism and anthropic perspectivism of so-called 'postmodern' thinking, and much in common with the Bergsonian praxis of philosophy.

Whitlock on Nietzsche, Boscovich, & the Eternal Return: An Inverted Spinozism

G. Whitlock has produced two essays in *Nietzsche-Studien* on the topic of Boscovich's influence on Nietzsche. It is in the second one that he presents a detailed and helpful line by line analysis of the fragment. The philosophical significance of this neglected influence on Nietzsche was the theme of his earlier and first essay. In this first essay on the subject Whitlock sought to show that at important junctures in his work Nietzsche deployed Boscovichian ideas to combat the pantheism of Spinoza. Although this cannot be said of the early fragment (a serious study of Spinoza does not take place until 1880-2), it characterises the later formulations of the will to power and, especially, the eternal return of the same. For him Nietzsche's later philosophy is to be read not so much as an 'inverted Platonism' but more as an 'inverted *Spinozism*'.[39] He rightly stresses that for Nietzsche the emphasis is placed on the *finite* character of force, whereas in Spinoza the assumption is that force is infinite, and it is only infinite force on Nietzsche's model that entails infinite novelty. First a short extract from Spinoza, followed by Nietzsche on Spinoza:

> From the necessity of the divine nature there must follow infinite things in infinite ways (Spinoza, *The Ethics*, Book 1, Proposition 16).

> The old habit, however, of associating a goal with every event and a guiding, creative God with the world, is so powerful that it requires an effort for a thinker not to fall into thinking of the very aimlessness of the world as intended. This notion - that the world

[38] For further insight into Nietzsche's critique of 'explanation' (with regard to scientific notions) see Poellner, *Nietzsche and Metaphysics*, pp. 55-7, and 'Causation and Force', pp. 294-6. And see, of course, Nietzsche himself on the contrast between 'explanation' and 'conventional fictions' used for 'the purpose of designation and communication' in *Beyond Good and Evil* section 21

[39] Whitlock, 'Boscovich, Spinoza, and Nietzsche', p. 207.

> intentionally avoids a goal and even knows artifices for keeping itself from entering into a circular course - must occur to all those who would like to force on the world the ability for *eternal novelty*, i.e., on a finite, definite, unchangeable force of constant size, such as the world is, the miraculous power of infinite transformations. The world, even if it is no longer a god, is still supposed to be capable of the divine power of creation, the power of infinite transformations; it is supposed to consciously prevent itself from returning to any of its old forms; it is supposed to possess not only the intention but the *means* of avoiding any repetition … It is still the old religious way of thinking and desiring, a kind of longing to believe that *in some way* the world is after all like the old beloved, infinite, boundlessly creative God - that in some way 'the old God still lives' - that longing of Spinoza which was expressed in the words '*deus sive natura*' (he even felt '*natura sive deus*'). What, then, is the law and belief with which the decisive change, the recently attained preponderance of the scientific spirit over the religious, God-inventing spirit, is most clearly formulated? Is it not: the world, as force, may not be thought of as unlimited, for it *cannot* be so thought of; we forbid ourselves the concept of an infinite force as incompatible with the concept 'force'. Thus the world also lacks the capacity for eternal novelty. (*KSA* 11, pp. 556-7; *WP* 1062)

Although Nietzsche pitted his thinking against the second law of thermodynamics (the law of entropy), he stipulated that 'the law of the conservation of energy demands (*fordert*) *eternal recurrence*' (*KSA* 12, p. 205; *WP* 1063). The following passage is perhaps the most crucial formulation of the doctrine in its cosmological aspect in Nietzsche's work and it has to be read attentively. It is taken from a note to which Nietzsche gave the title '*Die neue Welt-Conception*':

> If the world may be thought of as a certain definite quantity of force and as a certain definite number of centres of force - and every other representation (*Vorstellung*) remains indefinite and therefore useless - it follows that, in the great dice game of existence, it must pass through a calculable number of combinations. In infinite time (*unendlichen Zeit*), every possible combination would at some time or another be realized (*erreicht sein*); more, it would be realized an

> infinite number of times. And since between every combination and its next 'recurrence' ('*Wiederkehr*') all other possible combinations would have to take place, and each of these combinations conditions the entire sequence of combinations in the same series , a circular movement (*Kreislauf*) of absolutely identical series is thus demonstrated: the world as circular movement that has already repeated itself infinitely open and plays its game *in infinitum*. (*KSA* 13, p. 376; *WP* 1066)

The key linkage of ideas in this passage is that of *finite force* and *infinite* time. Whitlock places the emphasis on the former (finite force) but utterly neglects the latter (infinite time). This is because he fails to see that what is missing from Nietzsche's philosophy of nature and science is a notion of duration - the stress in the passage above is on the *realization of the possible*. Indeed, only on such a model of 'evolution' (the realization of the possible) is it possible to articulate a doctrine of eternal recurrence (a *calculable* number of combinations of force). Whitlock neglects the question of duration entirely and pursues the opposite move of seeking to make Nietzsche more Boscovichian than Boscovich. As we have seen the idea that force must be finite is a central notion informing Boscovich's text. Boscovich himself considers the idea of an infinite return of finite forces or combinations of energy, but after a careful consideration of the issue he is prepared only to grant it an 'infinite improbability': 'Hence we are still left with an infinite improbability of the return of any indefinitely chosen point of matter to any point of position, occupied at any previous instant of time indefinitely, of a return, I say, taking place at any indefinite start of subsequent time…' (pp. 200-1). The doctrine of return must be excluded simply because an infinite improbability eventually merges into a 'relative impossibility'.[40]

Instead of respecting the integrity of Boscovich's position, Whitlock argues that Boscovich's avoidance of the eternal return doctrine amounts to a failure of nerve on his part and is to be explained reductively in terms of him being a devout Jesuit.[41] I would suggest that the reason for Boscovich's refusal of a law of return lies in the fact that he has a notion

---

[40] Lee Smolin's claim that Nietzsche took the doctrine of eternal recurrence from Boscovich is clearly a cavalier judgement, since it is precisely on this notion that Nietzsche goes way beyond anything one could firmly attribute to Boscovich. See L. Smolin, *The Life of the Cosmos* (London: Weidenfeld & Nicolson 1997), p. 144.

[41] Whitlock, p. 218.

of duration, albeit a confused and under-developed one. And what is troubling about Nietzsche's coupling of finite force and infinite time is that it rests on a complete denial of duration: how is it possible to posit 'infinite time' without already having *spatialized* time? On this model time becomes the space in which the serial drama of forces and the realization of combinations of energy and is enacted again and again. Whitlock is impervious to such a questioning and has no problem with the conception of the universe presupposed at work in Nietzsche's account: 'a *closed set* of centres of force, events and their combinations. Given infinite time, this closed set must repeat itself infinitely many times'.[42] In short, this is the universe depicted as a closed system on *both* the local and the global levels.

It would be mistaken to take this key passage on finite forces and infinite time as definitive of Nietzsche's thinking.[43] It clearly stands in contradiction to other *Nachlass* passages where the emphasis is placed on the rejection of 'timelessness' and on change as belonging to the 'essence' of things (*KSA* 11, pp. 536-7; *WP* 1064). What it does show, I think, are the limits of Nietzsche's Boscovichian-inspired thinking of forces and of his attempt to go beyond mechanism. In the denouement to the passage cited above Nietzsche argues that his new world conception is not mechanistic simply because, if it were that, then it would condition a final state and not an infinite recurrence of identical cases. However, because the world has not reached a final state, mechanism has to be considered as 'an imperfect and merely provisional hypothesis'. But as Milic Capek has noted, we should not be fooled by Nietzsche's attempt to distance himself from mechanism. While it is the case that he rejected the notion of atom as a piece of passive matter and substituted it, under the influence of Boscovich, with a dynamical conception of force, there is still retained in his thinking the conception of matter as made up of discrete and persistent entities. It is only on the basis of such *entities* (as opposed to events),

[42] Ibid.

[43] This passage has been the subject of extensive analysis in Nietzsche commentary going back to the counter-arguments proposed by Simmel. The literature on the topic is a sizeable one and cannot be referred to here. My concern in this commentary is limited to noting its relevance to a treatment of the issue of Boscovich's influence on Nietzsche. The issue of the concordance or discordance between the doctrine of will to power and that of eternal recurrence, as articulated in WP 1066, must also be left in abeyance.

which are finite in number, that an eternal recurrence is possible, in which a finite number of combinations of these entities infinitely recur.[44]

Concluding Note

Whitlock has argued that the discovery of finite force was 'the *decisive moment*' in Nietzsche's new world-conception, that is, the eternal return and its supposed theoretical supposition in the theory of will to power. He contends that the source of Nietzsche's scientific conception of the world was Boscovich's theory of natural philosophy. The significance of this, he maintains, is that it 'completely rejects Martin Heidegger's representation of Nietzsche's relation to science'.[45] Boscovich is without question a major, and significantly overlooked, source for understanding the development of Nietzsche's ideas from 1873 to well into the 1880s. Whitlock has suggested that as many as a hundred notes in the *Nachlass* can be clarified in the light of Nietzsche working under the influence of Boscovich.

However, there are a number of problems with this argument and with reading everything in Nietzsche, especially with regard to the will to power, in terms of Boscovich. I have suggested that the most serious flaws in Nietzsche's cosmology of forces centre precisely on the insertion of finite forces into infinite time. This is already the problematic prefigured in Boscovich, if not articulated in his texts in terms of a doctrine of recurrence. While it is true to say that a theory of force informs Nietzsche's doctrine of will to power, it is also the case that the decisive move for Nietzsche is to be made in terms of ascribing an 'inner will' to this force, and such an idea comes not from physics but from experimental work Nietzsche was drawing upon in embryology and morphology, which forms a crucial part of his battle with mechanism, especially Darwinism.

On the question of Nietzsche and science we should also be a little more cautious than Whitlock. While it is true that Heidegger failed to pay sufficient attention to Nietzsche's immersion in the natural sciences, he shares this with most of other major commentators of his work (there are important remarks on Nietzsche and science in Deleuze's *Nietzsche and Philosophy*, but overall these are vague and imprecise and articulated in

[44] See M. Capek, 'Eternal Recurrence - Once More', in *New Aspects of Time*, pp. 265-77, p. 267.
[45] Whitlock, 'The Untold Story', p. 203.

ignorance of what Nietzsche was actually reading and the exact contributions he was seeking to make; just as Heidegger's 'Nietzsche' tells us more about Heidegger than it does Nietzsche, the same can be said of Deleuze's 'Nietzsche'). We should also not fall into the trap of assuming a complete separation between science and metaphysics, treating science as if it were completely free of it. Even at its most revolutionary and anti-metaphysical science often finds itself caught up in symbolical representations and metaphysical inconsistencies (as Bergson sought to show in the case of Einstein and Relativity theory). Much depends on the conception of metaphysics we have in mind and that we wish to work with. The most promising route to follow, I would suggest, is the point at which science and metaphysics become a parallel process to think beyond the human condition and bring us into communication with forms of life, including durations, both 'superior' and 'inferior' to our own.