CHAPTER 1

Introduction

> "But then", he says, "for what reason save an evil one did you cut up the fish which the slave Themison brought you?" As if I had not just said that I write about the little bits of all the animals – about their situation, size, and purpose – and studiously investigate and add to the books of anatomy by Aristotle. And, in fact, I am most astonished that you know about a single little fish inspected by me when I have likewise inspected many, in whichever place they can be obtained, and all the more so because I do none of this secretly, but all of it in the open, so that whoever desires, even strangers, may attend.… This little fish, which you called a sea hare, I showed to many who were present.
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> Apuleius, *Apology*[1]

Apuleius of Madaurus (b. *c.* AD 125) may not seem a likely person to open a book on dissection. A novelist and orator from Northern Africa, he is known best for his sharp wit and rhetorical panache. Yet, in the passage above, he presents himself as a dissector. Not just a dissector, but a public one. With the assistance of Themison, his medically trained slave, he pursues his passion for anatomy "in the open," welcoming any passers-by to observe the bone formations and other notable features of rare aquatic species. So passionate is his interest in this topic that he has an open call to friends and local fishermen to bring him any unusual specimens so that he can put them under the knife.[2] Further, he reads anatomical texts with

[1] Apuleius, *Apol.* 40 ("at enim" inquit "piscem cui rei nisi malae proscidisti, quem tibi Themis[c]on seruus attulit?" quasi uero non paulo prius dixerim me de particulis omnium animalium, de situ earum de[ni]que numero de[ni]que causa conscribere ac libros ἀνατομῶν Aristoteli et explorare studio et augere. atque adeo summe miror quod unum a me pisciculum inspectum sciatis, cum iam plurimos, ubicumque locorum oblati sunt, aeque inspexerim, praesertim quod nihil ego clanculo, sed omnia in propatulo ago, ut quiuis uel extrarius arbiter adsistat … hunc adeo pisciculum, quem uos leporem marinum nominatis, plurimis qui aderant ostendi).

[2] Apuleius, *Apol.* 33.

assiduous attention and even produces both Greek and Latin anatomical writing of his own.[3] Certainly, Apuleius has an agenda in describing these activities: He is defending himself on charges of magic, which included, among other things, an allegedly sinister interest in fish. Yet, the rhetorical felicity of his defense need not detract from its credibility. In fact, this speech dates to the period when interest in anatomy was at its peak in the ancient Mediterranean, when intellectuals were reading anatomical books for pleasure and the public dissection of animals for scientific ends was indeed a comparatively common occurrence.

Just a year before Apuleius' defense, and a bit further along the African coast, a young Galen (AD 129-*c.* 216) left Alexandria, where he had been studying, and returned to his hometown of Pergamon.[4] There, he leveraged his anatomical prowess and performative acumen to attain a coveted medical position from under the noses of more established doctors; soon he moved on to Rome, where his skill as a dissector earned him access to the social elite and eventually helped bring him to the notice of the emperor himself. Like Apuleius, he put his name around appropriate circles as someone on the look-out for choice anatomical specimens – and his appetite for them was insatiable. Across the Mediterranean, Galen's colleagues and rivals were similarly employed. The second century AD saw a burgeoning of dissection, both private and performative, and a surge in the production and circulation of anatomical texts. Apuleius is a powerful witness to this trend. Even outside the context of the medical world and in North African Oea, a comparative backwater of the Roman Empire, he attests to the fascination that dissection held across the social spectrum and to the diversity of interest in anatomical writing; further, his legal predicament reminds us that dissection was embedded in a nexus of other associations, some of them uncomfortable.

This book follows the development of the practice of dissection, including its social contexts, and traces the concomitant evolution of anatomical texts from fifth century BC Greece to Galen and Apuleius' day in the Roman period. No such comprehensive history of dissection in antiquity has yet been attempted. Scholarly work in this area has typically approached ancient dissection through the overlapping, but by no means

[3] Apuleius, *Apol.* 36–8.

[4] Apuleius' trial, if it was indeed a historical event, occurred in the winter of AD 158/9; see Hunink (1997), vol. I, p. 12. For a timeline of Galen's life, see Boudon-Millot (2012), 345–9.

identical, topic of ancient anatomy.[5] Anatomy consists of the arrangement and characteristics of the parts of the body, both external and internal. The science or study of anatomy therefore cultivates a knowledge of these topics, and anatomical texts, by my definition, include any text that engages with them, either exclusively or in a sustained way. Writing the history of anatomy involves mapping the evolution of anatomical thought over time: that is, chronicling the ways in which people conceive of the structures of the parts of the body and their interconnections. C. R. S. Harris' study of the vascular system from Alcmaeon to Galen is an excellent example of an in-depth history of anatomy: He articulates the details of different attempts throughout Classical antiquity to describe the structure, position, and relationship of the heart and the veins and arteries, including also a discussion of their function or physiology.[6] This book is not a history of anatomy; it will not address the details and development of anatomical data. Rather, it is a study of how these anatomical data were obtained and how this impacted the ways in which they were shared.

While the modern study of anatomy is predicated more or less exclusively on dissection, this is not an inevitable predication, and it has not always held true. There are, in short, other ways of conceiving of anatomy. Shigehisa Kuriyama's comparative study of Greek and Chinese medicine beautifully highlights the fact that dissection was not a foreordained anatomical methodology.[7] Even just within the Classical world, it did not hold continuous or universal sway. Brooke Holmes has demonstrated a marked shift around the fifth century BC, when the Greeks began approaching the interior of the body as a more knowable space, using exterior symptoms and observations to conceptualize its depths.[8] Colin Webster has now shown how ancient conceptions of the body depended on preexisting understandings of the physics of the natural world: Thus, technological developments shifted the ways in which the ancients conceived of the

[5] Several histories of early anatomy and dissection of varying length and focus have been written over the last century, including Singer (1925) and (1957), Edelstein (1932) and (1935), Kudlien (1968*a*) and (1969), May (1968), 13–38, Lloyd (1975*a*) and (1979), 156–69, Potter (1976), Vegetti (1979), 13–53, von Staden (1989), 138–53 and (1992*a*), Annoni and Barras (1993), Malomo, Idowu, and Osuagwu (2006), Byl (2011), 117–28, Rocca (2016), and Dean-Jones (2018). In addition, the Greco-Roman period often occupies the first section of books dealing with the history of anatomy in other periods, though often in an uncritical way; see Cole (1944), 24–47, Kevorkian (1959), 1–30, Persaud (1984), 29–69 and Persaud, Loukas, and Tubbs (2014), 3–45, Le Breton (1993), 25–35, Wootton (2006), 46–8, and Quigley (2012), 13.

[6] Harris (1973); Solmsen (1961) does the same for the nerves.

[7] Kuriyama (1999), 116–29.

[8] Holmes (2010); cf. Holmes (2018).

component parts of bodies and their functions.[9] More linguistically, Mary Beard has queried the ways in which anatomical vocabulary itself both reflected and molded ancient perceptions of bodily composition.[10] Ancient thinkers approached anatomy through analogy, through theoretical models, and through sheer conjecture.[11] Indeed, throughout the history of the development of dissection as a practice, alternative methods of anatomical insight continued to contest its primacy, its necessity, and even its reliability.

Nevertheless, Greek doctors and natural philosophers began experimenting with dissection at an early date, and it steadily gained importance as the most potent heuristic in the study of anatomy. Dissection, by my definition, consists in the cutting open of bodies and the observation of their component parts for the express purpose of adding to, confirming, or contesting anatomical knowledge; vivisection is a special type of dissection practiced on living bodies in order to ascertain both structure and, more particularly, function. Motivation critically underlies this definition of dissection: There are other ways of cutting into and observing bodies that are not dissective. Divinatory examination of animal entrails, for example, despite the keen and expert observations it requires, is not dissection because its practitioners are looking for divine, not anatomical data. Indeed, although the modern ubiquity of basic anatomical knowledge has homogenized our conception of bodily interiors, cutting open a body is a messy and multivalent activity. When first approaching an opened abdomen, it is very difficult to know what you are seeing until you have been told what you are looking at. Dissection, in short, requires a special type of looking.[12] Greek thinkers began to cultivate this way of viewing the

[9] Webster (forthcoming).

[10] Beard (2002).

[11] The Hippocratic idea of the womb as a cupping vessel or jar (e.g., *VM* 22 [I.626 Littré], *Mul.I* 33 [VIII.78 Littré]) and the popular conception of the heart and vessels as an irrigation system (e.g., Plato, *Ti.* 77c6–d8, Aristotle, *PA* 668a11–32) are good examples of anatomy by analogy; for more discussion of analogical approaches to the body, see Holmes (2010), 108–16. Theoretical models, for example of symmetry and the primacy of the center, similarly drove many of the early conceptions of the body (e.g., Diogenes' system of paired vessels at DK 64B 6[7] and Aristotle's three-chambered heart at *PA* 666b21–667a6). Plausible conjecture was a constant feature of ancient anatomy, underlying everything from the Methodists' pervasive system of pores or channels (Tecusan [2004], 11–12) to Erasistratus' *triplokia* (see Chapter 2, "Herophilus and Erasistratus" at p. 39) and Galen's assertion of a permeable interventricular septum in the heart (*Nat.Fac.* II.207–8).

[12] I am here following Kuriyama (1999), 111–29, who distinguishes dissection in these terms; he also broaches the assumptions and goals behind the move to dissection, a question which represents a distinct, philosophical dimension of the history of anatomy that I have not had space to engage with in a sustained way here.

interior at some point in the early fifth century in the context of a burgeoning desire to organize and understand the natural world; by the fourth century it had become a fully operative methodology.

Ancient dissection occurred almost exclusively on animal bodies, and throughout this book all unqualified references to dissection presume animal subjects. Some – notably Aristotle and those, like Apuleius, working in his tradition – were interested in animal anatomy on its own terms; most, however, used animals as a proxy for understanding human anatomy. This comparative anatomy is already visible among the authors of the Hippocratic Corpus, and they are fully aware of the limitations intrinsic to it: A goat's innards, when all is said and done, are not the same as a human's. Galen, our most extensive source, is also alert to comparative anatomy's potential to be misleading, but his confidence in the close homology between monkeys and humans forestalls any serious misgivings. This was for the best because the dissection of human bodies was not a routine occurrence in Greco-Roman antiquity; the only names securely associated with the practice are the early Hellenistic doctors Herophilus and Erasistratus. Nevertheless, historians have been perennially keen to focus on the availability of human subjects, perhaps in reaction to the fact that it was Vesalius' transition from the animal to the human body that ushered the science of anatomy into the modern era.

This book seeks to offer a complete picture of the practice of dissection in Classical antiquity. In doing so, it redresses imbalances in the attention paid to dissection in some previous work on the history of anatomy, namely a tendency to downplay the importance of the dissection of animals compared with that of humans and, relatedly, to overemphasize the Hellenistic period at the expense of the Roman one. Influentially, Ludwig Edelstein framed the Hellenistic switch from animal to human subjects as "the crucial question in the history of anatomy," but this focus on the human strikes me as ahistorical.[13] From the modern perspective animal dissection naturally seems a paltry substitute for human dissection, but the ancients did not feel this way. Certainly, they acknowledged that human

[13] Edelstein (1932), 97 ("diese Frage ist die entscheidende in der Geschichte der Anatomie"). In addition to a perennial fascination with the question in more general histories of anatomy, human dissection in antiquity has also been the subject of numerous dedicated articles, most recently Kudlien (1969), von Staden (1992*a*), Annoni and Barras (1993), and Dean-Jones (2018). I certainly do not dispute that human dissection is an interesting and worthwhile topic – nor that it was implicated in the leap forward in anatomical sophistication in the Hellenistic period – but simply assert that animal dissection is equally worthy of interest and plays a far more significant role overall in the history of ancient anatomical study.

subjects would provide the most accurate window into human anatomy, and later authors respected the privileged findings of Herophilus and Erasistratus accordingly. However, they were confident in their extensive use of animal dissection as a reliable proxy, and with good reason.[14] By the Roman period, despite never having dissected a human body, Galen exhibits a nuanced and expert understanding of anatomy in its minutest details.[15] Though he is respectful of the anatomical legacy of Herophilus and Erasistratus, it is manifest across his anatomical writings that his nearer contemporaries' work on animals, like his own, has advanced anatomical knowledge past their observations. Charles Singer's assertion that after the work of Herophilus and Erasistratus in the Hellenistic period "anatomy did not revive till the rise of the mediaeval universities" epitomizes the distorting effect of a disproportionate focus on human dissection.[16] When animal dissection receives its due share of the attention, a widespread, vibrant, and sophisticated surge in anatomical activity in the first two centuries of the Common Era comes into clearer focus: one that surpasses its Hellenistic antecedent in both its scale and its influence on the history of anatomical study. Indeed, I would argue that its reliance on animal subjects, which were both abundantly available and uncontroversial to kill, spurred rather than curbed its success and productivity.

I have taken a twofold approach to the history of dissection, reflected in the two-part structure of this book. In Part I, I consider what one might call the social history of the practice of dissection: who was doing it, how, and in what contexts. Although the answers to these questions lie mostly in texts, I have taken material culture and archaeological finds into account

[14] Indeed, anyone with access to their writing would have been perfectly aware that Herophilus and Erasistratus themselves contextualized their human dissections within a broader program of animal dissection.

[15] Galen, of course, knows full well that his simian-based anatomy is not exactly the same as human anatomy; indeed, he describes the monkey body as a "caricature" of the human body at *UP* III.80 (I.59H) (μίμημα γελοῖόν) and he is fully aware that the proportions as well as some of the details are different. Nevertheless, by cross-referencing his intimate knowledge of simian and other animal anatomy with his medical experience of human bodies, he arrives at what he is satisfied is a globally accurate picture of human anatomy. In general, when I speak of the anatomical knowledge derived from dissection in this book, I am referring to this amalgamation of animal data, as cast onto the human frame.

[16] Singer (1957), 38; cf. his claim on p. 46 that "it would seem that neither Lycus nor any of the other second century anatomists were able to use the human subject, and it is clear that Anatomy was in headlong decay. For all his greatness the only result of Galen's work was to codify the researches of antiquity for after ages." Authors since Singer have generally been more favorably disposed toward the anatomical work of Galen and his peers, but I hope that my intensive handling of the Roman period will offer a still more robust and multifaceted picture of the anatomical richness of the late first and second centuries AD than has yet been achieved.

wherever possible. Chapter 2 offers evidence for the practice of Dissection in the Classical and Hellenistic periods, terms which I use as rough but convenient markers for the fifth century BC and the fourth to first centuries BC, respectively; in light of the highly performative character that dissection would later come to adopt, I also include discussion of the range of public contexts within which the practice would have fallen in each of these periods. Chapter 3 turns to the Roman period (a moniker of convenience for the first and second centuries AD) and catalogues the motivations for and public-facing dimensions of dissective activity in Rome and across the Mediterranean. Chapter 4 gets into the practical details that underlay dissection in the ancient world: what subjects anatomists used and how they obtained them – including an in-depth discussion of the question of human dissection – and what further equipment and support was required and how easy it was to procure. Finally, Chapter 5 considers dissection in its broader social contexts. As Apuleius demonstrates, dissection operated within a wider world of bodily manipulations, and it would have been perceived with different valences by different people in different places. Though by no means exhaustive, this chapter seeks to contextualize dissection beyond the medical and philosophical circles where it was at home.

Part II of the book gauges the impact that dissection had on the field of anatomy by tracing the development of anatomical literature, including the diversity of its authorship, the evolution of its subgenres, and its variable relationship to the practice of dissection. Chapter 6 begins with anatomical writing in the Classical and Hellenistic periods. These texts mirror the development of dissection in these centuries: Few of the early texts are exclusively anatomical and, even in the Hellenistic period when more dedicated texts become popular, multiple approaches to anatomy remain vibrant. Chapter 7 surveys anatomical authors of the Roman period other than Galen. Though the bulk of the writing about anatomy from this time is lost, textual references and the papyrological record combine to reveal a wide and diverse field of anatomical literature, paralleling the popularity of dissection in this period as described in Chapter 3. Chapter 8 discusses Galen's minor anatomical writings, both those that survive and those that do not; it highlights the role that Galen apportions to dissection in these texts, as well as how he deploys it across his wider oeuvre. Chapter 9 focuses on Galen's *Anatomical Procedures*, a detailed set of instructions for the dissection of animals and the only text surviving from antiquity that seamlessly fuses dissection and anatomical writing. I consider Galen's purposes in writing this text and the audience he envisions using it and how,

ending the chapter with broad conclusions on the history of dissection in antiquity as a whole. Finally, a brief epilogue in Chapter 10 provides a coda of sorts, following the history of dissection and anatomical writing into Late Antiquity and offering a bridge from the Classical anatomical world to the medieval one.