The Life Sciences in Early Modern Philosophy

Introduction

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When philosophers and historians think of the conceptual innovations in early modern science that played an important role in the shaping of the modern world, it is generally mechanical physics that first comes to mind: the newly mathematized study of the motion of projectiles, planets, and billiard balls. The reason for this focus is that there were real, incontestable advances in the understanding of how the physical world works, and this improved understanding had plainly tangible effects in the history of technology and applied science. However, it is a rather narrow understanding of history that concerns itself only with those domains of human endeavor that are enjoying a phase of rapid progress. For indeed very often it is precisely the domains of inquiry that are lagging behind that also present the most difficult and interesting conceptual problems, and that weigh most heavily on the minds of the thinkers and experimenters who are simultaneously enjoying the fruits of their progress elsewhere. If in early modern Europe planetary motion was coming to seem more tractable than animal motion, this does not at all mean that planets were held to be in more urgent need of explanation than animals. Quite the contrary, one might say that what happened was this: the planets, as it turned out, lent themselves more easily to explanation. They were, one might provocatively suggest, the easier part of the scientific revolution. The harder part, the part that would not emerge as a full-fledged, independent domain of science until the 19th century, concerned that great part of nature that appears resistant to explanation in the same terms as the planets and the billiard balls: the part of the nature that does things that billiard balls do not do: the part that replicates itself, producing nearly identical copies of itself in many different ways; the part that has the capacity for self-motion; the part that eats and breathes.

Now there was, in the early modern period, a great diversity of views as to what exactly the relationship is between this latter domain of nature and the one described by

mechanical physics. Arguably the most significant attempt to deal with the gap between these domains (living vs. non-living) was to assimilate the one into the other, that is, to understand the living world in mechanical terms. Many philosophers (a label that includes what are today called 'scientists'), such as, notably, René Descartes, supposed that the success of their own programs of mechanical physics depended upon their ability to explain the generation, structure, and motion of living beings, as Descartes put it, "in the same manner as the rest."[1] That is to say that Descartes hoped to make living nature comprehensible by appeal to the same principles and laws as were lately helping to make so much sense of the rest of nature. Others, such as the 'vitalist' philosopher Henry More, supposed that the motion and generation of living beings could not possibly be explained "in the same manner as the rest." But the key thing to observe here is that, notwithstanding their opposing commitments, all agree that it is of the utmost urgency to account for the generation, structure, and motion of living beings. Indeed, Descartes would even assert that the success of his *entire* philosophy depends upon his ability to provide a successful account of certain vital processes.[2] And though he does not say as much, we may rightly characterize More's 'entire philosophy' as tied up with the success or failure of his conviction that, *pace* Descartes, vital processes *cannot* be explained in the way Descartes hopes to explain them.

In sum, no matter what particular views an early modern philosopher held about living beings, all agreed on the urgency of providing an account of them. Such an account could either be directed at explaining away their supposed uniqueness, or, on the contrary, at proving their uniqueness; but either way an account was in order. In this respect, one might propose that the problem of life in the early modern period imposed itself in much the same way that the famous problem of consciousness does today. David Chalmers and his opponents strongly disagree on the question of whether there *is* a 'hard problem' of

[1] AT VI 45. AT: *Oeuvres de Descartes*, 12 vols., eds. C. Adam and P. Tannery (Paris: Vrin/CNRS, 1964-1976). (Cited by volume and page.).

[2] Thus, for example, he writes in a letter to Marin Mersenne of 1639: 'I am prepared to admit that if what I have written on [cardiac motion] … turns out to be false, then the rest of my philosophy is entirely worthless' (AT II 501).

consciousness or not,[3] but both sides in the debate spend a great deal of time and energy discussing consciousness. If we follow this analogy through, life ends up being tractable in much the same way Chalmers's opponents suppose consciousness will end up being tractable: that is, as a natural phenomenon among others, as a result of the arrangement of natural stuff. Living beings turn out to be an unusually complicated arrangements of proteins, but their unusual complexity does not in the end place them in a distinct ontological class.

Things could of course turn out differently for the problem of consciousness; there is no *prima facie* reason why we should expect it to be advanced by science in the same way as life came to be over the course of the 19th and 20th centuries. But the comparison of the two problems, as they occur in history, with each coming forth as 'hot' in its own period and context, may help us to understand what was at stake in early modern reflections on the concept of life and the nature of living beings. For in each case what we see is disagreement as to whether the phenomenon or entity in question is the sort of phenomenon or entity for which the simple accumulation of more empirical or scientific information about it will prove to be enough to fully comprehend it. That is, one camp sees the resolution of the problem as --they hope-- dependent simply on accumulation of more knowledge of the world of the sort we already have, while the other camp supposes that the phenomenon or entity in question --life, as the case may be, or consciousness-- requires knowledge of a different sort than the kind that is already helping us to make sense of the rest of the world. This latter camp supposes that there is a conceptual difference between living beings and non-living ones, or between conscious beings and non-conscious ones. And this commitment, in turn, requires their opponents as well to engage with the problem at the conceptual level, if only to refute the view that there is a conceptual distinction at all. And so, in the end, all parties to the debate, about life or consciousness, are engaged in the practice of philosophy.

[3] See in particular David Chalmers, 'Facing Up to the Problem of Consciousness,' *Journal of Consciousness Studies* 2, 3 (1995) : 100-219. For a characteristic statement of the opposing view, see Daniel Dennett, 'Explaining the 'Magic' of Consciousness,' *Journal of Cultural and Evolutionary Psychology* 1, 1 (2003) : 7-19.

What those who adhere to the conceptual distinctness of the domain of living beings tend to highlight are a few remarkable features of these beings that seem entirely resistant to explanation "in the same manner as the rest." For one thing, these beings seem to be *structured* entirely unlike anything else in nature. They have complex interworking parts (as, admittedly, certain other natural but plainly inanimate systems do), and moreover this functional complexity seems to operate at very fine-grained levels of analysis. Indeed, prior to the discovery of the living cell in the 19th century, and to some extent even up until the DNA sequencing of a number of biological species, it could easily appear that there simply was no lower limit to vital organization at all, that is, that the functional complexity would continue beyond any *possible* level of analysis. In this respect, living beings seemed to be in a class entirely apart from other natural entities, which, it was supposed, could be analyzed down to their basic, non-functional constituents within a small number of steps.

A second apparent difference between living beings and non-living entities is that the former seem to operate according to special laws that have no equivalent in the rest of the natural world. For example, if a nerve is pricked, and the limb of which it is a part twitches, this twitch cannot be understood in any obvious way according to the same principles that explain the communication of motion from one billiard ball to another. Now of course those who deny that life constitutes a distinct ontological category can argue that at the microscopic level what is going on is fundamentally no different than what goes on with billiard balls, that muscle contraction and expansion involve countless, subvisible billiard-ball-like collisions. But the onus is on them to find these collisions and to describe them, and in the absence of any plausible means of providing such a description, those who defended the ontological distinctness of living beings not surprisingly were not impressed by the evident explanatory stretching required to extend the language of mechanical physics to the domain of physiology.

Similar points may be made, of course, about other peculiar physiological phenomena, such as digestion, respiration, circulation, etc. But one phenomenon has always stood out as a particularly salient motivation for claiming that living beings constitute a distinct

ontological class: namely, their capacity for reproduction, for cycling back upon themselves, as Aristotle would put it, so as to obtain a sort of eternity in number if not in kind.[4] Now today we are starting to see some rudimentary examples of machine self-replication, but in the 17th century it seemed a fairly solid and certain shibboleth for the separation of the living from the non-living, or of beings from machines and artefacts, that whereas no two clocks placed in a room together ever managed to produce a third, little clock, two dogs or humans, if appropriately selected, very well might.[5] Asexual generation was already well attested (though differently described), and spontaneous generation was still debated; these do not involve the coming together of two individuals for the production of a third, but they do seem to be processes that have no analog in non-living nature. Spontaneous and sexual generation, along with sexual generation, all seem to yield up *beings* in the strict sense, rather than simply yielding new arrangements of pre-existing matter, as would seem to be the case in, say, the formation of stalactites or (a more controversial, indeed borderline, case) crystals. This is to say that living beings, in contrast with natural entities, are the sort of things that are *generated* rather than simply formed, and what generation is, exactly, and how it is that a being that previously did not exist, later does, is not just a philosophical problem, but at least since the pre-Socratics has stood as a philosophical problem *par excellence*.

One further way in which living nature stands apart –and also a way that, in turn, stands apart from those already listed-- is in respect of its order and variety, and of the nature of the kinds that make up this variety. Of course, there are chemical and physical kinds too, but as many early modern philosophers insisted, it is living kinds, what we now call biological species, that seem to represent the very idea of what would later be called,

[4] Aristotle writes of animals in *On the Generation of Animals* II 1 : 'For since it is impossible that such a class of things as animals should be of an eternal nature, therefore that which comes into being is eternal in the only way possible. Now it is impossible for it to be eternal as an individual (though of course the real essence of things is in the individual) --were it such it would be eternal-- but it is possible for it as a species. This is why there is always a class of men and animals and plants.'

[5] See in particular this passage from a (1683) letter by Bernard de Fontenelle : "Do you say the Beasts are Machines just as Watches are? Put a Dog Machine and a Bitch Machine side by side, and eventually a third little Machine will be the result, whereas two Watches will lie side by side their lives without ever producing a third Watch?" (The translated passage is cited from *Matter, Life, and Generation,* Shirley A. Roe, Cambridge University Press, 1981. The original passage can be found in *Oeuvres de Fontenelle:* des Académies Française, des Sciences, des Belles-lettres, de Londres, de Nancy, de Berlin et de Rome, Volume 5, p. 99).

after J. S. Mill, 'natural kinds'.[6] Biological species, in the early modern period as today, seem to play an important role in constituting our very idea of what it is for a thing to be a thing of a certain sort: a moment's reflection will convince you that the great majority of examples typically adduced by philosophers to illustrate the idea of form, essence, haecceity, and so on, have always been biological species. This means, inevitably, that thinking about the living world entered in important ways into classical philosophical debates such as that between the nominalists and the realists, and it would be neglectful to gloss over the way in which biological species imposed their particular character here, or to suppose that the examples of, say, 'cowhood' and 'triangularity' always served the same conceptual purposes, in the same way, in the course of philosophical arguments about whether there are real kinds or not. In the early modern period in particular, the longstanding practice of allowing biological species to stand in as paradigmatic examples of kinds in general was thrown into a sort of crisis, as the rate of discovery of new kinds sky-rocketed in consequence of both microscopic investigations as well as greatly increased contact with the non-European world. Empirical discoveries greatly complexified the understanding of natural order, and indeed called into question the very idea that nature constitutes an order at all.

We have organized the contributions to this volume in accordance with the particular problems, just outlined, that living beings and living nature posed for early modern philosophy: the problem of life in general, whether it constitutes something ontologically distinct at all, or whether it can ultimately be exhaustively comprehended "in the same manner as the rest"; the problem of the structure of living beings, by which we understand not just bare anatomy but also physiological processes such as irritability, motion, digestion, and so on; the problem of generation, which might be included alongside digestion and other vital processes, were it not for the fact that it presented such an exceptional riddle to philosophers since antiquity, namely, the riddle of coming-into-being out of --apparent or real-- non-being; and, finally, the problem of natural order.

[6] See in particular J. S. Mill, *A System of Logic*, London, Longman, 1884.

The scholarly investigation of the intersection between philosophy and the life sciences in the early modern period is not only interesting in its own right; it is also helping to unravel many well-entrenched historiographical and interpretive categories, such as the distinction between rationalists and empiricists and that between realists and idealists. These paradigmatic distinctions now appear rather less salient for apprehending what was actually at stake in early modern philosophical debates. In their place, and in part through the work of the scholars collected here, new approaches are being developed. The present volume advances a recent historiographical turn towards the intersection of early modern philosophy and the life sciences by bringing together many of its leading scholars to present the contributions of important but often neglected figures, such as Ralph Cudworth, Nehemiah Grew, Francis Glisson, Hieronymus Fabricius ab Aquapendente, Georg Ernst Stahl, Juan Gallego de la Serna, Nicholas Hartsoeker, Henry More, as well as more familiar figures such as Descartes, Spinoza, Leibniz, Malebranche, and Kant.

Throughout, the contributors to the volume are concerned, each in their own way, to reveal the crucial importance for early modern philosophy of questions in what would later branch off as the science of biology. They are concerned to show not that some independent area of activity conceptualized as 'the life sciences' was of interest to early modern philosophers, in the way that today, say, biology is of interest to philosophers of biology, but rather that what we today think of as questions of the life sciences were in fact *constitutive* of what early modern philosophers themselves thought of as philosophy. This is, or ought to be, beyond any historical doubt. We hope that the papers in this volume will help bring our scholarly community—particularly historians of philosophy and philosophers with a serious interest in history—somewhat closer to where we ought to be.