On the New Nature and the Impact of Synthetic Philosophy on Cosmogenic Speculation[1]

1. Introduction.

Just before he fell fatally ill, Stephen Gaukroger and I had an outdoor lunch at the Wells Tavern in Hampstead on May 19th, 2023. Amongst other topics, we spoke about his new research on the relationship between classics (and humanities) and science(s) in Victorian England. He sent me a word for windows document of "The shaping of character" that turns out to have been published online, also on May 19th (Gaukroger 2023).

Gaukroger's piece attributes a passage to T.H. Huxley that caught my attention. I quote Gaukroger, quoting Huxley:

> A century later, in 1866, Thomas Huxley writes of science saving civilisation from barbarism, talking of a 'new nature' created by science and manifested 'in every mechanical artifice, every chemically pure substance employed by manufacture, every abnormally fertile race of plants, or rapidly growing and fattening breed of animals'. This new nature, we are told, is 'the foundation of our wealth and the condition of our safety from submergence by another flood of barbarous hordes; it is the bond which unites into a solid political whole, regions larger than any empire of antiquity; it secures us from the recurrence of pestilences and famines of former times; it is the source of endless comforts and conveniences, which are not mere luxuries, but conduce to physical and moral well-being'.

Gaukroger cites volume 1, p. 51, of Huxley's *Collected Essays*, where this material can indeed be found in a volume titled, "Methods and Results." But the passage is originally from Huxley's *The Progress of Science: 1837-1887*, which was first published in 1887 (not 1866). The passage also must have charmed Gaukroger because he had already it quoted it before in print pretty much verbatim (Gaukroger 2020: 24).

The significance to Gaukroger of this passage is, of course, the tight connection Huxley draws among the natural and human sciences, progressive

[1] Much of the material first appeared on my blog *Digressionsnimpressions*. I thank Trevor Pearce for comments there that have shaped the present essay.

civilization, and global empire. In the limited space available to me here I cannot do justice to the weight of these topics.

But it may be illuminating to situate Huxley's passage in the context of competing receptions of Spencer's programmatic synthetic philosophy. In so doing, I show how Huxley and Peirce reconfigured a familiar, long-standing debate about cosmogeny and cosmology in the early modern period a topic close to Gaukroger's heart (e.g., Gaukroger 2000; 2010).

To understand what I am after it is worth nothing three main ideal-typical cosmogenic position popular in the early modern period: (i) a mind ordered the cosmos and then governed it providentially; (ii) the cosmos had no beginning and exists eternally and necessarily; (iii) the cosmos, including its origin, is governed by chance. Of course, in practice, some subtle variations within the ideal type were possible. The first position was embraced by Deists and Theists alike and often traced back, fairly or not, to ancient Stoicism. It was the majority view within the mainstream of the scientific revolution despite the protestations of Spinoza, Hume, and Diderot. (Osler 1996 & 2001) This dominance was opposed by Spinozists (viz. ii) and neo-Epicureans (viz. iii). (Schliesser 2020)

During the second half of the nineteenth century one might expect that with the rise of evolutionary theory, Epicurean cosmogonies would return to prominence. And in what follows this is indeed what I illustrate, but with a twist: in two most prominent heirs to Spencer's synthetic philosophy, Huxley and Peirce, we see a conscious attempt to integrate the tree main cosmogenic ideal types, previously thought opposed to each other, into a unified account wholly novel from the perspective of earlier periods of philosophical speculation. This is so, despite the fact that Huxley and Peirce do not do unify them in the same way.

2. Huxley as Synthetic Philosopher

Huxley's 1887 essay is a remarkable work previously unknown to me, and so I am grateful to Gaukroger's omnivorous reading habits. Huxley's piece is

aimed at an informed public, and showcases Huxley's ability to make complex material across a great diversity of sciences seem self-evident, while being rather alert to the changing nature of the of the so-called 'research frontier.' (de Solla Price 1965) In fact, Huxley clearly has a version of that concept available to him: "even while the cries of jubilation resound and this floatsam and jetsam of the tide of investigation is being turned into the wages of workmen and the wealth of capitalists, the crest of the wave of scientific investigation is far away on its course over the illimitable ocean of the unknown." (Huxley 1889: 54)

In his essay, Huxley explicitly resists the idea that the cognitive or epistemic division of labor within the sciences inevitably drives the sciences apart (Millgram 2015; Schliesser 2019). In fact, one of his more important claims in the work is that developments in the sciences (and technologies) mutually illuminate, scaffold, and constrain each other. There is, thus, in his argument the sense that the unity of nature and the unity of science mutually entail each other, and, as Gaukroger discerned, this is one glue for empire.

In fact, against the current orthodoxy in science studies, Huxley strongly resists the thought that the different sciences have different methods and ultimate aims:

> Physical science is one and indivisible. Although, for practical purposes, it is convenient to mark it out into the primary regions of Physics, Chemistry, and Biology, and to subdivide these into subordinate provinces, yet the method of investigation and the ultimate object of the physical inquirer are everywhere the same.—(Huxley 1898: 60)

Ruling over all the sciences, is evolutionary philosophy: "Evolution, as a philosophical doctrine applicable to all phenomena, whether physical or mental, whether manifested by material atoms or by men in society, has been dealt with systematically in the "Synthetic Philosophy " of Mr. Herbert Spencer." (Huxley 1898: 102) We might say, then, that for Huxley philosophy is the queen of the sciences not as her generative mother, but as her (synthetic) source of integration. In immediate context Huxley is critical of Comte's competing hegemonic program because positivism is built on lack of acquaintance with the salient sciences, and "permeated by a thoroughly unscientific spirit." (Huxley 1898: 103)

One of the most fascinating features of Huxley's essay is the implied cosmogony he offers. The argument starts from the discovery in chemistry that there is a kind of "*periodic law* of recurrent similarities." (emphasis in Huxley) Huxley puts it as follows, "If the sixty-five or sixty-eight recognised 'elements' are arranged in the order of their atomic weights-from hydrogen, the lightest, as unity, to uranium, the heaviest, as 240--the series does not exhibit one continuous progressive modification in the physical and chemical characters of its several terms, but breaks up into a number of sections, in each of which the several terms present analogies with the corresponding terms of the other series." (Huxley 1898: 76) Huxley then adds the following observation:

> This is a conception with which biologists are very familiar, animal and plant groups constantly appearing as series of parallel modifications of similar and yet different primary forms. In the living world, facts of this kind are now understood to mean evolution from a common prototype. It is difficult to imagine that in the not-living world they are devoid of significance. Is it not possible, nay probable, that they may mean the evolution of matter from a primary undifferentiated matter?…At present, it may be said to be the burning question of physico-chemical science. (Huxley 1898: 77-8)

Huxley himself draws attention to the analogy with Aristotelian prime matter (Huxley 1898: 78). But he illuminates what he has in mind with reference(s) to Descartes cosmology (Huxley 1898: 79) and Kant's cosmogony (Huxley 1898: 97). In particular, Huxley speculates in the following manner:

> If the material units of the existing order of nature are specialised portions of a relatively homogeneous *materia prima* --which were originated under conditions that have long ceased to exist and which remain unchanged and unchangeable under all conditions, whether natural or artificial, hitherto known to us-it follows that the speculation that they may be indefinitely altered, or that new units may be generated under conditions yet to be discovered, is perfectly legitimate. Theoretically, at any rate, the transmutability of the elements is a verifiable scientific hypothesis; and such inquiries as those which have been set afoot, into the possible dissociative action of the great heat of the sun upon our elements, are not only legitimate, but are likely to yield results which, whether affirmative or negative, will be of great importance. The idea that atoms are absolutely ingenerable and immutable 'manufactured articles' stands on the same sort of foundation as the idea that biological species are 'manufactured articles'

> stood thirty years ago…It seems safe to prophesy that the hypothesis of the evolution of the elements from a primitive matter will, in future, play no less a part in the history of science than the atomic hypothesis, which, to begin with, had no greater, if so great, an empirical foundation. (Huxley 1898: 79-80)

So, at first, it may seem that Huxley has in mind something like Descartes' idea that in the beginning there was just matter, and then God (like a cosmic billiard ball player) put the original vortex into motion and then matter differentiated itself. Of course, Huxley himself is an agnostic, and so he brackets God's role in this. Rather, Huxley treats the periodicity of the periodic table as evidence for the idea that chemical elements descent from a common origin of homogeneous matter, *and* may well keep evolving. The latter follows from the denial of their immutability.

Subsequently, Huxley turns to other topics in his survey. But once he has expounded Darwin, he returns to his account of the evolution of matter. This turns out to presuppose that the laws of nature remain fixed:

> The doctrine of evolution, so far as the present physical cosmos is concerned, postulates the fixity of the rules of operation of the causes of motion in the material universe. If all kinds of matter are modifications of one kind, and if all modes of motion are derived from the same energy, the orderly evolution of physical nature out of one substratum and one energy implies that the rules of action of that energy should be fixed and definite. In the past history of the universe, back to that point, there can be no room for chance or disorder. (Huxley 1898: 103)

So, Huxley's narrative is compatible with the idea that the original, homogeneous substratum of matter either existed for all time or (we are at the threshold of a modern kind of big bang theory) itself came into existence at a particular time due to an unknown cause and (eventually) evolved into the present differentiated universe by fixed rules. These fixed rules then govern the evolution of matter.

Huxley then adds a twist and anticipates an idea that I associate with Dan Dennett's speculative cosmological Darwinism as a universal acid (Dennett 1995):

> But it is possible to raise the question whether this universe of simplest matter and definitely operating energy, which forms our hypothetical starting point, may not itself be a product of evolution from a universe of such matter, in which the manifestations of energy were not definite-in which, for example, our laws of motion held good for some units and not for others, or for the same units at one time and not at another - and which would therefore be a real epicurean chance-world? (Huxley 1898: 103-104)

That is, the starting point of our universe with its laws of nature may itself be the contingent *effect* of an earlier cosmic evolutionary process that included, perhaps, different laws altogether or a wider diversity of laws and forms of matter (including our own). Huxley himself treats the *earlier* cosmic evolutionary process as instantiating epicurean chance, whereas our own universe is more compatible with either Spinozism or Deism.
However, *that* there can be multiple kinds of universes in *succession* of each other also has a Stoic provenance in Seneca's account in his work on comets in *Natural Questions 7*.

As I noted in the introduction, historically, in debates over the nature of the source of ordered-ness of the cosmos, there are three rival and usually thought of as mutually conflicting hypotheses: epicurean chance, god's design, or (eternal) Spinozistic necessity. Huxley's speculation appeals to features of all three of these and integrates them into a new kind of evolutionary cosmogony. In the next section, I show that Huxley was by no means alone in treating the significance of evolutionary theory in this way.

3. Peirce.

After I published an earlier version of the previous section on Huxley, Trevor Pearce reminded me of Peirce's (1891) "The architecture of theories." This is apt because in it Peirce defends what he calls a "Cosmogonic philosophy." (Peirce 1891: 175-6) Peirce's essay became the start of a celebrated series of essays that are rather important to American pragmatism's self-understanding, but here I want to limit myself to discussion of a single feature in it.

Before I enter into it, I should note that throughout it Peirce's brilliance and technical creativity is on display, but that it is also a bit jarring. In a short

amount of space, Peirce jumps from topic to topic. The piece is full of arguments in the sense of considerations in favor of a view, but it does not develop any arguments in our modern sense at any length.

As I noted, when it comes to cosmogony, there were traditionally three mutually conflicting options: the Epicurean system of chance, the Spinozist system of necessity, and the providential system of divine order. However, when Peirce confronts the three options in his characteristically distinct fashion, we encounter a twist:

> One of the questions philosophy has to consider is whether the development of the universe is like the increase of an angle, so that it proceeds forever without tending toward anything unattained, which I take to be the Epicurean view, or whether the universe sprang from a chaos in the infinitely distant past to tend toward something different in the infinitely distant future, or whether the universe sprang from nothing in the past to go on indefinitely toward a point in the in finitely distant future, which, were it attained, would be the mere nothing from which it set out. (Peirce 1891: 172-173)

The first two options are fairly clearly the system of chance and necessity. However, the third option is while allowing for creation of something out of nothing and teleological in character ("toward a point in the…future"), different from the deist or theist accounts that were standard in the early modern period; it looks as if it is also *cyclical* (from nothing to nothing). As is well known this has Stoic provenance (see Seneca's *Natural Questions 7*), but usually this was suppressed in the domestication of Stoicism to Deist and Theist purposes in a wider Christian culture. The details of Peirce's argument are worth figuring out, but need not concern us here because Peirce's own view will turn out to be a novel variant on the system of necessity.

Not unlike Huxley, Peirce is undaunted by the division of cognitive labor. Here's what he suggests to a system-builder in philosophy:

> That systems ought to be constructed architectonically has been preached since Kant, but I do not think the full import of the maxim has by any means been apprehended. What I would recommend is that every person who wishes to form an opinion concerning fundamental problems, should first of all make a complete survey of human knowledge, should take note of all

> the valuable ideas in each branch of science, should observe in just what respect each has been successful and where it has failed, in order that in the light of the thorough acquaintance so attained of the available materials for a philosophical theory and of the nature and strength of each, he may proceed to the study of what the problem of philosophy consists in, and of the proper way of solving it.—(Peirce 1891: 162)

Peirce then launches into offering a "hint" at the results of his "long studies." (Peirce 1891: 163) He starts his narrative with Galileo and the origin of dynamics and rapidly moves through the centuries to focus on the role of laws in scientific research. The first surprise occurs at the atomic level:

When we come to atoms, the presumption in favor of a simple law seems very slender. There is room for serious doubt whether the fundamental laws of mechanics hold good for single atoms, and it seems quite likely that they are capable of motion in more than three dimensions. (Peirce 1891: 164)

Unfortunately, Peirce does not explain his grounds for this piece of speculation. This is especially odd because we quickly learn that Peirce himself is committed to a kind of principle of sufficient reason for events, facts, or phenomena that exhibit *orderliness to minds*:[2]

> To suppose universal laws of nature capable of being apprehended by the mind and yet having no reason for their special forms, but standing inexplicable and irrational, is hardly a justifiable position. Uniformities are precisely the sort of facts that need to be accounted for. That a pitched coin should sometimes turn up heads and sometimes tails calls for no particular explanation; but if it shows heads every time, we wish to know how this result has been brought about. Law is par excellence the thing that wants a reason. (Peirce 1891: 165)

That is to say, Peirce denies that universal laws of nature can be taken as primitive (as, say, Tim Maudlin would suggest in our time). Now, unlike rationalists like Descartes, Clarke, or Leibniz, Peirce does not pursue the grounds of laws of nature in some metaphysical principle. Rather, not unlike Huxley, he proposes that the laws of nature are themselves the effects of evolution, and, in fact, could *only* be the *effects* of such a process. Not unlike

[2] This echoes Newton's essay De Gravitatione, but I have been unable to find evidence that Peirce was familiar with it.

Huxley, Peirce is also explicitly responding to Spencer's synthetic philosophy (Peirce 1891: 165-166).

That the laws of nature are the effects of an evolutionary process turns out to have far-reaching consequences:

> Now the only possible way of accounting for the laws of nature and for uniformity in general is to suppose them results of evolution. This supposes them not to be absolute, not to be obeyed precisely. It makes an element of indeterminacy, spontaneity, or absolute chance in nature. Just as, when we attempt to verify any physical law, we find our observations cannot be precisely satisfied by it, and rightly attribute the discrepancy to errors of observation, so we must suppose far more minute discrepancies to exist owing to the imperfect cogency of the law itself, to a certain swerving of the facts from any definite formula. (Peirce 1891: 165)

Not to put too fine point on Peirce's position: if laws of nature are the effects of an evolutionary process then the laws of nature cannot be exception-less; they will have to be granular in character. Lurking here is a further regress: the rules or laws of nature that guide this evolutionary process are, if they are produced by evolution, as they must be, themselves granular, etc.

Peirce *seems* to bite this bullet because it looks like he thinks nature must have "more minute discrepancies" all the way down. And that's because like Huxley and (later) Dennett (1995), he treats evolution as a kind of universal acid: "Wherever there are large numbers of objects, having a tendency to retain certain characters unaltered, this tendency, however, not being absolute but giving room for chance variations, then, if the amount of variation is absolutely limited in certain directions by the destruction of everything which reaches those limits, there will be a gradual tendency to change in directions of departure from them." (Peirce 1891: 167)

In fact, for Peirce this is no bullet to bite for two reasons: first, because he thinks that there is always a discrepancy between observation and laws. This echoes Descartes' position in his *Principles.* I mention this because while Peirce's argument is an impeccable instance of evolutionary reasoning, it is still somewhat surprising to see this argument so late in the nineteenth century after a couple of centuries of non-trivial pay-off from Newton's

dictum that in enquiry, laws must be taken to hold "either exactly or very nearly true not withstanding any contrary hypotheses, until yet other phenomena make such propositions either more exact or liable to exception." (Janiak 2014: 153)

Second, Peirce explicitly rejects the idea — variants of which can be found in Descartes, Kant, and (as we saw above) Huxley — that a homogeneous original matter can give rise to the observed variety in the universe. (Schliesser 2013) As he puts it, "exact law obviously never can produce heterogeneity out of homogeneity." (Peirce 1891: 165) This echoes Newton's argument against Spinozism in the General Scholium (Schliesser 2021), although Peirce takes it in a different direction than Newton would.

For, it turns out that while Peirce certainly thinks reality is in a certain sense granular and (with a nod to ancient Epicureans) swerve-y in character, Peirce rejects the further regress (in the context of disagreeing with Spencer). For, while the granular laws of visible nature are the *effect* of an evolutionary process, he does not think we need to explain (as Herbert Spencer suggests we must) this process in terms of further laws. For, "the principle of evolution requires no extraneous cause." (Peirce 1891: 165) Evolution is, as it were, inherent or immanent in reality itself "since the tendency to growth can be supposed itself to have grown from an infinitesimal germ accidentally started." (Peirce 1891: 165) This brute fact is a denial of sufficient reason (and so Spinozism), but it embraces the Spinozist idea of activity being intrinsic to and immanent in nature (Wolfe 2017).

The previous paragraph seems rather ad hoc or question-begging. But Peirce has a further consideration up his sleeve: "because the law of the conservation of energy is equivalent to the proposition that all operations governed by mechanical laws are reversible; so that an immediate corollary from it is that growth is not explicable by those laws, even if they be not violated in the process of growth." (Peirce 1891: 165)

With that in place, Peirce's own Darwinian cosmogony goes like this:

> It would suppose that in the beginning—infinitely remote—there was a chaos of unpersonalised feeling, which being without connection or regularity would properly be without existence. This feeling, sporting here

> and there in pure arbitrariness, would have started the germ of a generalising tendency. Its other sportings would be evanescent, but this would have a growing virtue. Thus, the tendency to habit would be started; and from this with the other principles of evolution all the regularities of the universe would be evolved. At any time, however, an element of pure chance survives and will remain until the world becomes an absolutely perfect, rational, and symmetrical system, in which mind is at last crystallised in the infinitely distant future. (Peirce 1891: 176).

Above I called a position like this 'Spinozist.' But unlike Spinoza, for whom an infinite mind is always co-extensive with the universe, for Peirce such a mind is the emergent, evolutionary *effect* of the universe. That is, evolution is understood as a mindless *ordering* principle inherent in nature that, while relying on chance, also, by first making the universe more law-like, eventually *eliminates* chance over infinite time from the universe. We move from an Epicurean to a Spinozist to an ordered universe. Somewhat surprisingly, then, the pure infinite mind that is the outcome of this cosmic evolution will be a system of *strict* universal laws.

4. Coda

Unsurprisingly, Gaukroger was familiar with the contours of Peirce's argument that I have just sketched. Gaukroger inferred it from Peirce's (1892) follow up essay in *The Monist*. Gaukroger describes it in the context of a footnote criticizing Popper's claim that Tarski's semantics is incompatible with pragmatism without, thereby, defending pragmatism (Gaukroger 1998: 108 n. 16). I am sad I can't ask him how he thought it connected to Peirce's social theory.

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