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Grene and Hull on types and typological thinking in biology

Phillip Honenberger*

Consortium for History of Science, Technology and Medicine, 431 Chestnut Street, Philadelphia, PA 19106, USA

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ABSTRACT

Marjorie Grene (1910–2009) and David Hull (1935–2010) were among the most influential voices in late twentieth-century philosophy of biology. But, as Grene and Hull pointed out in published discussions of one another's work over the course of nearly forty years, they disagreed strongly on fundamental issues. Among these contested issues is the role of what is sometimes called "typology" and "typological thinking" in biology. In regard to taxonomy and the species problem, Hull joined Ernst Mayr's construal of typological thinking as a backward relic of pre-Darwinian science that should be overcome. Grene, however, treated the suspicion of typological thinking that characterized Hull's views, as well as those of other architects of the New Evolutionary Synthesis, as itself suspicious and even unsustainable. In this paper I review three debates between Grene and Hull bearing on the question of the validity of so-called typological thinking in biology: (1) a debate about the dispensability of concepts of "type" within evolutionary theory, paleontology, and taxonomy; (2) a debate about whether species can be adequately understood as individuals, and thereby independently of those forms of thinking Hull and Mayr had construed as "typological"; and (3) a debate about the prospects of a biologically informed theory of human nature.

1. Introduction

Marjorie Grene and David Hull were among the most influential contributors to late twentieth-century philosophy of biology. That two of the three biennial prizes offered by the *International Society for History, Philosophy, and Social Studies of Biology* (ISHPSSB) are named after Grene and Hull, respectively, is a testament to the extraordinary influence these figures have had on the field.[1] But, as Grene and Hull pointed out in public statements on one another's work over the course of nearly forty years, they disagreed strongly on fundamental philosophical and biological issues.[2] Among the most central of these disagreements are those concerning the role of what is sometimes called "typology" and "typological thinking" in biology. In regard to taxonomy and the species problem, Hull joined Ernst Mayr's construal of typological thinking as a backward relic of pre-Darwinian science that should be overcome.[3] Grene, however, treated the suspicion of typological thinking that characterized Hull's views, as well as those of other architects of the New Evolutionary Synthesis such as George Gaylord Simpson, as itself suspicious and even unsustainable.[4]

In this paper I review three debates between Grene and Hull bearing on the questions of the legitimacy and utility of so-called "typological thinking" in biology: (1) a debate about the dispensability of type-concepts within evolutionary theory, paleontology, and taxonomy; (2) a debate about whether species can be adequately understood as individuals, and thereby independently

* Tel.: +1 267 276 5028.
E-mail address: ph@pachs.net.
URL: http://www.chstm.org

[1] For descriptions of the Marjorie Grene and David Hull prize, respectively, see http://ishpssb.org/prizes/ (accessed 01/09/2014) and http://ishpssb.org/page/6/ (accessed 01/09/2014). The other prize is offered in honor of Werner Callebaut.

[2] The main sources (including those that become central targets of criticism of the other) are: Grene (1958, 1989, 1990, 2002), Hull (1965a, 1965b, 1969, 1976, 2002). All information I've seen or heard on the subject suggests that, despite their philosophical disagreements, Grene and Hull were personally amicable.

[3] See Hull (1965a, 1965b, 1976, 1989b [1986]). Hull played a part in shaping the synthesis story about a conflict between typological and non-typological thinking in biology: see Hull (1965a, 1965b) and the account of the mutual influence of Mayr and Hull during this period in Winsor, 2006.

[4] See Grene (1958, 1974a, 1989, 1990, 2002).

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of those forms of thinking Hull and Mayr had construed as "typological"; and (3) a debate about the prospects of a biologically informed theory of human nature. Among the conclusions I draw from this review are that (i) in agreement with Grene, concepts of "type" and so-called "typological thinking," long criticized by influential biologists and philosophers such as Mayr, Simpson, and Hull, are useful and very plausibly indispensable to biological theorizing, including in connection with the idea of biological species; yet (ii) a satisfactory evaluation of the utility, risk, and dispensability or indispensability of such concepts and such ways of thinking in biology depends upon a close study of the differences and relations between different *types* of types: those groupings, classifications, or what-have-you that are variously called "types," "forms," "essences," "structures," and a number of other things in biology and philosophy of biology, which Grene, Hull, and other authors often fail to distinguish. Finally, (iii) there is room, within an admission of the potential utility of some concepts of "type" and of some varieties of "typological thinking," for a renewed pursuit of a biologically-informed theory of human nature.

2. Recent debates about typological thinking

An influential story told by Ernst Mayr construes most of pre-Darwinian biology, including the biological thinking of figures as diverse as Plato, Aristotle, and Linnaeus, as problematically "typological" (Mayr's term) while Darwin and the traditions of biology that have followed him (such as biometrics and population genetics) have become increasingly committed to positions inconsistent with such typological thinking.[5] According to Mayr's account, typological thinking postulates a finite set of unobserved and unchanging ("fixed") categories, which are taken to be more real than the observed and variable world. It further supposes there is no continuity or gradualism between membership in one or another of these categories, or between the categories themselves, but rather only "gaps" or "jumps" between categories. Because of the contradiction between these commitments and the gradualist implications of neo-Darwinian evolutionary theory (as articulated in the New Evolutionary Synthesis), Mayr recommended a rejection of typological thinking and the adoption of new, non-typological ways of thinking (in particular, what he called "population thinking") more characteristic of the neo-Darwinian tradition.[6]

Some historians and philosophers of biology have recently argued that Mayr's account of typological thinking is historically misleading or conceptually confused or both. Some have argued that (a) from a contemporary biological perspective, some aspects or kinds of "typological thinking" are not as problematic as Mayr and other architects of the New Evolutionary Synthesis took them to be.[7] In addition, it has been argued that (b) Mayr's account construes the pre-Darwinian typological views as simply bad biology, a view that is hard to sustain in the case of putative "typologists" such as Carl Linnaeus and Richard Owen; (c) relatedly, it assumes that typology is closely associated with idealism, and thus is necessarily non-materialistic, non-empirical, or non-scientific; but, again, these correlations are not necessary[8]; (d) it treats "typological" as a synonym of "essentialist," which need not be the case, and historically has often not been the case: in particular, putative essences may or may not be articulated in terms of types, and types may or may not be described essentialistically (that is, in terms of necessary and sufficient conditions)[9]; (e) it assumes that typological biological thinking of any kind is identical to or entails typological thinking about *species* (that is, defining or understanding species distinctions typologically), which it does not; famous examples of so-called "typological thinking," such as that of Johann Wilhelm Goethe and Owen, did not involve species designations but rather more general taxonomic designations (such as "plant" and "vertebrate," respectively); (f) it associates typological thinking with "creationism" insofar as the 'types' emphasized by the typologist are supposedly taken to be products of divine creation or ideation; but this association, again, is not necessary, and not born out by a contextually-sensitive historical reconstruction of the views and motivations of some supposedly exemplary typologists, such as Owen[10]; and (g) it assumes that typological thinking is inconsistent with population thinking or with natural-selection-based accounts of evolution, which it quite arguably is not.[11]

[5] See, for example, Mayr 1976b [1957], Mayr 1976c [1959], and Mayr 1976d [1968]. Mayr dubs the non-typological tradition, initiated by Darwin, "populational." The suspicion of "types," among architects of the New Evolutionary Synthesis, seems to precede Mayr: for instance, see Simpson (1940). This suspicion was strengthened by similar conclusions being drawn by Hull himself, in Hull (1965a, 1965b). For recent histories of the New Evolutionary Synthesis's judgments about "essentialism" and "typological thinking," see Winsor (2006), Amundson (2005), and Chung (2003).

[6] Mayr's most frequently cited articulation of the distinction is as follows:

"Typological thinking no doubt had its roots in the earliest efforts of primitive man to classify the bewildering diversity of nature into categories. The *eidos* of Plato is the formal philosophical codification of this form of thinking. According to it, there are a limited number of fixed unchangeable 'ideas' underlying the observed variability, with the *eidos* (idea) being the only thing that is fixed and real, while the observed variability has no more reality than the shadows of an object on a cave wall, as it is stated in Plato's allegory. The discontinuities between these natural 'ideas' (types), it was believed, account for the frequency of gaps in nature. Most of the great philosophers of the seventeenth, eighteenth, and nineteenth centuries were influenced by the idealistic philosophy of Plato, and the thinking of this school dominated the thinking of the period. Since there is no gradation between types, gradual evolution is basically a logical impossibility for the typologist. Evolution, if it occurs at all, has to proceed in steps or jumps. [Population thinking, on the other hand,] stresses the uniqueness of everything in the organic world. What is true for the human species—that no two individuals are alike—is equally true for all other species of animals and plants. Indeed, even the same individual changes continuously throughout its lifetime and when placed into different environments. All organisms and organic phenomena are composed of unique features and can be described collectively only in statistical terms. Individuals, or any kind of organic entities, form populations of which we can determine only the arithmetic mean and the statistics of variation. Averages are merely statistical abstractions; only the individuals of which the populations are composed have reality" (Mayr 1976 [1959], 27–28).

[7] Rieppel (2010) provides an overview of recent renewals of typological thinking in biology. See also Amundson (2005), Lewens (2009); and Grene (1958, 1990), discussed below.

[8] For instance: The views of the German morphological and embryological traditions were materialistic in a way that offended the religious sympathies of the British school of "natural theology" (Amundson, 1998, 2005). And the views of Carl Linnaeus, Étienne Geoffrey-St. Hilaire, and Richard Owen were developed as a means of accounting for a wealth of empirical data, arguably in no way principally different (in this regard) from the methods of (say) Darwin. Where they seem to deviate from strict empiricism by postulating a non-material "type" that describes or captures the common organization of a range of different species, this type can often be construed as a generalization or formal description, not principally different from the formal models that were later developed (by R. A. Fisher and others) to describe characteristically Darwinian mechanisms of natural selection. There is nothing inherently or especially "Platonic," in the sense of "immaterialist," about these views (Amundson, 2005; see also Owen, 2007 [1849]). Indeed, the postulate of trans-specific *types* made by Owen and other naturalists of the nineteenth century was a crucial preliminary step in Darwin's ability to argue for the existence of a concrete, historical common ancestor that would explain the structural parallels defining these types (Amundson, 2005).

[9] The conceptual distinguishability of essentialism, idealism, and typological thinking (and thus the lack of entailment from any one of these positions to any of the others) is well-argued in Lewens (2009), 357–9. Winsor (2006) points out that Hull's (1965) paper on "essentialism" in taxonomy played an important role in creating the appearance of an identity or close connection between essentialism and typological thinking.

[10] As argued in Amundson (1998, 2005).

[11] Lewens (2009) and Grene (1990) argue that the two are not as incompatible as Mayr's distinction makes things seem. For recent defenses of Mayr's distinction and his preference for populational over typological thinking, see Sober (1980) and Nanay (2010).