*The Species Problem: A Philosophical Analysis*. By RICHARD A. RICHARDS. (Cambridge: Cambridge University Press, 2010. Pp. x + 236. Price £50.00).

Richard Richards draws a critical historical survey of species thinking together with an examination of a number of associated philosophical concerns and their implications for biological practice to form a novel solution to the species problem.

Richards begins by stating the nature of the problem as he sees it. Species are the basic taxonomic groupings of organisms. They are defined by relying on a particular conception of species, typically referred to as a ‘species concept’. A species concept states what criteria must be met for an organism to be a member of one species rather than another. A problem exists because there is more than one candidate concept (in 1997 Richard Mayden counted 22). The different grouping criteria associated with different species concepts may lead to different species groupings—organisms may belong to one species using the criteria for species membership associated with one concept and another using a different concept. Species groupings resulting from different species concepts may be non-concordant. For Richards, the species problem is therefore a counting problem. Counting how many species there really are or how many species are endangered becomes highly problematic.

Early chapters trace the history of thinking about the species problem from Aristotle onwards. These are a valuable contribution to the continuing discussion of this longstanding problem. Richards challenges what he calls the ‘essentialism story’ (ES)—a standard interpretation that characterizes past (pre-Darwinian) species thinkers as committed to a property essentialist consensus.

The myth of a pre-Darwinian essentialist consensus makes the contrast between Darwin and what came before stark. But the story of Darwin’s dynamic population thinking overcoming a widely-held static property essentialism is erroneous. Richards has sharp words for those philosophers who continue to perpetuate this myth—e.g. Daniel Dennett (p. 18), Elliott Sober (p. 18) and Mark Ereshefsky (p. 49)—but suggests that adherence to this myth has deep roots, Aristotle’s views having been originally obscured by the Epicureans, Porphyry, Boethius, Aquinas and Ockham (p. 34-48). Richards’ main objection to ES is its assumption of *property* essentialism, the belief in species fixity, and the immutability of species—not its essentialism *per se.* Instead of subscribing to a property essentialism that takes species to be immutable, Richards works through the writings of Aristotle, Linnaeus, Buffon and others suggesting their views were more nuanced.

Richards claims that from 1859 to 1997 all biologists agreed that, when thinking about species, ‘coherence with evolutionary theory is a primary consideration’ (p. 177). No doubt this is broadly true. But it obscures disagreements that lead to the multiplicity of species concepts. Botanists, anthropologists, zoologists, ethologists, developmental biologists, and microbiologists disagree about what is evolutionarily significant, for instance, what the main sources of variation are (e.g., hybridization, sexual selection, facilitated variation, genetic drift, lateral gene transfer, adaptive cell behaviours).

Instead of arguing for one species concept over all others, Richards’ *division of conceptual labour* (DCL) solution presents a structural solution. Species concepts belong to one of two hierarchically arranged levels—a higher theoretical level and a lower operational level. Species concepts are theoretical if they ‘define species taxa and constitute the species category’ (p. 140). They are operational if they provide criteria for identifying groups of organisms as belonging to one species rather than another. Operational concepts provide correspondence rules that link the theoretical concept with observational data. DCL may make species monism more attractive for some as it requires a reordering rather than rejection of the multiplicity of species concepts. One can be a theoretical concept monist whilst helping oneself to a plurality of operational species concepts.

The metaphysical nature of species is discussed next. Richards develops arguments for why species are individuals rather than sets or homeostatic property cluster kinds. He evaluates these alternative metaphysical notions of species in terms of how well they work in biological practice and within the evolutionary framework of biology. He ultimately defends Michael Ghiselin’s species-as-individuals view. Species, like organisms, are spatio-temporally restricted, concrete individuals and organisms are parts of a species individual. Richards suggests that this view is the only one confirmed by wide empirical investigation (p. 176). However, others might suggest that what is viewed as confirming evidence may be the result of biased attention to the nature of sexually reproducing Metazoans.

Setting the question of the truth of this claim aside, this metaphysical view of species serves to justify Richards’ *species category essentialism*. The species category has an essence. This is an explicit set of necessary and sufficient conditions that ‘revolves around the idea of segments of population lineages’—a notion of species following Kevin de Querioz’s general lineage concept (p. 216). Whilst strongly advocating this as the monist theoretical concept, Richards acknowledges that our view of what the theoretical species concept is may change over time reflecting new evidence or theoretical advances but the DCL structure will persist.

It is interesting to note that one could interpret Richards’ view—in particular, the species-as-individuals view he adopts from Ghiselin—as a kind of property essentialism. The parts of the individual are organisms that have essential spatiotemporal (genealogical) relationships with other organisms in virtue of which they are parts of the individual species. Unlike the property essentialism he dismisses of the ES, this version allows for the mutability of species. Species as individuals change over time because their parts change over time—through the death of some organisms and the birth of others.

Richards concludes by explaining what a scientific concept is. He attempts to connect the discussion of species concepts with a sampling of debates concerning meaning and reference, definitional structure, the ‘theory theory’, referential vagueness, indeterminacy of meaning, conceptual change, incommensurability, and even a bit on theology and species. The discussion of these topics is extremely compressed and somewhat lacking in depth; fewer topics discussed in more detail would have been preferable. Richards’ conclusion ultimately rests on an account of the social structure of science. ‘Species’ is systematically ambiguous because its meaning changes in different disciplinary contexts. It is largely pedagogically determined. Linguistic and logical notions present in Aristotle’s *Categories* were initially used to understand species (p. 196). Although this highly contextualized account seems at odds with his monist-unificationist account, it may be reconciled once again within his DCL. This seems apparent: ‘When geneticists and systematists use the term species, they may mean something different by virtue of theoretical interests, emphasis and training, but they can still be speaking of the same thing in its definitional core—the species that also interest ecologists and palaeontologists’ (p. 204).

Although Richards’ critical history from Aristotle to the present is a valuable contribution, his decision to stop at 1997 was disappointing. He justifies this end point stating ‘since Mayden’s accounting of species concepts in 1997, little has changed’ (p. 110). A few recent accounts are referred to in later chapters but much of the recent discussion of species is omitted; for instance there is no mention of the polyphasic species concept now in use in bacteriology and microbiology. Much of the recent discussion of what makes the monist resolution to the species problem most problematic concerns the species concepts developed to apply to microbial, fungal, and archaeal species in response to the unsuitability of those assuming sexual reproduction; for example, the biological species concept, mate recognition concept, and reproductive cohesion concept. These suggest that the organizational structure of the vast majority of the earth’s species resist a univocal monistic species concept. The evolution of prokaryotes and microbes is not simply represented as a single branching tree (See Maureen O’Malley and John Dupré, ‘Size doesn’t matter’ *Biology and Philosophy* 22 (2007), pp. 155-191 for further discussion). Thinking about different systems of evolutionary inheritance and the reticulated structure of microbiological evolution radically changes what we consider species to be. Microbiological species may not be the same kind as macrobiological species. Such thinking makes Richards’ monist view seem less plausible.

Whether one accepts Richards’ solution may ultimately come down to whether one thinks a univocal conception of species is possible (or desirable). Those allowing plurality on both theoretical and operational levels will reject this solution as will those that argue that the diversity of species concepts reflects a disunified world. Richards provides little argument against views that do not take unification as a virtue. But even though not all philosophical topics were covered in as much depth as some might prefer, *The Species Concept* succeeds in developing an innovative argument for theoretical monism, one that will surely appeal to those that value a unified approach. *The Species Problem* provides an important historical account of the problem and a cogent framework for philosophers to make sense of the multiplicity of species concepts and the philosophical problems that arise from them.

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