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On Darwin's science and its contexts

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The notions of 'the Darwinian revolution' and of 'the scientific Revolution' are no longer unproblematic; so this paper does not construe its task as relating these two items to each other. There can be big-picture and long-run history even when that task is declined. Such history has to be done pluralistically. Relating Darwin's science to Newton's science is one kind of historiographical challenge; relating Darwin's science to seventeenth-century finance capitalism is another kind. Relating Darwin's science to long-run traditions and transitions is a different kind of task from relating his science to the immediate short-run contexts.

Introduction

An invitation to write on Darwin and the scientific revolution has to be approached warily (Figure 1). Many people nowadays start their thinking about sixteenth and seventeenth century Europe by rejecting the standard implications of these three words: 'the scientific revolution.' However, even someone who is sceptical about the value of that three-word phrase, can obviously be a believer in much that is usually studied under that heading: the fundamental contrasts between Aristotle's physics and Descartes' natural philosophy; between the astronomy of Ptolemy and the astronomies of Copernicus, Kepler and Galileo; between the ideology of knowledge in Plato's *Republic* and in Bacon's *Advancement of Learning;* between the role of scholastic philosophy in medieval feudal life and the role of the mechanical and experimental philosophies later in agrarian, financial and commercial capitalism. And such a skeptic can believe, no less, in the fundamental continuities, the comparisons, between Euclid and Hobbes's assumptions about geometry; between Epicurean and Gassendian atomism; between Stoic and Newtonian invocations of active and passive principles in explanations of natural motions; between ancient, medieval and renaissance alchemy and astrology.

These themes about innovations and continuations imply the commonplace that there can only be comprehensive understanding of sixteenth- and seventeenth-century science when the characterizing typings (Epicurean, say, or alchemical) and the contextual placings (natural philosophy curricula or feudal cities) are allowed to engage us with the long run of millennia as well as with the shorter runs of centuries and decades. It is likewise, no less familiarly, with Darwin, when we seek typings and placings that can clarify how he relates to what came before him. For there is a need to relate Darwin to the issues dividing the two schools of geology first distinguished by William Whewell in the early 1830s as uniformitarians and catastrophists, as well as to the issues dividing Plato and Democritus concerning cosmic teleology, issues Whewell would later insist were indispensable in deciding how to respond to Darwin's *Origin.*

For many historians these typings and placings for Darwin can be subsumed under another three-word formula: the 'Darwinian revolution;' and anyone adopting this subsumption could well decide that a major challenge can be formulated as the task of relating the 'Darwinian revolution' to 'the scientific revolution'. However, the notion of a Darwinian revolution is also no longer uncontested; and so cannot be appealed to as readily as it once was. This loss is far from restraining us as historians of Darwin, any more than historians of 'early modern science' (one more three-word formula now subject to caveats) have been restricted by losing the assumptions and implications inherent in talk of 'the scientific revolution.' Showing that we can do without such talk of revolutions calls for no mere declarations to that effect, but requires exemplifying illustrations, and such illustrations are principally what this paper seeks to provide.

Forms, laws and order

Just before Darwin published the *Origin* in 1859, Baden Powell, Oxford man of science and theologian (and soon to be father of the founder of the Boy Scouts), in a book of 1855, *Essays on the spirit of the inductive philosophy, the unity of worlds, and the philosophy of creation*, reflected very instructively about current disputes concerning species origins (Figure 2). In doing so, he objects to some recent writers – he probably had Adam Sedgwick in mind, and Whewell too perhaps – who, he says, talk about the fixity of species as if it were a corollary or indeed an instance of the fixity of the laws of nature; and so they talk about species origins as if they are origins of new fixed laws. This assimilation of origins for species and origins for laws could be mistaken, Powell argues. The origins of species may well be natural events, productions occurring within an established lawful course of nature and so not made as additions of new laws. Powell might have invoked a medieval theological distinction between God's constitutional work in first establishing the order of nature, and his administrative work in sustaining and governing nature since. For Powell was saying that species origins may well

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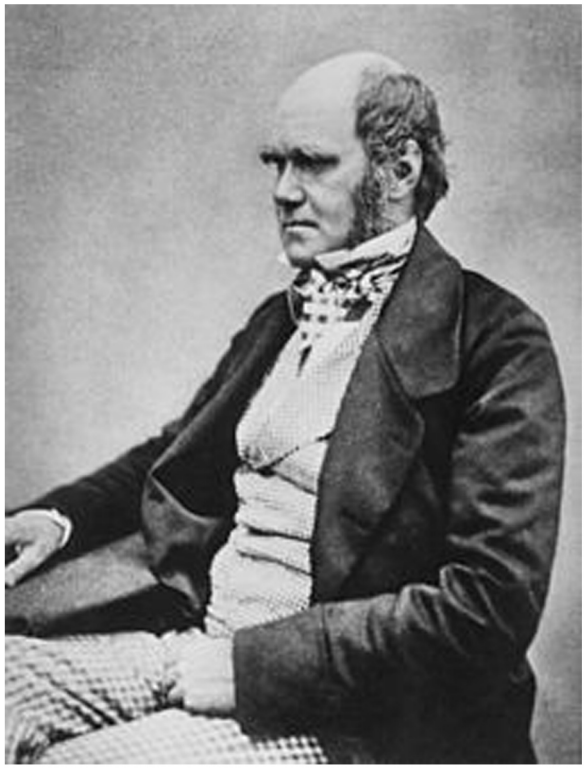

Figure 1. Charles Darwin age 45 in 1854.

be caused by God working through nature and in accord with natural laws and so in administrative not constitutional actions. As the pertinence of this medieval distinction indicates, Powell and those he was seeking to convict of mistaken science and theology, mistakes in the philosophy of creation to use his own title, were heirs to millennia of thinking about species, laws and order. It is a theme well worth including in any historiographies for the long runs and the big pictures.

Figure 2. The Rev. Baden Powell.

Consider an uncontroversial synoptic succession: for Aristotle the order of the cosmos was constituted by forms; for Descartes the order of the universe was constituted not by forms but by laws of nature which are universal laws for all matter and all motions in all bodies; for Darwin nature is ordered by laws, but by laws that are mostly not laws of motion. And consider an uncontroversial corollary of this synoptic succession: for Aristotle there could be no origins for species in the order of nature because species as forms are ultimate origins that have no origins; for Descartes and Darwin species are not forms that are ultimate origins, so species can have origins within the order of nature. But, while for Descartes the lawful origins of species are the laws of motion, for Darwin the origins are the laws of heredity, variation and reproductive multiplication in plants and animals, laws that are not laws of motion.

It is not easy to avoid controversy in such a selective synopsis, much harder to do so when we develop fuller narratives; and no attempt to avoid controversy is made in the rest of this section. For the aim is, rather, to provoke fruitful discussion by offering a target for critical assessment, and so to contribute to historiographical clarifications. If we allow ourselves to focus on just four major traditions in Greek cosmological theorizing, then an easy generalization can be made: for Plato and other Platonists cosmic order was due to forms, and likewise for Aristotle and his school. By contrast, the atomists (Democriteans and Epicureans) and the Stoics, despite their deep differences on other questions, agreed in not invoking any theory of forms. Consider next a complication: in Plato's *Timaeus* – where the cosmos arises from the work of a Craftsman god who looks to timeless, transcendent forms and introduces them into matter – these forms are ultimate origins without origins; but in Plato's unwritten teachings there appears to have been a deriving of forms, their identities and differences, from deeper sources in numbers. However, we may set this complication aside here in concentrating on the great influence of the *Timaeus*. Opposing its teachings, Aristotle gives the cosmos no beginning and insists that forms are immanent and enmattered not transcendent and separate from their embodiments. But for Aristotle as for Plato forms and so species as forms are origins, *archai*, with no origins.

It would be agreeably simplifying if we could say that for the Stoics and Epicureans the order of nature was due to laws not forms. But despite talk about lawfulness in nature from both schools, there is no comprehensive sustained articulation of a nomic constitutional cosmological analogy; there is then no articulation of the view that just as a constitution of laws may be given by human or divine lawgivers in founding a state, so the cosmos is ordered according to a constitution of laws. Nor is another tempting simplification allowable. For we cannot find in the Bible itself, or in the Judeo-Christian tradition generally, a consistent articulation of such a nomic-constitutional view that can be neatly contrasted with the legacies of Plato and Aristotle's accounts of forms and cosmic order. In Philo Judaeus, in the first century CE, or in Augustine a few centuries later, there is no sustained account of laws of