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Scott Lidgard; Lynn K. Nyhart (Editors). Biological Individuality: Integrating Scientific, Philosophical, and Historical Perspectives. 361 pp., figs., index. Chicago: University of Chicago Press, 2017. $25 (paper).

The problem of biological individuality, as it is traditionally understood, consists in explicating what a biological individual is and in specifying clear criteria for picking out biological individuals. In the case of a lichen, for example, the question is whether there is just one biological individual (the lichen), many (the fungus and green algae), or both. The volume edited by Scott Lidgard and Lynn K. Nyhart takes a fresh look at the debate on biological individuality and widens its traditional focus in at least two fruitful ways. First, it portrays biological individuality as a "problem space" (24) that joins together different perspectives of biologists, historians, and philosophers. The various chapters of the volume reveal that, although each discipline has its own goals and sets of questions, the different perspectives on biological individuality mutually improve and complement each other. Second, the practice-oriented, pluralist stance that the volume takes (which is developed in detail in Ch. 1 and 13) draws the reader's attention to how different individuality concepts and associated individuation criteria do their work in past and contemporary biological practice, for instance, which epistemic goals they serve and for which biological problems they are suited.

The volume is structured into chapters that focus on specific questions, biological cases or historical episodes concerned with biological individuality (Ch. 2-10) and chapters that tie together these different questions and perspectives (Introduction, Ch. 1, 11-13). In the introduction and in Chapter 1, Lidgard and Nyhart provide a useful methodological and conceptual framework that prepares the reader for the interdisciplinary endeavor.

Chapters 2, 3, and 4 focus on single-celled and multicellular individuals. Herron (Ch. 2) analyzes different degrees of individuality that are present in cells, colonies, and clones of the volvocine green

algae. Sterner (Ch. 3) draws on the same case study and introduces the concept of a "demarcator" (85) to provide an alternative explanation of evolutionary transitions (e.g., from uni- to multicellularity). Reynolds (Ch. 4) adopts a historical-social perspective and examines how sociological terms and ideas have been applied to biology to describe the cell-cell interactions that tie together a "society of cells" (121).

Chapters 5, 6, and 7 have a historical focus and investigate how biologists from the 19th and 20th centuries have developed non-Darwinian frameworks for thinking about biological individuality. Nyhart and Lidgard (Ch. 5) show that in 19th century biology questions about the alternation of generations are intimately connected with the problem of biological individuality. Gissis (Ch. 6) develops a non-standard interpretation of Herbert Spencer's work, according to which an individual is characterized by the stable interactions with its environment, not by demarcation from the environment. Rieppel (Ch. 7) shows how Martin Heidenhain's concept of "enkaptic hierarchy" (186) was fruitfully applied in ecology and phylogeny and why it remains useful today, despite having been used in Nazi ideology.

Chapters 8, 9, and 10 are concerned with composition, that is, with individuals related as parts and wholes. Osborne (Ch. 8) examines late 19th century perspectives on the status of parasites as biological individuals and how the biomedical discourse intersected with political discussions about the French colonies. The question of how much autonomy a biological individual can have in a whole (e.g., in an organism or state) is also prominent in Landecker's chapter (Ch. 9), which outlines how ideas of metabolism and the autonomy of the eater have developed since the mid 19th century. Brigandt (Ch. 10) provides a philosophical analysis of how structural and functional considerations play a role in individuating the parts of biological wholes.

The final three chapters are commentaries that reflect on the problem of biological individuality and on the other chapters of the volume from the perspectives of history, biology, and philosophy. Elwick (Ch. 11) locates the chapters in a larger historical pattern and argues that our essentialist

everyday intuitions have mislead most historians of biology to conceptualize biological individuals as "tidy and bounded entities" (277) with essences. Gilbert (Ch. 12) argues that 21st century biology calls for a "new paradigmatic framework" (298) that conceptualizes standard cases of biological individuals (such as humans) as holobionts. Love and Brigandt (Ch. 13) suggest that philosophers should turn their attention from metaphysical to epistemic questions about biological individuality and analyze how biologists actually pick out individuals to achieve certain epistemic goals.

What distinguishes this volume are not only the diversity of topics and perspectives that it combines but also the instructive ways in which they are tied together: The introduction explains how biologists, historians and philosophers, despite their interest in different questions, can mutually enrich their work. Lidgard and Nyhart's conceptual framework (Ch. 1) and Brigandt and Love's pragmatic-pluralistic approach (Ch. 13) give a clear direction to the volume and help the reader to locate the other chapters in the complex problem space. A drawback of this clear direction is that it is exclusive: More monistically minded metaphysicians, historians and philosophers of biology are portrayed as being unable to contribute to the progress of the interdisciplinary endeavor. Nevertheless, its integrative and practice-oriented character makes the volume innovative and particularly valuable not only for historians and philosophers but also for practicing biologists.

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