

Aristotle's theory of science in his *Posterior Analytics* is premised upon what has seemed to many an unpromising starting point: That all scientific knowledge is of necessities. While many philosophers still take mathematics to trade exclusively in necessary propositions, few philosophers or scientists today would take this to be true of the natural sciences like meteorology, chemistry and biology. Some have concluded on the basis of the preponderance of mathematical examples in the contexts where Aristotle makes this claim that he formulated his theory of science primarily with mathematics in mind and sought to extend it to other sciences as something of an afterthought. Others, in a related vein, see Aristotle's avowal of this position as a holdover from his early Platonism that he was still wresting himself free from when he wrote the *Posterior Analytics*. Even the growing number of scholars who take the theory of the *Posterior Analytics* to be geared towards his work in natural science tend to take him to relax the claim that scientific knowledge is of necessities in natural-scientific contexts.

My dissertation undertakes a careful study of Aristotle's position with respect to the necessity of scientific knowledge and argues that Aristotle's position, far from being incompatible with the study of the natural world, is properly understood an attempt to account for and explain the possibility of such knowledge. Aristotle's claim is not evidence that he failed to properly account for non-mathematical sciences in his "official" theory of science; rather, it is the crux of an interesting, and perhaps even compelling theory of the relationship between mathematical and non-mathematical sciences

Specifically, I argue that Aristotle holds his view as a way to reconcile two theses about knowledge that stand in tension. On the one hand, Aristotle holds that for scientific knowledge to have the value we take it to have as a cognitive state, it must be possible for us to rely on it. This requires that we be able to employ scientific knowledge without needing, each time we wish to employ it, to check that the world is still as our knowledge represents it. This means, in Aristotle's technical vocabulary, that having scientific knowledge is a stable condition or "state" (*hexis*) like being virtuous, rather than a transient condition like being cold. In particular, Aristotle infers that we never lose knowledge unless we suffer cognitive harm (such as an injury resulting in permanent cognitive impairment) or cognitive deterioration (such as severe memory loss).

Yet Aristotle also holds that all knowledge, including scientific knowledge, is a *dependent* mental state. A mental state is *dependent* if it requires that the world really is, and remains, as this mental state represents it in order for it to continue to be a mental state of that kind. In the case of knowledge, this means that a given instance of knowledge only continues to count as knowledge if the world remains as the knower takes it to be. If I know, for example, that Socrates is sitting, then I retain this knowledge only so long as the state of affairs I know continues to hold over time – only so long as Socrates stays in his seat. Aristotle codifies this idea by placing knowledge in the category of relatives (*pros ti*). Knowledge is essentially "of" something in the sense that it depends, for its continued existence, on the continued holding of some state of affairs.

Now, if someone could have scientific knowledge of a changeable state of affairs like Socrates' sitting, then the fact that this knowledge is *dependent* would contradict the claim that this piece of knowledge is *stable* in the sense described above. Rather than rejecting either the claim that knowledge is dependent or that it is stable, Aristotle infers that we cannot have scientific knowledge of a changeable state of affairs like Socrates's being seated. Dependency and durability together entail that we cannot have scientific knowledge of any state of affairs that is not eternally true.

What, then, does the scientist know, if not changeable states of affairs? Aristotle resists drawing as a moral that we have knowledge only about unchanging Forms rather than the mundane particulars of our experience. Instead, he endeavors to explain how ordinary objects can be the subjects of necessary truths, and thus how we can have scientific knowledge about the perishable world. The key to Aristotle's explanation is the notion of *qua*-predication. While, for Aristotle, the state of affairs that I, *qua* individual, am alive will cease to be true when I die, the fact that I, *qua* human, am alive remains true eternally even after my death. For whereas the former is made true by a fact about *me* and hence depends on my continuing existence for its continuing truth, the latter is made true by a fact about what it is for me to be human. Part of what it is to be human is to be alive, and the fact that being alive is part of what it is for me to be human does *not* require me to stay alive for it to stay true. Although he holds that both statements are properly speaking statements *about* me, Aristotle thus denies that the latter requires my, or any other individual's, continued existence for its continuing truth. Instead, it is grounded in what Aristotle calls a "simple" truth: A truth that does not depend on the combination or division of objects and properties.

Understood in this way, Aristotle's view does not pose any threat to the study of biology and other "soft" sciences. All sciences, on Aristotle's view, study sensible objects in abstraction from their particularity. As a result, they have as their primary objects abstractions that have the features they have of necessity. But since these abstractions are abstractions *of* particular sensible objects, our grasp of abstractions allows us to intelligently interact with and make judgments about sensible particulars with contingent properties. The natural sciences differ from the mathematical sciences not in that they study concrete objects *rather* than abstractions, but in that they do not abstract from all ways that objects in their domain may change. Rather than conceiving of natural sciences as "empirical" and mathematical sciences as "non-empirical", then, Aristotle takes both natural and mathematical sciences to refer to features of the objects of our experience, but to differ in the type of abstraction they perform on these objects. There is, for Aristotle, no such thing as a purely "empirical" or purely "non-empirical" science. Any systematic knowledge of reality involves, for Aristotle, both a rational pole, in which we isolate the changeless and universal features of some domain, and an experiential pole, in which we apply our universal knowledge to the particulars from which we originally abstract it.

In addition to giving a philosophically interesting reconstruction of Aristotle's view about the object of scientific knowledge, my dissertation makes four main scholarly contributions. First, I show that Aristotle's considerations regarding knowledge in the *Categories* have important bearing for his thinking about knowledge in the *Posterior Analytics*. Second, I show how Aristotle's theory of truth in *Metaphysics* Θ.10 grounds his theory of *per se* predication in the *Posterior Analytics*. Third, by carefully distinguishing the senses of "necessary" targeted by each of Aristotle's arguments for the necessity of knowledge, I make a contribution to debates about the extent to which Aristotle has a non-temporal concept of modality. And fourth, by clarifying the justification and motivation for Aristotle's claim that what we know is a necessity, I clarify the respects in which Aristotle's theory of science in the *Posterior Analytics* does, and does not, require modification in the context of biological science.