

## ARISTOTLE ON INQUIRY

Aristotle is a rarity in the history of philosophy and science – he is a towering figure in the history of both disciplines. Moreover, he devoted a great deal of philosophical attention to the nature of scientific knowledge. How then do his philosophical reflections on scientific knowledge impact his actual scientific inquiries? In this book, James Lennox sets out to answer this question. He argues that Aristotle has a richly normative view of scientific inquiry, and that those norms are of two kinds: a general, question-guided framework applicable to *all* scientific inquiries, and domain-specific norms reflecting differences in the target of inquiry and in the means of observation available to researchers. To see these norms of inquiry in action, the second half of this book examines Aristotle's investigations of animals, the soul, material compounds, the motions of heavenly bodies, and respiration.

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*Erotetic Frameworks and Domain-Specific Norms*

JAMES G. LENNOX

*University of Pittsburgh*



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*Dedicated to the memory of Allan Gotthelf*

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## *Preface*

This book has had a long gestation period, during which I have accumulated many debts. Throughout the process, Patricia Lennox has supported my work in every way imaginable – not the least of which is filling life beyond my work with joy. Early on in the process I invited Alan Code to Pittsburgh for an extended visit for the sole purpose of discussing this project, and those discussions were critical in helping me frame it. Discussions over meals and long walks with my former colleague James Allen and with Allan Gotthelf, David Charles, Philip van der Eijk, and István Bodnar also were helpful at this early stage. At a somewhat later stage, Mariska Leunissen and Joe Karbowski read through a preliminary draft and discussed difficulties of overall structure with me – the two-part structure of the final version I owe to them. In a similar vein, Aryeh Kosman and Joel Yurdin visited Pittsburgh and met with Jon Butacci and me for discussions of how Aristotle sees experience in relation to inquiry, which helped to alter the trajectory of my work at a crucial point.

While the manuscript was developing, a number of people did me the (helpful) honor of organizing workshops where I could present and discuss the ideas here presented. Klaus Corcilius organized one such event at the University of California, Berkeley, March 6–7, 2015, during which I presented an overview lecture and took part in four seminars organized around specific chapters. I received helpful comments from Timothy Clarke, Lucas Angioni, Michel Curbellier, and of course Klaus Corcilius on that occasion.

Victor Caston organized a similar event at the University of Michigan, Ann Arbor, April 16–17, 2015, during which I received helpful suggestions from Victor, Richard Janko, Emily Katz, and James Joyce. During that visit I also had two memorable conversations over coffee about the project with Victor. My dear friend Giovanni Camardi and his colleague Giovanna Giardina invited me to give two lectures based on material from three chapters at University of Catania, Sicily, May 11–12, 2015,

during which I had memorable conversations with them and their students about the book's themes. Marko Malink organized a workshop at New York University on April 22–23, 2016, on Chapters 1–7, with chapter presentations by Josh Mendelsohn (Chapter 1), Marko (Chapter 2), Joel Yurdin (Chapter 3), Pieter Sjord Hasper (Chapter 4), Greg Salmieri (Chapter 5), Claire Bubb (Chapter 6), and Jessica Moss (Chapter 7). The discussions during each of these sessions helped me identify assumptions that needed defense and gaps in the argument that needed to be filled.

David Charles and Verity Harte invited me to present some of the ideas discussed in Chapters 2 and 3 to the Ancient Philosophy Colloquium at Yale University on October 14, 2016. Besides doing a wonderful job of organizing that visit, Emily Kress met with me to discuss her work on *Physics* II and how it might relate to the ideas expressed in Chapter 5. On April 13–14, 2017, besides delivering a lecture on Aristotle and Darwin to the Rotman Institute of Philosophy, my friend and fellow Canadian Devin Henry organized a seminar around themes developed in the book. I benefited enormously from these events, probably even more than I am now aware.

During these years, I also had the pleasure of presenting the themes of the book in seminars (various iterations of “Aristotle’s Natural Science” and “Aristotle on Method”) attended by outstanding graduate students in Philosophy and History of Philosophy of Science and colleagues Allan Gotthelf, Jessica Gelber, and Kathleen Cook. Working with Keith Bemer, Jon Buttaci, Tom Marré, and Greg Salmieri during those years, as they researched and wrote dissertations on themes closely connected to mine, was especially valuable, but all the participants in these seminars contributed in different ways to the final product.

In addition to these many helpful live interactions, I received valuable written comments from Christina Hoenig and Jacques Bromberg in our Classics Department at the University of Pittsburgh, as well as from Jon Butacci, David Charles, Alan Code, Andrea Falcon, Jessica Gelber, Allan Gotthelf, Mariska Leunissen, Joe Karbowski, Emily Katz, Emily Kress, Tom Marré, Anne Peterson, Diana Quarantotto, Stasinios Stavrianeas, and Joel Yurdin.

I also thank Cambridge University Press’s two readers for their extremely helpful questions, suggestions, and corrections. One of these, Sarah Broadie, revealed her identity to me, so I am able to personally thank her for her detailed, constructive questions and suggestions. For their help at the production stage, it is a pleasure to thank Michael Sharp and Mary Bongiovi for editorial guidance, Bret Workman for his help with

copyediting, and Akash Datchinamurthy for overseeing production. And last but very far from least, I owe special thanks to Christopher Kurfess, who not only helped with the preparation of the indexes but also offered valuable advice on many other questions that came up during the copyediting process.

This book is dedicated to my dear friend Allan Gotthelf. He joined me in my department in 2003, shortly after I began working on this book, and discussions with him about it were a constant source of inspiration. I deeply regret that Allan passed away before work on it was completed.

While all of the above-mentioned people (and no doubt many others) have helped to make this a better book than it would otherwise be, I doubt any of them will find the final product fully convincing. I take full responsibility for the result.

Certain ideas and themes in Chapter 3 were first presented in April 2010 in a paper entitled “Aristotle on Norms of Inquiry” as part of a Biggs Residency at Washington University, St. Louis, and then at the History of Philosophy of Science meetings in Budapest in June; it was published in 2011 in the first issue of the society’s journal, *HOPOS* 1(1): 23–46. Chapter 4 grew out of ideas first presented as “Aristotle’s Natural Science: the Many and the One” at the 2009 Duke-UNC-Chapel Hill Conference on Ancient Philosophy, where I received helpful comments from Gisela Striker; and as the 2010 Rosamond Kent Sprague Lecture in Ancient Philosophy, University of South Carolina, published in *From Inquiry to Demonstrative Knowledge: New Essays on Aristotle’s Posterior Analytics*, J. H. Lesher, ed., Kelowna, BC: Academic Printing and Publishing, 2010: 1–24; also published in 2010 in *Apeiron* 43(2/3): 1–24. Chapter 5 relies heavily on ideas first published as “How to Study Natural Bodies: Aristotle’s μέθοδος” in *Aristotle’s Physics: A Critical Guide*, Mariska Leunissen, ed., Cambridge University Press, 2015: 10–30. Chapter 6 develops some of the ideas presented in “The Unity and Purpose of *On the Parts of Animals* 1,” in *Being, Nature, and Life in Aristotle*, James G. Lennox and Robert Bolton, eds., Cambridge University Press, 2010: 56–77. Chapter 7 is based on a lecture presented at Flinders University in 2009 and published as “Aristotle on Mind and the Science of Nature” in Marietta Rossetto, Michael Tsianikas, George Couvalis, and Maria Palaktoglou, eds., *Greek Research in Australia: Proceedings of the Biennial International Conference of Greek Studies, June 2009*, Flinders University Department of Languages, 2009: 1–18. Chapter 8 develops ideas first presented in “*De caelo* 11.2 and Its Debt to *De incessu animalium*,” in Alan C. Bowen and Christian Wildberg, eds., *New Perspectives on Aristotle’s De caelo* (Philosophia Antiqua, Vol.

117), Leiden and Boston: Brill, 2009: 147–214; and Chapter 9 builds on “Aristotle on the Emergence of Material Complexity: *Meteorology* IV and Aristotle’s Biology,” presented as part of a 2012 HSS/HOPOS symposium on *Meteorology* IV organized by Tiberiu Popa, published in 2014 in *HOPOS* 4(2): 272–305. Finally, Chapter 10 is based on material first presented at University of Patras in June 2011, and in subsequent iterations at the University of Toronto, University of Rochester, Oxford University, University of Pisa, University of Notre Dame, Aristotle University of Thessaloniki, Humboldt University (Berlin), Catholic University of America (Washington), and Charles University (Prague). Some of the ideas presented in this chapter appear as “Why Animals Must Keep Their Cool: Aristotle on the Need for Respiration (and Other Forms of Cooling),” chapter 10 in *Heat, Pneuma and Soul in Ancient Science and Philosophy*, Hynek Bartos and Colin King, eds., Cambridge, 2020.

## Abbreviations

### Aristotle

<i>APo.</i>	<i>Posterior Analytics (Analytica Posteriora)</i>
<i>APr.</i>	<i>Prior Analytics (Analytica Priora)</i>
<i>Cat.</i>	<i>Categories (Categoriae)</i>
<i>Cael.</i>	<i>On the Heavens (De caelo)</i>
<i>de An.</i>	<i>On the Soul (De anima)</i>
<i>EE</i>	<i>Eudemian Ethics (Ethica Eudemia)</i>
<i>EN</i>	<i>Nicomachean Ethics (Ethica Nicomachea)</i>
<i>GA</i>	<i>On the Generation of Animals (De generatione animalium)</i>
<i>GC</i>	<i>On Generation and Corruption (De generatione et corruptione)</i>
<i>HA</i>	<i>History of Animals (Historia animalium)</i>
<i>IA</i>	<i>On the Locomotion of Animals (De incessu animalium)</i>
<i>Juv.</i>	<i>On Youth and Old Age (De juventute et senectute)</i>
<i>Long.</i>	<i>On Length and Shortness of Life (De longitudine et brevitate vitae)</i>
<i>MA</i>	<i>On the Movement of Animals (De motu animalium)</i>
<i>Mem.</i>	<i>On Memory (De memoria et reminiscencia)</i>
<i>Metaph.</i>	<i>Metaphysics (Metaphysica)</i>
<i>Mete.</i>	<i>Meteorology (Meteorologica)</i>
<i>PA</i>	<i>On the Parts of Animals (De partibus animalium)</i>
<i>Ph.</i>	<i>Physics (Physica)</i>
<i>PN</i>	<i>Parva naturalia</i>
<i>Po.</i>	<i>Poetics (Poetica)</i>
<i>Pol.</i>	<i>Politics (Politica)</i>
<i>Pr.</i>	<i>Problems (Problemata)</i>
<i>Resp.</i>	<i>On Respiration (De respiratione)</i>
<i>Rh.</i>	<i>Rhetoric (Rhetorica)</i>
<i>Sens.</i>	<i>On Perception and Perceptibles (De sensu et sensibilibus)</i>

*List of Abbreviations*

<i>Somn. Vig.</i>	<i>On Sleep and Waking (De somno et vigilia)</i>
<i>Top.</i>	<i>Topics (Topica)</i>

**Plato**

<i>Phlb.</i>	<i>Philebus</i>
<i>Plt.</i>	<i>Statesman (Politicus)</i>
<i>R.</i>	<i>Republic</i>
<i>Sph.</i>	<i>Sophist</i>
<i>Ti.</i>	<i>Timaeus</i>

**Hippocratic Writings**

<i>Carn.</i>	<i>On Fleshes (De carnibus)</i>
<i>VM</i>	<i>On Ancient Medicine (De vetere medicina)</i>

**Other Ancient Authors**

D.L.	Diogenes Laertius, <i>Lives of the Philosophers</i>
<i>in de An.</i>	Philoponus, <i>Commentary on Aristotle's De anima</i>
<i>in Cael.</i>	Simplicius, <i>Commentary on Aristotle's De caelo</i>
<i>in Mete.</i>	Alexander of Aphrodisias, <i>Commentary on Aristotle's Meteorology</i>
<i>in Ph.</i>	Philoponus, <i>Commentary on Aristotle's Physics</i>
	Simplicius, <i>Commentary on Aristotle's Physics</i>

**Modern Authorities**

DK	H. Diels & W. Kranz, <i>Die Fragmente der Vorsokratiker</i> , 6th ed., 1951.
LSJ	H.G. Liddell, R. Scott, & S. Jones, <i>Greek-English Lexicon</i> , 9th ed., 1968.