From the holdings of the Department of Special Collections , Princeton University Library, Princeton, NJ

These documents are either in the public domain, or can only be used for educational and research purposes (Fair use) as per U.S. Copyright law (text below). By accessing this file, all users agree that their use falls in the public domain or within fair use as defined by the copyrightlaw. We do not charge any permission or usage fees for the publication of images of material inour collections, including those provided by Princeton University Library, via our website, catalog, or directly from staff.For more information regarding copyright, credit, and citation please review the information onthe Copyright, Credit and Citation Guidelines page of our website.
https://library.princeton.edu/special-collections/policies/copyright-credit-and-citation-guidelines. If you have any questions, including how to order higher-quality images from the collection, contact Special Collections Public Services via our Ask Us! Form. https://library.princeton.edu/special-collections/ask-us

---

Doctoral Dissertations, 2011-2026 Philosophy

2023

Aristotle on Void: An Analysis of Physics IV 6-9

Brasher, Bridget

Princeton, NJ : Princeton University

---

http://arks.princeton.edu/ark:/88435/dsp010v838387p

U.S. Copyright law: The copyright law of the United States (Title 17, §108, United States Code) governs the making of photocopies or other reproductions of copyrighted material. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be used for any purpose other than private study, scholarship, or research. If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of fair use that user may be liable for copyright infringement. This institution reserves the right to refuse to accept a copying order if, in its judgment, fulfillment of the order would involve a violation of copyright law. https://www.copyright.gov/title17/title17.pdf

ARISTOTLE ON VOID:

AN ANALYSIS OF *PHYSICS* IV 6-9

Bridget Brasher

A DISSERTATION

PRESENTED TO THE FACULTY

OF PRINCETON UNIVERSITY

IN CANDIDACY FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

RECOMMENDED FOR ACCEPTANCE BY

THE DEPARTMENT OF

PHILOSOPHY

Advisers: Benjamin Morison (primary) and Hendrik Lorenz (secondary)

September 2023

© Copyright by Bridget Brasher, 2023. All rights reserved.

Abstract

This dissertation examines Aristotle's inquiry on void in his *Physics*, Book IV, chapters 6-9. There, Aristotle presents numerous arguments against the existence of void. He finds that void is not only unnecessary for physical phenomena but impossible. Before doing so, he seeks an answer to what void is, if it exists, finding that if void exists, it is place deprived of body. He then proceeds to target that thing in his subsequent refutations. I begin the dissertation by asking the prior, methodological questions, how can Aristotle by his own lights think that there is a correct answer to what a nonexistent item is? And how could Aristotle target that thing in a demonstration of nonexistence, given this that logic precludes the use of empty terms, i.e., terms which fail to signify an existent, and 'void' would be such an empty term? I find that Aristotle has a considered method for approaching nonexistence inquiries, which is a counterpart of his method for existence inquiries in *Posterior Analytics* II 1-2. It emerges within the context of this counterpart method that Aristotle has certain grounds for saying what a nonexistent thing like void is, if it exists, and so too, that Aristotle can prove by demonstration the nonexistence of something using his own logic without violating the existence entailments of that logic. I then turn to examine Aristotle's answer to what void is, if it exists: place deprived of body. I find that Aristotle targets a consistent account of void throughout the inquiry, though according to this account there will be both a separated void and inseparable voids. I next consider Aristotle's lengthy engagement with his predecessors, which, I find, tells us much about the intellectual and historical context around void. I argue against the scholarly orthodoxy and maintain that, in fact, the atomists likely never argued for the existence of void. Finally, I turn to Aristotle's most complex argument against the existence of void, the so-called 'cube argument' at 216a26–b20. I offer a straightforward reconstruction, which resolves interpretative difficulties and reveals a compelling attack on void.

Acknowledgements

Being a part of Princeton's Classical Philosophy Program has been the opportunity and joy of a lifetime. Every member of the program is in some way a part of this dissertation, a source of inspiration, insight, and camaraderie.

The dissertation would not exist were it not for Benjamin Morison. I am grateful to Ben not only for the seemingly countless hours he has spent reading my work but for the expertise he has made every effort to pass on to me. Ben drills in his students the indispensable τέχνη of close textual analysis. I find now that however dense a passage I confront, the thought, 'What would Ben do?,' surfaces like an aim to strive for and a guideline upon which I can always rely. His supervision has shaped my path in this field, and no doubt as I get older and continue on I will discover still more for which I owe him gratitude.

I thank Hendrik Lorenz for his open-minded and open-hearted approach to scholarship and mentorship. Hendrik has the ability to take any idea and identify the promise in it. One truly feels good and inspired when leaving an advising meeting with him. I further thank Hendrik for bringing to the Classical Philosophy Program invaluable exchanges with our peers in Latin America. In such ways Hendrik both models and lays the ground for the sort of intellectual life towards which we can all aspire.

I am grateful also to Mirjam Kotwick. Mirjam has generously offered comments on my work and served on my generals and dissertation committees. Particularly invaluable are her philological and text critical insights, without which we historians of ancient philosophy would be woefully lost. In fact, she has inspired in me a fascination for textual criticism. I thank Mirjam for her time and effort on my behalf.

When people ask me why I am pursuing a PhD in Greco-Roman philosophy, my response always begins with "Jessica Moss." My undergraduate mentor, Jessica believed in me before I could have begun to fathom a career in philosophy, let alone Greco-Roman philosophy. I am deeply grateful to Jessica. I hope only that I can be as good a mentor to my undergraduates as she was to me. Relatedly, I am grateful to Claudia Yau, my former peer at Princeton, for being a constant mentor in the field and a source of advice and inspiration.

I thank also Ursula Coope in the first place for sponsoring my visit to Oxford and agreeing to read my work. I thank her further for her extremely incisive comments on that work. I am very grateful that she took her time to sponsor and read the work of this visiting student.

There are so many others who have informed this dissertation. I am grateful to Hans Halvorson at Princeton for serving on my generals and dissertation committees. I am grateful also to Daniel Garber, Desmond Hogan, Susan Brison, Tom Kelly, Caroline Cheung, Marko Malink, Jessica Moss, Gabriel Shapiro, Ethan Russo, and Bin Kwon, who offered me their comments in meetings or as audience members at Princeton and NYU.

Outside the dissertation itself, a multitude of additional people have inspired me and brought life to my time as a doctoral student. I am grateful first of all to Sam Berstler for her exceptionally

generous mentorship and encouragement. Sam instantly makes every academic environment a better one. I am grateful (again) to Daniel Garber for supervising my first role as teaching assistant. I thank Melissa Lane, Jonathan Gold, and Alexander Nehamas at Princeton for their support throughout the years. And I am grateful to Michail Peramatzis, Luca Castagnoli, Simon Shogry, Lea Cantor, Chiara Martini, Alesia Preite, and Ursula again for warmly welcoming me back to Oxford.

Many thanks are due as well to the fantastic team of current and former administrative staff in the Princeton Philosophy Department. This includes Brittany Masterson, Daniel Rusnak, Josephine Kelly, Anna Faiola, Keisha Craig, Nancy Groll, Anna Colasante, and Joann Zuczek. They have made my journey through this program as smooth as possible.

To my current and former peers at Princeton, thank you for the ideas, the friendship, and the many laughs. In the Classical Philosophy Program, this includes Tom, Merrick, Ian, Marcus, Daniel, Gabriel, Adele, Claudia, Wenjin, Christen, Giulia, Norah, Malina, Wintor, René, João, Hao, Lauren, and Antonio. Beyond my peers in Classical Philosophy, I am thankful to many and especially Haley Brennan and Alice Van't Hoff. Haley and Alice, I cannot imagine Princeton without either of you. You are each a phenomenally important friend to me, and I hope we will stay in touch as long as we live.

Above all I am grateful to my family, to my partner, Sam Sykes, and to Liam and Gigi. Mom, thank you for bringing me into this world and for your unconditional love ever since. Thank you for giving so much of your life to Elizabeth and me. Every day I see in myself your spirit, passion, and curiosity. Dad, you have taught me the value of perseverance, hard work, and most importantly, that the secret to life is enjoying the passage of time. Thank you for everything you worked to give us. To Elizabeth, you are my best friend, sister, confidant, and forever mentor. My whole life I have looked to you, and what an exceptional bar you have set. Thank you for always being there. Liam and Gigi, you have brought such happiness to my life and will always be in my heart. And to the Sykes Family, thank you for welcoming me into your home. Finally, Sam Sykes, I love and owe you more than I can write, so let me simply say, this dissertation is dedicated to you.

To Sam.

…ἀτὰρ σύ μοί ἐσσι πατὴρ καὶ πότνια μήτηρ
ἠδὲ κασίγνητος, σὺ δέ μοι θαλερὸς παρακοίτης:
ἀλλ᾽ ἄγε νῦν ἐλέαιρε καὶ αὐτοῦ μίμν᾽ ἐπὶ πύργῳ…

Contents

	Abstract	3
	Acknowledgements	4
	Introduction	8
1	**Aristotle's Approach to Nonexistence Inquiries**	
	Introduction	16
	The Structure of Existence Inquiries	21
	The Parallel Structure of Nonexistence Inquiries	26
	Resolving the Demonstration Dilemma	30
	Resolving the What-it-is Dilemma	39
	Final Remarks	57
2.	**What Void Is, If It Exists**	
	Introduction	59
	Sedley's Two Voids	62
	The Candidates for Place Not Relevant in an Account of Void	64
	Which Candidate is Relevant, and the Popularity of Common-sense Space	66
	Aristotle's Two Voids: An Interpretive Problem Unsolved by Ross or Hussey	74
3	**What Proponents of the Existence of Void Argued (and What They Didn't)**	
	Introduction	85
	Analyzing the Claims by Void's Proponents	86
	Claims 1-3 in Their Historical Context	106
4	**The Cube Argument Against the Existence of Void**	
	Introduction	123
	The Scenario of the Cube Argument	124
	The Dilemma of the Cube Argument	154
	Conclusion	
	Ground covered	165
	Implications and questions for further research	169
	Bibliography	173

Introduction

Aristotle's proof that void (τὸ κενόν) cannot exist steered the course of scientific thought for nearly two millennia. The belief that nature abhors a vacuum, and the corollary that there must be some medium there, some ether, flourished well into the late nineteenth century. Setting the orthodoxy until that time, Aristotle delivered some fifteen arguments against the existence of void in his fourth century BCE inquiry, *Physics* Book IV, chapters 6-9. In these arguments Aristotle to a great extent errs. One argument, for instance, uses as an absurdity in a *reductio ad absurdum* against the existence of void the fact that bodies would continue infinitely in motion unless impeded. We know now that this is not absurd but Newton's First Law. Arguments like these led the history of science astray. Yet not all of Aristotle's arguments against the existence of void are at odds with our current perceptions. Aristotle for instance raises the arbitrariness of motion beginning within a true void. And such *a priori* puzzles still give us pause. We wonder today, did everything really come from nothing? If so, why *then*? And why did everything come about in the particular way it did, rather than some other way? As it turns out, recent discoveries in quantum physics have moved us towards the view that a space absolutely devoid of (what we call) energy does not exist. Rather, the quantum vacuum is a reserve of constantly fluctuating energy, offering up the particles to be materialized into the physical forms we see around us. Everything did not come from nothing, after all.

Aristotle poses his arguments against the existence of void in the latter two chapters of his inquiry, chapters 8-9. Before doing so, however, he sets out to find an answer to what void is—if it exists—in the first two chapters, chapters 6-7. Aristotle finds that void is place deprived of body, if it exists. According to this understanding of void, bodies move and are located in a three-dimensional spatial extension. When that place extension is empty, it is void. In fact, no less

influential in the history of science than Aristotle's arguments against the existence of void was his understanding of just what void is or would be: place or extension deprived of body. When Evangelista Torricelli in 1643 and Blaise Pascal in 1647 created voids, what Torricelli and Pascal took themselves to have created were just what Aristotle said: places or extensions deprived of body. Indeed, in many ways even the contemporary perspective on void, regions of space deprived of as much energy as possible, is a remote descendent of Aristotle's own answer to what void is.

Yet despite the tremendous influence of Aristotle's *Physics* IV 6-9 inquiry on the history of science, there has been no dedicated scholarly treatment of it. While Sir William David Ross and Edward Hussey offer some analyses in their respective *Physics* commentaries, and so too, scholars recruit various bits of *Physics* IV 6-9 as evidence in recurring debates of Aristotelian scholarship, we lack a systematic and dedicated treatment of the inquiry itself. My dissertation seeks to offer this. I look both at what Aristotle thinks void is, if it exists, as well the arguments he uses to prove that such a thing cannot exist. I consider also his lengthy treatment of what his predecessors thought about void in *Physics* IV 6-9. I find that Aristotle's engagement with his predecessors can tell us much about the intellectual and historical context around void at that time.

The dissertation begins in Chapter 1 by addressing two prior, methodological questions. (1) How can Aristotle even say what void is, given that he does not think void exists? Only existent items have essences and definitions according to Aristotle, so void does not have an essence or definition to discover. Nor could any candidate account of void be more explanatory of the physical world than any other, as, say, an account of place could be more so than another, since void explains nothing. The inquiry on void is an outlier in Aristotle's *Physics.* It is the only case where Aristotle's subject matter is something he claims does not exist. Yet he spends just as much time

getting clear about this subject matter. But on what basis can Aristotle find an answer to what void is? What could justify a correct answer? Why should any one answer be better than another?

And (2), I ask how Aristotle could prove by demonstration that void does not exist, given that Aristotle's logic can use only non-empty terms, i.e., terms that signify an existent, yet 'void' would be an empty term. That is, terms in an Aristotelian demonstration entail the existence of what they signify. Even to affirm the universal negative proposition, "no places are voids," is to affirm the existence of voids (and places). For, according to Aristotle, universal negative propositions can convert the terms in their subject and predicate positions, so, the universal claim that no places are voids entails that no voids are places. And because the universal negative for Aristotle implies its subaltern, the particular negative, it implies that some void is not a place. That is, there is something that is a void but not a place—$\exists x\,(Ax \,\&\, \neg Bx)$—i.e., something that is a void. In this way the terms of Aristotle's logic must signify an existent, yet "void" would not signify an existent. How, then, could Aristotle demonstrate the nonexistence of void?

Aristotelian scholarship has not offered treatments of how Aristotle could by his own lights say what a nonexistent is nor how he could demonstrate a negative existential claim. My Chapter 1 does both. By examining what Aristotle actually does in *Physics* IV 6-9, I show that Aristotle has a considered method for proving nonexistence that is a counterpart of his method for proving existence he prescribes in *Posterior Analytics* II 1-2. I find that Aristotle has certain grounds for saying what a nonexistent thing like void is, if it exists, in order to show that such a thing cannot exist. And I further find that Aristotle can demonstrate the nonexistence of something using his own logic without violating the existence entailments of that logic.

In Chapter 2 I turn to an examination of Aristotle's answer itself: what does Aristotle think void is, if it exists? Aristotle declares at *Physics* IV 7, 214a16-17, "void, if it exists, is place

deprived of body." What is *this*, place deprived of body? I find that the account of place relevant in Aristotle's quasi-definition is not Aristotle's own account of place, according to which the place of some body x is the two-dimensional inner outline of the body that surrounds x. Rather, the account of place relevant in an understanding of void is one according to which the place of some body x is a non-bodily, three-dimensional extension coexistent with x. I offer a treatment of this account of place. According to this account, the non-bodily place extension is without resistance and is 'neutral,' neither affecting nor affected by the bodies passing through it. I find that this understanding of place enjoyed considerable popularity not only at the time of Aristotle's writing in ancient Greece but in the ancient Buddhist and Jain traditions of the Indian subcontinent as well. Indeed, I show that it maintained popularity in Europe through to the 17th and 18th centuries, with at least Gassendi, Locke, and Newton all appealing to this same idea of place. I suggest that this sort of place, which I call common-sense space, holds an intuitive grasp on us.

Upon finding that Aristotle appeals to this common-sense space in his account of void as place deprived of body, I then address an interpretive issue. Namely, Aristotle will in the course of his arguments against the existence of void address two apparently different sorts of entity, what he calls a "separated void" and an "inseparable void." It is an issue unsolved by commentators how these sorts of void differ, while each being places deprived of body. I attempt to resolve this issue. I show that the inseparable voids are empty extensions tethered to and dependent upon particular bodies, e.g., a jug's empty extension between its inner walls. The inseparable extension can receive bodies and serve as place for them, e.g., the extension between the walls of the jug can receive water or air, yet it is itself tethered to a body. The extension is a place in virtue of its relationship to the vessel to which it is tethered. The separated extension, in contrast, is a universe-spanning extension tethered to no bodies. It is the extension within which all bodies move. Here,

unlike with the inseparable voids, the extension counts as place not in virtue of an ontological relation it bears to some particular bodily vessel, e.g., a jug. Rather, the extension is place simply in virtue of its being just that: an extension that can be occupied by bodies. In offering my interpretation of the separated and inseparable voids, I thus show that Aristotle consistently retains the same account of what void is, if it exists, throughout *Physics* IV 6-9.

In my Chapter 3, I address Aristotle's lengthy treatment of what his predecessors had to say about void in the first two chapters of his inquiry, chapters 6-7. Aristotle's engagement with the proponents of the existence of void in particular is extensive. Seeking to do justice to the void they bore in mind, he considers at length what they have said about it. They make several claims that support the existence of void. Aristotle lays out their claims at *Physics* IV 6, 213b2-29. After arriving at his answer to what void is, if it exists, which he takes to do justice to the void they bore in mind, Aristotle revisits their claims at *Physics* IV 7, 214a16-b11. He shows that the claims do not in fact support the existence of the void to which their proponents are committed.

Aristotle focuses on three main claims by proponents of the existence of void. Each concerns a different physical phenomenon. The proponents explain the phenomena by appealing to the existence of void. In each of Aristotle's responses, he offers an alternative explanation, which does not appeal to void. The first claim concerns locomotion. When a body travels or grows, there must be an empty space available to receive it. For if everywhere were full, there would be nowhere for bodies to go, since a body cannot move into a space already occupied. The second claim concerns the ability of a body to shrink in volume. Proponents of the existence of void claim that wine is able to shrink in a cask to accommodate the addition of skins by retreating into its own preexistent voids. Finally, the third claim concerns nutrition. Proponents claim that nutrition is possible because there are void spaces preexistent in our bodies into which food can go. This must

be the case, they say, since otherwise there would be no room for food in our bodies, and nutrition would be impossible. In my Chapter 3 I examine each of these three phenomena in detail, analyzing both the proponents' explanations appealing to void as well as Aristotle's own explanations for these phenomena. I thus consider how Aristotle believes that locomotion, shrinking in volume, and nutrition can occur in a plenum.

I then develop an upshot of my analysis of the proponents' claims. The orthodox scholarly view of *Physics* IV 6, 213b2-29, maintains that the three claims Aristotle lays out there were arguments for the existence of void offered by the atomists.[1] Against the scholarly view, I argue that they were not intended to be arguments for the existence of void but rather were explanations of notoriously problematic physical phenomena. The explanations presupposed void, which was assumed. I argue that the reason Aristotle does not cite any atomist arguments for the existence of void is likely because the atomists never gave any such arguments. Indeed I give reasons for thinking that the atomists would not have been inclined to argue for void.

At this point in the dissertation, I will have discussed major methodological questions that confront Aristotle when undertaking his *Physics* IV 6-9 inquiry on void. I will also have discussed Aristotle's answer to what void is, if it exists, showing how he conceives of place deprived of body. I will then have discussed Aristotle's extended treatment of his predecessors, drawing out its implications for what we can infer about the historical and intellectual context around void at Aristotle's time. I will not yet however have examined any of Aristotle's actual arguments against the existence of void. The final chapter of the dissertation, Chapter 4, is then dedicated to this.

Aristotle offers some fifteen unique arguments against the existence of void. Unfortunately, it is outside the space constraints of this dissertation to do justice to each. Instead, I will consider

[1] See for instance Ross (1936), Hussey (1983), and Laks & Most (2016).

the most complex of these arguments. While this argument is the most difficult, it may also be that which Aristotle considered his most important, as he concludes his refutation against the separated void with this argument. The argument occurs at *Physics* IV 8, 216a26–b20 and centers on a wooden cube placed in the void. I offer a reconstruction of this argument.

I find that the entire argument is a *reductio ad absurdum* against the existence of void. Aristotle spends the first half setting up a scenario, in which he supposes that void exists and draws out some initial consequences of this supposition. The scenario focuses on a wooden cube placed in the void. Aristotle finds that the cube's magnitude will have the same relative position as the bit of void and place it occupies and be equal in extent to that bit of void and place. He notes, further, that the cube's magnitude and the void extension are both strictly attribute-less. So, both are 'bare' extension, equal in extent, and share the same relative position. Aristotle then moves to pose a two-horned, logically exhaustive dilemma. Either, p, the cube's magnitude and the equal bit of void and place are distinct entities, or not-p, they are not distinct entities. Because the disjunction is a logical truth, either p or not-p must be true. The argument then runs by showing first that acceptance of p leads to an impossibility, so not-p must be true. Yet, as the argument shows, the required acceptance of not-p involves rejecting the account of place on which the theory of void depends. Thus not-p entails the rejection of void. In this way the argument functions as a *reductio* against the original circumstance of the scenario, the existence of void.

I conclude the dissertation by first summarizing what I take to be its main achievements. I then suggest two possible implications for Aristotle's physical theory that emerge on the basis of the dissertation's analysis, which I have not had space to consider in the body of the dissertation. I outline the sort of further research required to bear them out. The first concerns whether Aristotle considered the interpenetration of three-dimensional extensions to be impossible. Scholars who

take Aristotle to consider such interpenetration impossible use as the primary evidence for their view the 'cube argument' I considered in my Chapter 4. For, they interpret the argument such that it functions by showing that the void theorist is committed to the interpenetration of extension, and because, they say, Aristotle takes such interpenetration to be absurd, showing that the theorist is committed to that absurdity. My analysis of the cube argument, however, revealed no such move on Aristotle's part. One possible implication of the dissertation's work, then, is that Aristotle did not take the interpenetration of three-dimensional extensions to be impossible.

The second implication I suggest in the conclusion concerns whether Aristotle is committed to the conservation of volume. That is to say, the only way to increase a body's volume is to add matter to it, and, if matter is added, the volume must increase proportionally. So too, the only way to decrease a body's volume is for it to lose matter, and if matter is lost, the volume must decrease proportionally. When Aristotle responds to the claims of voids' proponents at *Physics* IV 7, 214a16-b11, his responses and the alternative explanations he offers for the phenomena are suggestive of such a commitment. I propose that Aristotle's treatments at *Physics* IV 7, 214a16-b11 and elsewhere show that he takes volume to be conserved in certain cases. I further propose that his discussions in *Physics* IV 9 and elsewhere show that he takes volume *not* to be conserved in certain other cases. Specifically, I hypothesize, while volume is conserved in cases of non-elemental change, it is not conserved in cases of elemental change.

Chapter 1

Aristotle's Approach to Nonexistence Inquiries[2]

Introduction

Aristotle sets out to prove the nonexistence of void in the fourth book of his *Physics*, chapters 6-9, presenting some fifteen arguments that the existence of void is not only unnecessary for explaining physical phenomena but is impossible. Yet Aristotle does not simply go about straightaway proving void's nonexistence. He takes it to be imperative that he first get clear about what the thing is that he wishes to target—i.e., what void is (τί ἐστιν at 213a14). Aristotle thus spends much of the first two chapters of the inquiry, chapters 6-7, trying to get right what void is, arguing against its existence only afterwards in the second two chapters, 8-9. The first task is critical, Aristotle reckons. For prior to any proof of the nonexistence of something is a getting clear about just what that thing is. Should one fail to grasp what a thing is, attempts to prove its nonexistence cannot get off the ground as proofs of *its* nonexistence. Specifically, in the case of void, should someone who seeks to prove the nonexistence of void fail to grasp correctly what void is, and so fail to train her sights on the right thing, no proof about *void* could follow. Aristotle sees the project of arriving at the correct answer to what void is to be prior to a proof of void's nonexistence. Because Aristotle apparently takes himself to answer what void is successfully, calling it "place deprived of body" (214a16-17), he presumably takes the following to be true:

The What-it-is Dilemma—Horn 1: There are grounds for a correct answer to what void is

[2] All translations of Greek (and occasionally Sanskrit) are my own.

But if void does not exist anyway, on what basis can Aristotle say in *Physics* IV 6-7 that he has found the correct answer where others get it wrong? Aristotle critiques those who say that void is the formless matter in things for getting what void is wrong, insisting that they 'do not speak well' about void. But if there is no void, then what exactly is Aristotle's charge against them? He cannot complain that they fail to refer to an actually existent object, void. For by his own lights neither does he. Moreover, the standard for speaking correctly about void must differ from that for speaking correctly about, say, place, which Aristotle believes exists as a feature of the physical world. We test a theory of place by seeing whether it explains accepted facts about the world, whether it solves apparent problems in phenomena we see, and so on. If one theory of place better explains accepted facts than another, it is the better theory. Aristotle for instance rejects a theory of place according to which the place of a thing is that thing's own outline. This is because, he says, place must be separable from the thing of which it is the place. For, if a thing's place is its own outline, then the thing would always take its place with it, so to speak. Yet we already accept that locomotion occurs, i.e., things change their place. Because this theory cannot explain locomotion, it is a worse theory of place than one that otherwise does. But Aristotle can compare no two theories of void like this. Not being something that exists, void can explain nothing about the physical world. No account of void can be better than another in the way that an account of place may be. Without justification for the superiority of any one answer to what void is, Aristotle seems committed to:

The What-it-is Dilemma—Horn 2: There are no grounds for a correct answer to what void is

When Aristotle for instance critiques those thinkers who say that void just is matter, what is it he takes to be their mistake? He can neither say that their void is insufficiently explanatory of the

physical world, nor that they have produced the wrong essence of void. And yet Aristotle apparently takes *himself* to have successfully determined what the nonexistent void is. He must then have some answer to this question: just what is it that grounds a nonexistent object being the way it is? Scholarship has grappled extensively with Aristotle's approach to answering the what-it-is question. It has less often asked what it would mean for Aristotle to do the same, or something much like the same, for nonexistent items like void.[3]

The puzzle cannot be preempted by making the exercise for nonexistent entities entirely a matter of words and meaning. It is not true to say that Aristotle is only interested in the meaning of the word, "void," such that an inquiry into what void is *just is* a semantical inquiry into what the word means. A quick glance at *Physics* IV 6-7 shows as much; that Aristotle adds the qualification "if it exists" (εἰ ἔστιν) when declaring what void is at 214a16-17 is by itself enough to cue us in that he is talking about the purported thing, not the word.[4] Aristotle's inquiry is a metaphysical one that seeks clarification on a supposed worldly object.

Once Aristotle gets clear about void, finding it to be "place deprived of body," he militates some fifteen arguments against its existence. He takes his arguments to be successful, resolving at 216b20-21, "So then, it is clear from these arguments that there is no…void" (Ὅτι μὲν τοίνυν οὐκ ἔστι…κενόν, ἐκ τούτων ἐστὶ δῆλον). Aristotle has shown, he thinks, that void does not exist. On

[3] Scholarly treatments of how Aristotle can settle on what a nonexistent is or would be tend to be confined to debates about nominal definitions—what nominal definitions are and whether they can be had by nonexistents according to Aristotle. The scholarly consensus, Bolton (1976), Demoss and Devereux (1988), seems to be that nonexistents cannot have nominal definitions. Meanwhile, there are ample studies on Aristotle's approach to answering the what-it-is question for existents. See e.g., Meister (2021), Henry (2021), Falcon (2019), Gómez-Lobo (2018), Witt (2018), Gelber (2015), Sedley (2015), Rosen (2014), Peramatzis (2014), Gotthelf (2012), Devereux (2011, 1981), Charles (2010, 2000), Schiaparelli (2011), Gill (2010), Chiba (2010), Pellegrin (2010), Code (2010, 1986, 1985), Lennox (2010), Modrak (2010, 2001), Deslauriers (2007), Bernardete (1993).

[4] This is not to say that what the word "void" means will play *no* role in the inquiry. But importantly its role is limited to its ability to aid in the metaphysical inquiry. I discuss the role of the semantical question and the relation it bears to the metaphysical inquiry below in my section 4.2.

the presumption that Aristotle is doing science in *Physics* IV 6-9, where science according to Aristotle can be expressed using demonstration, Aristotle seems committed to the following: [5]

The Demonstration Dilemma—Horn 1: We can prove by demonstration the nonexistence of void

To say that the nonexistence of void is demonstrable is presumably to say both that there could be some demonstration that proves the nonexistence of void and that void would be a term in that demonstration. But Aristotle does not think that void exists. Like the terms 'goat-stag' and 'Santa Claus,' void is an empty term. It fails to signify an existent. And it is the dominant scholarly position that Aristotle's quantified predicative logic does not employ empty terms.[6] No genuine demonstration can feature 'void' as a term. After all, consider that each claim in Aristotle famous square of opposition entails the existence of what its terms signify. Even to assert the 'e' claim, "no places are voids," is to affirm the existence of voids. For, since universal negative propositions can convert the terms in their subject and predicate positions, the universal claim that no places are voids entails that no voids are places. And because the universal negative for Aristotle implies

[5] One may object that we should not think that Aristotle needs to prove by demonstration the nonexistence of void in *Physics* IV 6-9. The objector would take as her motivation the view that the inquiries of *Physics* II-IV are not meant to be doing full-fledged science, and so their reasoning need not be expressible in demonstration. Rather, the objection goes, the inquiries of *Physics* II-IV are mere "παίδεια" or concept-building. It is only later, perhaps in *Physics* V-VIII, that Aristotle does full-fledged science. I thank Marko Malink for raising this objection. I do not however find the view that *Physics* II-IV is mere παίδεια compelling. While I do not have space to argue this point at length, I will mention that Aristotle in *Physics* VIII 253b8 and elsewhere makes back-reference to the account of change he gave *Physics* III as occurring ἐν τοῖς φυσικοῖς ("in the physical treatises"), thereby suggesting that in *Physics* III he sees himself as doing genuine science and so should be demonstrating, contrary to my objector's interpretation. So too, Aristotle in *Physics* VIII 253b7-10 refers back to his account of nature as a principle of motion at the start of *Physics* II as occurring ἐν τοῖς φυσικοῖς. Cf. also *Physics* VIII 257a22-b2 and 267b20-22.

[6] For an articulation of the dominant view, see Smith (2022) in his Stanford Encyclopedia of Philosophy entry, "Aristotle's Logic." For scholars who reject the dominant view, see Read (2015), Striker (2009), Wedin (1990), and Thompson (1953).

its subaltern, the particular negative, it implies that some void is not a place,[7] in other words, that there is something that is a void but not a place—∃x (Ax & ¬Bx)[8]—and so, that something is a void. There has been lots of scholarly discussion on existential import in Aristotle's logic.[9] There has been less, but nevertheless some very helpful discussion, about how to accommodate empty terms on Aristotle's picture.[10] These helpful discussions however do not go so far as to explain how Aristotle can demonstrate nonexistence.[11] Yet if Aristotle cannot offer a demonstration that uses void as a term, it seems that Aristotle may be forced to accept:

The Demonstration Dilemma—Horn 2: We cannot prove by demonstration the nonexistence of void

In this chapter I will offer an analysis of *Physics* IV 6-9. I will examine what Aristotle does in *Physics* IV 6-9. I will find Aristotle's solutions to what I have called the *Demonstration Dilemma* and the *What-it-is Dilemma*.

Before turning to *Physics* IV 6-9, however, I begin by appealing to evidence from the *Posterior Analytics*. I will show (as others have done in varying ways)[12] that Aristotle there outlines a systematic method for proving existence. I will then show (as no others have done) that Aristotle implements a counterpart of this method, parallel in structure yet adapted for proving

[7] Aristotle is not as explicit as we would like about subalternation, suggesting it only at *Top*. 2.1, 109a1–6. Yet it is clear that he is committed to it: AaB implies AiB, and so the negation of AiB (AeB) must imply the negation of AaB (AoB).
[8] Of course, formulations like ∃x (Ax & ¬Bx) are not Aristotelian. Indeed, there is reason to think Aristotle did not have a strictly formal language at all. On this cf. Morison (2011).
[9] See e.g., Strößner (2020), Corkum (2018), Read (2015), Seuren (2010), Mignucci (2007), Martin (2004), Crivelli (2001, 2004), Modrak (2010), Vilkko & Hintikka (2006), Charles (2000), Carson (2000), Hintikka & Halonen (2000), Wedin (1978, 1990), DeMoss & Devereux (1988), Bolton (1976), Smiley (1962, 1973), Patzig (1968), Kneale & Kneale (1962), Thompson (1953), Lukasiewicz (1951).
[10] See for instance Read (2015) Crivelli (2001, 2004), and Charles (2000).
[11] Crivelli (2001, 2004) and Charles (2000, ch. 4.3) in their discussions of empty names get me close to the solution I ultimately find in *Physics* IV 6-9. I return to their treatments below.
[12] See e.g., Lennox (2021), Bronstein (2016), Charles (2000), Goldin (1996), Barnes (1994), Ross (1949).

*non*existence, in his *Physics* IV 6-9. It is within the structure of this counterpart inquiry that the two dilemmas I mentioned above reveal themselves—and are solved.

The chapter's takeaway will be threefold: (i) Aristotle has a method for conducting a *non*existence inquiry parallel to his *Posterior Analytics* method for conducting an existence inquiry; (ii) Aristotle has certain considered grounds for answering what a nonexistent item like void is or would be; and (iii) Aristotle can prove the nonexistence of something by demonstration without violating the existence entailments of his logic.

1. The structure of existence inquiries

Before turning to Aristotle's inquiry on void in *Physics* IV 6-9, I will begin by outlining Aristotle's considered, systematic approach to proving that something *does* exist, which he puts forward in his *Posterior Analytics*. While Aristotle in the void inquiry is aiming to show that something does not exist, I will show that he carries out the void inquiry with an eye to the positive case in the *Posterior Analytics*. Indeed, I will show that in the void inquiry Aristotle follows a counterpart of the roadmap for proving existence that he offers in *Posterior Analytics.*

In his *Posterior Analytics* ('*APo.*'), Aristotle lays out what he takes to be the principles of scientific inquiry. He offers his roadmap for proving existence in the amply discussed chapters one and two of *APo.* Book II. There Aristotle begins by outlining four questions we may ask when inquiring. I paraphrase the questions at 89b24-25 as:

(1) whether an x is F (where 'F' is some predicate or other) (τὸ ὅτι)
(2) the reason why a subject is F (τὸ διότι)
(3) whether a subject exists (εἰ ἔστι)

and

(4) what a subject is (τί ἐστι).

Aristotle discusses together the first and second questions, whether x is F and why x is F. He then discusses together the third and fourth, whether x exists and what x is. He says that we treat the first two questions "in one way," while we treat the second two "in another way." He discusses the third and fourth together at 89b31-35, writing,

> [T1] While we seek these [Questions 1 and 2] in one way, we seek the others [Questions 3 and 4] in another way, e.g., whether god or the centaur is or not. I mean whether it is or not *simpliciter*, not whether it is white or not—and upon grasping that it is, we seek what it is (γνόντες δὲ ὅτι ἔστι, τί ἐστι ζητοῦμεν), e.g., so, what is god? Or what is a man?
>
> ταῦτα μὲν οὖν οὕτως, ἕνια δ᾽ ἄλλον τρόπον ζητοῦμεν, οἷον εἰ ἔστιν ἢ μὴ ἔστι κένταυρος ἢ θεός (τὸ δ᾽ εἰ ἔστιν ἢ μὴ ἁπλῶς λέγω, ἀλλ᾽ οὐκ εἰ λευκὸς ἢ μή)· γνόντες δὲ ὅτι ἔστι, τί ἐστι ζητοῦμεν, οἷον τί οὖν ἐστι θεός, ἢ τί ἐστιν ἄνθρωπος;

In T1 Aristotle describes an inquiry in which we ask whether some thing exists.[13] He clarifies that he is not asking whether or not the subject is some F, e.g., whether it is white. Rather, he is asking whether or not it is *simpliciter*, i.e., whether it exists. Aristotle then notes that, upon grasping (γνόντες) that it exists, we next seek *what* it is. Note Aristotle's use of the Greek *gnôsis,* "grasp." *Gnôsis*' is veridical in Aristotle's usage—we have *gnôsis* of truths. It is generic for "knowledge." Note that here Aristotle does not use the stronger term, *epistêmê*, or "understanding." In order for an inquirer to have *epistêmê* of something, she must grasp the explanation for that something.[14] You may know the fact that, say, moons are eclipsed, but if you do not know the explanation for why moons are eclipsed (i.e., they are deprived of light due to screening of a heavenly body) you

[13] It is controversial whether Aristotle means for the subject in questions (3) and (4) to include substances or only ontologically derivative things, like eclipses. Ross (1949, 76) and Tredennick & Forster (1960, 11-12) think the latter. Barnes (1994, 206) disagrees. Gómez-Lobo (1980), for his part, tries to reinterpret the "εἰ ἔστι" question in a non-existential way. He claims (81-2) that rather than contrasting an existential question (question 3) with a predicative (question 1) in *APo.* II 1-2, Aristotle is "inviting us to distinguish between asking whether something is a centaur or a god (or a man 89b35) [question 3] and asking whether the identified individual is pale or not [question 1]." There are good reasons for rejecting this move by Gómez-Lobo, however. In any case, since void would not be a substance, I do not need to take a position on the debate between Barnes, on the one hand, and Ross and Tredennick & Forster, on the other.

[14] *APo.* I 2, 71b9-12.

do not have understanding (*epistêmê*).[15] That is, in T1 having a *gnôsis* that the subject exists is having a *mere gnôsis* that the subject exists.[16] And, as T1 indicates, it is upon having this mere *gnôsis* that the subject exists that the inquirer asks what it is.

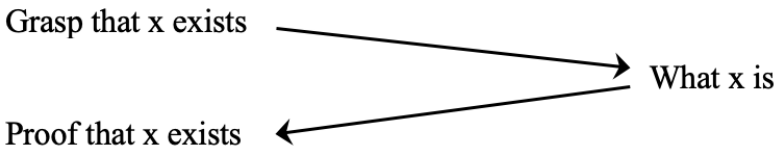
This is not the end of the inquiry, nor is it the end of Aristotle's exposition. In T1 the inquirer has not *proven* the thing's existence, having instead a mere grasp that it exists, nor has Aristotle yet explained in his exposition why we should seek what the thing is upon having a grasp that it exists. What do these questions, 'whether it exists' and 'what it is,' have to do with one another? He explains further at 89b38-90a1:

> [T2] Whenever we seek the fact or if it is *simpliciter*, we seek whether there is or is not a middle term of it (μέσον αὐτοῦ), and when we have grasped the fact [Q1] or whether it is [Q3], i.e., partly or *simpliciter*, next we seek the reason why [Q2] or what it is [Q4], thereby seeking what the middle term is.
>
> ζητοῦμεν δέ, ὅταν μὲν ζητῶμεν τὸ ὅτι ἢ τὸ εἰ ἔστιν ἁπλῶς, ἆρ᾽ ἔστι μέσον αὐτοῦ ἢ οὐκ ἔστιν· ὅταν δὲ γνόντες ἢ τὸ ὅτι ἢ εἰ ἔστιν, ἢ τὸ ἐπὶ μέρους ἢ τὸ ἁπλῶς, πάλιν τὸ διὰ τί ζητῶμεν ἢ τὸ τί ἐστι, τότε ζητοῦμεν τί τὸ μέσον.

T2 indicates a second part of the inquiry going back the other direction. Whereas we have already heard that the inquirer moves from grasping that the thing exists to seeking what it is, here in T2 we learn that her answer to what it is becomes the explanatory middle term in the subsequent demonstration that it exists. (So also for the other set of questions: the answer to why x is F is the middle term she uses to prove that x is F).[17] So, T2 reveals that we prove by demonstration whether a thing exists using our answer to what it is, which is the explanatory middle term in the

[15] On *epistêmê*, see e.g., Bronstein (2016), Lorenz (2013), Barnes (1994), and Burnyeat (1981).
[16] Cf. also Bronstein (2016, 77ff), who makes this point about *gnôsis* versus *epistêmê* in *APo* II 1-2. I thank Benjamin Morison for calling my attention to this feature of *APo* II 1-2.
[17] It is a question how the inquirer can know in the first place what sort of facts (*to hoti*) are good candidates, for having a middle term in this way. The *to hoti* could not be principles, for instance, since principles lack a middle term. How should the inquirer know in the first place not to inquire in this way after things that are principles? I thank Marko Malink for raising this problem in an NYU reading group. My analysis does not turn on any particular resolution to this problem.

demonstration of its existence. Upon proving that it exists, we have *epistêmê* (not mere *gnôsis*) that it exists. And, as shown in T1, we arrived at our answer to what the thing is in the first place on the basis of our mere *gnôsis* that it exists. The whole inquiry may be sketched:



The shape of this inquiry bears a racecourse structure containing two routes—it goes towards a point and then back again.[18] Note that this observation that there are in fact two separate routes in the *APo.* II 1-2 inquiry is not already well established in the literature. Lennox (2021, 17) for instance does not see that there are two routes to the inquiry. Because he misses this point, he conflates the two and writes, "the message of APo ii.1 is that you can know (and the verb is ἐπίστασθαι) that the moon is in eclipse, or that elephants exist, prior to going on to inquire about the causes of eclipses or the nature of elephants." But once we recognize the twofold route structure and that it is *gnôsis*, not *epistêmê,* that is used in the first route, we see that it is certainly *not* the case that Aristotle thinks we can understand (*epistasthai*) the answer to the existential question before answering the what-it-is question.[19]

It is clear that this inquiry belongs to the sort of inquiries that Aristotle likens to racecourses (*EN* 1095a35) and discusses often.[20] He describes these inquiries as starting with "what is more familiar to us" and then proceeding to what is "more familiar by nature." Then, upon reaching

[18] I thank Benjamin Morison for our lengthy discussions about the inquiry's twofold route structure.
[19] Cf. also Bolton (2018), who appears to miss the twofold route structure, and therefore puzzles about the fact that "Aristotle can seem to say that we can already have non-accidental knowledge of the existence of eclipses and still be searching for whether (πότερον) they exist."
[20] Cf. *Physics,* 184a16-21, *APo*., 71b33-72a.

what is more familiar by nature, the inquirer returns back to what is more familiar to us with understanding of it, since what is more familiar by nature explains what is more familiar to us.

It is easy to see how this racecourse structure fits the existence inquiry laid out in *APo* II, 1-2. Take the case of whether thunder exists.[21] The inquirer first has a grasp (*gnôsis*) that something out there exists that she calls "thunder," which she apprehends as some noise in the clouds.[22] Then, as the *APo.* story prescribes, she reflects on this grasp that thunder exists and what she already takes for granted about thunder, say, that it occurs amidst storm clouds; that it is often accompanied by flashes of light. This gives hints about what thunder would have to be if it is to explain the facts that she takes for granted. In this way she uses her initial *gnôsis* that thunder exists to get at the definition of thunder. She thus arrives at her answer: the extinction of fire. Now, when *proving* that thunder exists, it is this answer that serves as the middle term and explanation in the proof by demonstration. She then proves by demonstration the existence of thunder with the Barbara syllogism:[23]

P1. Thunder holds of extinction of fire	(AaB)
<u>P2. Extinction of fire</u> holds of clouds	(BaC)
C. Thunder holds of clouds	(AaC)

[21] See the Aristotelian examples of eclipse and thunder at *APo.* II 8, 93a21-b14.

[22] Cf. Charles (2000, 37-39), Bolton (1976, 521-533; 2018, throughout), and DeMoss & Devereux (133-154), for more on the connection between her grasp that thunder exists and her "apprehension of something of the thing" (ἔχοντές τι αὐτοῦ τοῦ πράγματος at 93a22), i.e., that thunder is some noise in the clouds. Ross (1949, 635), Bolton (1976), and DeMoss & Devereux call "some noise in the clouds" the 'nominal definition' of thunder. All of these scholars note what Charles (2000) and Bolton (2018) call a "three-stage view" of Aristotle's inquiry towards the essence of thunder (the third stage), the first and second stages of which are the grasp that "thunder" signifies noise in the clouds and the grasp of its existence, respectively. Bolton (2018) critiques the three-stage view as an interpretation of *APo.* II 1-2. I remain neutral on whether the three-stage view is a correct interpretation of *APo*. II 1-2, since the parallel that I find between the APo. existence inquiry and the *Physics* IV 6-9 nonexistence inquiry does not turn on *APo*. II 1-2 being understood in this way.

[23] For this syllogism, again see *APo.* II 8, 93a21-b14.

Here, the answer to what thunder is, extinction of fire, is used to prove that thunder holds of clouds—that is, thunder takes place in clouds, or in other words, thunder exists.[24] It is in virtue of the fact that extinction of fire holds of clouds that thunder holds of clouds. In this way, she proves in the return route that thunder exists using the answer to what thunder is—an answer that she obtained in the first place using her initial grasp that thunder exists in the outbound route.

2. The parallel structure of nonexistence inquiries

So much, then, for the broad structure of the roadmap for proving existence that Aristotle outlines in the *Posterior Analytics*. Now, I have promised that Aristotle will use a counterpart of this roadmap in his approach to the *non*existence of void in *Physics* IV 6-9. To begin to make my case for this claim, I wish to turn to the plan Aristotle outlines at the start of his void inquiry in *Physics* IV 6. Aristotle writes at 213a12-14, "Just as with place, it is left to the natural philosopher to consider void, whether it is or not, how it is, and what it is." So, the natural philosopher must examine three things concerning void:

[24] It is true that Aristotle does not explicitly call 93a21-b14 a demonstration of thunder's *existence*, but consideration of the context of *APo.* II 8, as well as the demonstration itself, make it clear that that it is a demonstration of existence. Having just found that it is impossible to demonstrate what something is, in *APo.* II 8 Aristotle sets out to show in what way demonstration *is* related to what something is (ὃν δὲ τρόπον ἐνδέχεται λέγωμεν, εἰπόντες πάλιν ἐξ ἀρχῆ at 93a17). He begins by reminding his audience about his position in *APo.* II 1-2 that to know what a thing is is to know the cause of its existence (Ἐπεὶ δ' ἐστίν, ὡς ἔφαμεν, ταὐτὸν τὸ εἰδέναι τί ἐστι καὶ τὸ εἰδέναι τὸ αἴτιον τοῦ εἰ ἔστι at 93a5). He then asks how we go about getting our answer to what the thing is in the first place. He finds that we do so by first "grasping something of the thing" (καθ' ὅσων δ' ἔχομέν τι at 93a28). Once we grasp something of the thing, we can arrive at our answer to what the thing is. That answer, Aristotle tells us, is *used* as the middle term in a demonstration. It is at this point in *APo.* II 8 that Aristotle offers the thunder proof above as an example. And, as we know, and as Aristotle reminded us at the start of *APo.* II 8, it is precisely in a demonstration of a thing's *existence* that the answer to what it is serves as the middle term. We should think, then, that the thunder demonstration in *APo.* II 8 is indeed a demonstration of existence (or at least a demonstration of the fact, τὸ ὅτι, which at this stage in *APo.* II Aristotle treats interchangeably with a proof of existence). So, although Aristotle does not flag that the thunder demonstration is a demonstration of existence (or of the fact)—after all that is not the point of II 8, rather the point is to show how demonstration can relate to what a thing is—it is nevertheless clear that it is an existence demonstration. I thank Jessica Moss for raising this concern about *APo.* II 8.

(a) whether or not void is (εἰ ἔστιν ἢ μή)
(b) how void is (καὶ πῶς)

and

(c) what void is (τί ἐστιν)

To someone who had not seen the existence roadmap of *Posterior Analytics* II 1-2 or appropriately distinguished its twofold route structure, the order of these steps would be surprising.[25] After all, as the *Physics* IV 6-9 inquiry unfolds, Aristotle gets clear about what void is *before* showing whether or not it exists. He seeks clarity on what void is in the inquiry's first two chapters, six and seven, and then argues against the existence of void (understood according to the result of chapters six and seven), in the next two chapters, eight and nine. Someone confronting the plan might wonder to herself—why does the order seemingly have it exactly backwards? We have independent reason for thinking that the order is no accident, as Aristotle offers his plan for the place treatise at *Physics* IV 1, 208a27-29, in this very order.[26]

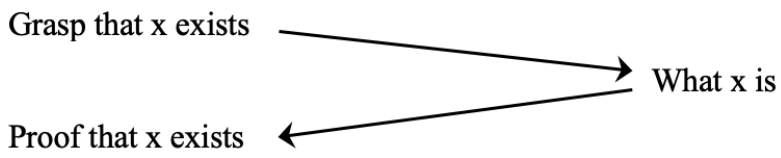
The trick is to see that Aristotle is simply reciting the outbound route of the *Posterior Analytics* roadmap. Once we see this, the plan's order and the moves of the void inquiry that follow become transparent. During the first two chapters of the inquiry, chapters 6-7, Aristotle will move from considerations about void's existence to an answer to what it is, establishing at *Physics* IV 7, 214a16-17 that it is place deprived of body. Or, still more specifically, Aristotle will in chapters 6-7 first move from considerations about void's existence to inferences about "how it is," i.e., what properties and relations void must bear, and in turn from there to his answer to what it is at 214a16-17. It is then only after arriving at his answer to what it is that Aristotle will in the second half, chapters 8-9, prove that void does not exist using that answer, and thereby undertake the return

[25] See for instance Ross (1936, 581), who writes "In the main, Aristotle denies the existence of the void, and καὶ πῶς ἔστι, καὶ τί ἐστιν may therefore excite suspicion." Nevertheless, Ross recognizes, the textual placement of the three questions in this order is confirmed by 208a30, as I note below.
[26] See also *Physics* III, 202b35, in the treatise on the infinite.

journey. So, just as in the *APo.* inquiry, where the critical turning point that enabled the proof of the second half was what the thing is, which itself was arrived at via the first half, so too it is like this in the void inquiry. After achieving his answer, place deprived of body, Aristotle will proceed to target that thing in the arguments that follow. He will show that void does not exist precisely because place deprived of body does not exist.[27] So, following, the roadmap of *APo.* II 1-2, the steps of Aristotle's initial plan at 213a12-14 depict the outbound journey of the void inquiry and state his intentions for the first half of the inquiry, chapters. 6-7.[28]

As I have presented it so far the void case appears to be a straightforward application of the roadmap for existence that *Posterior Analytics* offered. But it must, and will, differ in the details. The void inquiry aims at arguments for *non*existence, and the *APo.* roadmap was intended for existent items. I will spend this chapter resolving hurdles that arise in the outbound and return routes of the *Physics* IV 6-9 counterpart inquiry.

Before proceeding, however, it is necessary to flag one key difference between the *APo.* inquiry and the *Physics* IV 6-9 counterpart inquiry, which is neither wholly a matter of the outbound nor return routes. Recall the structure of the *APo.* inquiry:



[27] Cf. my analysis of the so-called cube argument in my Chapter 4. There, Aristotle will ultimately show the nonexistence of void precisely because he shows the nonexistence of what void is taken to be. I discuss the cube argument as an instance of what I am calling the return journey in the conclusion to this dissertation.

[28] One might maintain that there is still something weird on my attempt to understanding the plan at 213a12-14. Namely, it is weird that Aristotle should only give his plan for the outbound route, rather than lay out his plan for the whole inquiry—outbound *and* return. I just have to accept this weirdness. I thank Ursula Coope for raising this objection with me.

In the *APo.* inquiry, the righthand node, the answer to what x is, is arrived at via the outbound route and in turn enables the argument for existence of the return route. So too, in the counterpart, void inquiry, the righthand node will play this precise role. The answer, place deprived of body, will be arrived at via the outbound route and will in turn enable the argument for nonexistence of the return route. Now, I have been speaking as though the answer, place deprived of body, is an answer to the question, what is void?, such that what is being asked is *what void is* (what x is, as the righthand node above has it). Indeed, this is how Aristotle himself often speaks in the void inquiry. When he sets out his plan at 213a12-14, he seeks 'what void is' (τί ἐστιν), and when he weighs up candidate answers in chapter 7, he considers what void 'seems to be' (δοκεῖ εἶναι).

Yet when Aristotle actually offers his answer, "place deprived of body" at 214a16-17, he speaks more precisely. He writes,

> [T3] Void must, if it exists, be place deprived of body.
>
> τὸ κενὸν ἀνάγκη τόπον εἶναι, εἰ ἔστιν, ἐστερημένον σώματος.

Void must be place deprived of body, *if it exists*.[29] Since void does not exist, void actually has no essence. It is bog-standard Aristotelian doctrine that only existent items have essences. Aristotle cannot by his own lights simply state what void's essence *is.* He cannot offer a definition of void. However*,* because Aristotle wants to make a definition-like claim here, he carefully adds the qualification, *if it exists*.[30] So, the central question is not what void is or what void's essence is but

[29] Hussey (126) in his comments on 214a16 does not flag this qualification and in his paraphrase of 214a16 leaves it out. Ross (1936, 585) includes it in his paraphrase but does not explain its presence.

[30] I will return to the status of this claim in my part 4 (especially 4.3) below. No doubt, there is something a bit funny about asking what something is or what its essence is, *if it exists*. After all, only existent things *are* and have essences—that is, only things in the actual world (i.e., the world as Aristotle conceives it). What could it even mean to ask what something would be, *if* it existed? Aristotle thinks that void does not and indeed cannot exist, so in this case the question has an impossible antecedent. And how can Aristotle

what void's essence is, if void exists. Aristotle will then target the answer to that, place or extension deprived of body, in his arguments against the existence of void.

So too, then, the righthand node of the void inquiry, which Aristotle will arrive at via the outbound route, and which will enable him to prove nonexistence, differs from the *APo.* roadmap in this way. It answers the question, what x is, if x exists.

3. Resolving the *Demonstration Dilemma*

Aristotle finds that if void exists, its essence is place deprived of body—specifically it is place deprived of body where the sort of place relevant is three-dimensional extension. He uses that answer, place or extension deprived of body, to prove the nonexistence of void. His arguments target void understood as place or extension unoccupied by body.

So much, then, is in common with the existence return route of *APo.* II 1-2: namely, in both cases, the answer to what the thing is (if it exists) is appealed to in the subsequent (non)existence arguments. Yet any similarity with the existence return route beyond this becomes much more complicated. For the existence return route can be expressed in a scientific demonstration, yet difficulty abounds when we try to imagine exactly how an attempt to demonstrate the nonexistence of void could go. We will recall from Aristotle's exposition of the *APo.* roadmap that the answer to what the thing is becomes the middle term in a demonstration of its existence. But the void inquiry is not undertaking a demonstration of existence. So, the answer to what void is, if it exists, will of course not be a middle term demonstrating void's existence. That there is no such explanatory middle term in the case of nonexistents is indicated by Aristotle in T2: "Whenever we

say what something is on the basis of an impossible antecedent? What sort of search is that? I return to these questions below in 4.3. I thank Gabriel Shapiro for posing these questions.

seek the fact or if it is *simpliciter*, we seek whether there is or is not a middle term of it."[31] In other words, when we are seeking whether the thing in question exists, we are ultimately seeking whether there is a middle term that will explain its existence, just as we saw in the Barbara syllogism above. But there is no middle term to explain why something exists, since we are not proving existence. What is more, in the nonexistence case, we only answer what the thing is, *if* it exists. Our answer is thus the consequent of a conditional with an impossible antecedent. For this reason, "void is place deprived of body, if it exists" is not a properly scientific proposition. It cannot be a premise in a demonstration in the way, say, "thunder is extinction of fire" can. How then could "void is place deprived of body, if it exists" serve a demonstration at all? [32]

What is more, the term 'void' itself cannot feature in a demonstration proving its nonexistence. Since void does not exist, 'void' will be an empty term within Aristotle's framework—that is, the term 'void' will fail to signify an existent. For the majority of scholars, who regard empty terms as strictly excluded by Aristotle's quantified predicative logic, what to do about empty terms in Aristotle constitutes a problem. Is it simply impossible, then, that Aristotle should ever prove nonexistence by demonstration?[33]

---

[31] Cf. DeMoss and Devereux (139-140), who infer from this quote that there is no answer to the what-it-is question for nonexistents. Strictly speaking this is true—as I noted at the end of the last section, place deprived of body is not an answer to what void is, but rather to what void is, if it exists.

[32] I thank Marko Malink for raising this point.

[33] At this point someone will no doubt interject that part of the reason demonstration appears so tricky is because Aristotle does not think demonstration would be appropriate here—Aristotle has no intention or need to *demonstrate* the nonexistence of void! To support this claim, first, the objector may again raise the view I flagged in my fn. 5 above, namely that Aristotle is not doing scientific reasoning in *Physics* II-IV, but rather mere "παίδεια" or concept-building, and so he is not intent on demonstrating here. I argued against this view in my fn. 5 above. Secondly, someone may raise a different objection that nonexistence simply isn't the sort of thing to be demonstrated. In support of this claim, the objector may note that demonstration is about producing 'the why of things,' i.e., revealing the reasons and explanatory priority that obtain among existent things. So, demonstrations should not take up nonexistents as their objects. But in response to this we should note the following. A syllogism with a universal negative conclusion, Celarent, is included among the syllogisms of the first figure. Aristotle calls the first figure the 'most scientific' (ἐπιστημονικὸν) in *APo.* I 14. He claims that all sciences pursue their demonstrations through it. Presumably, Celarent is included here. And one way of looking at what Celarent does is just to see it as

3.1. The two thunder demonstrations

To begin to see that it is possible, we should first return to the *APo.* existence inquiry and notice that it is not always the case that the existence demonstration features the term corresponding to the thing whose existence is to be shown. When Aristotle presents his existence demonstration for thunder, he in the very same lines gives an alternative gloss to the one I sketched above. Consider the text at *APo.* II 8, 93a29-30…b7-12:

> [T4] So, in cases in which we apprehend something of what the thing is, let it be first like this… What is thunder? Extinction of fire in cloud. Why does it thunder? Because the fire in the cloud is extinguished. Cloud C, thunder A, extinction of fire B. Thus B belongs to C, the cloud, for the fire is extinguished in it; and A, noise, to this; and B is indeed an account of A, the first extreme.
>
> Ὧν οὖν ἔχομέν τι τοῦ τί ἐστιν, ἔστω πρῶτον μὲν ὧδε·… τί ἐστι βροντή; πυρὸς ἀπόσβεσις ἐν νέφει. διὰ τί βροντᾷ; διὰ τὸ ἀποσβέννυσθαι τὸ πῦρ ἐν τῷ νέφει. νέφος Γ, βροντὴ Α, ἀπόσβεσις πυρὸς τὸ Β. τῷ δὴ Γ τῷ νέφει ὑπάρχει τὸ Β, ἀποσβέννυται γὰρ ἐν αὐτῷ τὸ πῦρ· τούτῳ δὲ τὸ Α, ψόφος· καὶ ἔστι γε λόγος τὸ Β τοῦ Α τοῦ πρώτου ἄκρου.

Note that Aristotle in his description of the demonstration offers two alternative A terms. In the one case A is given as 'thunder,' such that thunder holds of clouds in virtue of extinction of fire holding of clouds. This is the version of the existence demonstration I sketched above. But Aristotle considers an alternative A term, noise, such that the syllogism's conclusion has noise, not thunder, holding of clouds. We will recall that it was this, noise in the clouds, that the inquirer

---

proving nonexistence. After all, Celarent shows that one thing, A, does not hold of any of another, C, i.e., there is no C that is A. And while it is true that in *APo.* I 25 Aristotle calls affirmative demonstrations like Barbara better (βελτίων) than negative demonstrations like Celarent, Celarent is apparently still considered a perfectly legitimate demonstration, just as in the preceding chapter, I 24, particular demonstration was considered a perfectly legitimate demonstration, even though Aristotle there claimed that universal is 'more demonstration' (μᾶλλον ἀπόδειξις) and better (βελτίων). What is more, even if Aristotle did mean to rule Celarent out for demonstration, and so restricted himself to Barbara as the sole legitimate mood when demonstrating, nonexistence claims would nevertheless fall out of Barbara's affirmative universal (I thank Benjamin Morison for discussing this alternative with me). That is, when finding by Barbara that A holds of all Cs, it would fall out of this that there is no C that is not-A. I thank Marko Malink for raising this second objection.

first apprehended and that enabled her to get a grasp (*gnôsis*) that thunder exists. Her apprehension offered an initial description of thunder, using which she ultimately reached her answer to what thunder is, extinction of fire. In the alternative syllogism, it is that noise holds of clouds that is proved. The syllogism goes:

P1. Noise holds of extinction of fire	(AaB)
P2. Extinction of fire holds of clouds	(BaC)
C. Noise holds of clouds	(AaC)

She proves that noise holds of clouds (i.e., noise takes place in clouds) by showing that noise holds of extinction of fire and extinction of fire holds of clouds. Because Aristotle takes this to be a demonstration of thunder's existence no less than the alternative version I sketched above,[34] it is clear that he considers proving that the one term of the initial description holds of the other is enough to prove the existence of thunder by demonstration. Or, stated generally, for any x and an inquirer's initial apprehension of x, the inquirer can prove the existence of x by demonstration by showing that the one term in the description corresponding to the initial apprehension holds of the other. The term for the thing itself, in this case 'thunder,' need not feature in the demonstration in order to demonstrate the existence of thunder.

3.2. Empty terms as compounds of non-empty terms

We can take for granted, then, that Aristotle does not consider it necessary that the term corresponding to the thing itself feature in a demonstration of the thing's existence. The initial description of the thing instead offers two terms, where showing that the one holds of the other is enough to get existence. Can something like this happen for void, and for nonexistence

[34] Cf. my fn. 24 above on why we should think it is a demonstration of existence at all.

demonstrations and empty terms generally? That is, can we take our description of void, place or extension deprived of body, as offering additional terms to be used in a demonstration in this way?

Aristotle's treatment of empty terms elsewhere suggests that we should anticipate exactly this. Aristotle elsewhere solves hard cases with empty terms by making important use of what the corresponding thing is meant to be (or what the term stands in for)—where the answer to what it is meant to be or what the term stands in for offers up two or more *non-empty* terms, which in turn enable the original empty term to become analyzable in the desired way. Paolo Crivelli (2001, 2004) and David Charles (2000) discuss such hard cases. Their interpretations will be instrumental for my aims.

Crivelli is concerned that utterances whose would-be subject or predicate is empty constitute a problem for Aristotle's quantified predicative logic. In particular he has in mind two hard cases. First, he worries whether such utterances may count as quantified predicative assertions, and so face a problem given the existential import of such assertions. Second, he considers whether utterances with empty terms have truth value. To approach these cases, Crivelli appeals to Aristotle's example of the term, 'cloak,' in *De Interpretatione* 8, 18a13–27, where Aristotle tells us that 'cloak' stands for horse-and-man. 'Cloak' is empty because, as Aristotle says, it stands for "two which do not make up a single one" (18a18)—horse-and-man is an arbitrary unity and is not an object. Crivelli maintains that the utterance 'A cloak is white' is not a genuine predicative assertion but rather the composite assertion: 'A horse is white and a man is white.' Because it is a composite assertion, and the assertions of Aristotle's quantified predicative logic are non-composite, the presence of an empty term in the utterance is no problem for Aristotle's

quantified predicative logic. For such an utterance would not belong to that class of quantified predicative assertions anyway.[35]

This brings Crivelli also to the answer to his question concerning truth value. Crivelli finds that, because the utterance with the empty term is a composite assertion—that is, because we can break down the empty term into a combination of non-empty terms, where utterances with *those* terms straightforwardly have truth value, the utterance with the empty term will have truth value on that basis. So, Crivelli finds, 'A cloak is white' is true just in case 'A horse is white' is true and 'A man is white' is true.[36]

For my purposes, the upshot of Crivelli's analysis is this: Aristotle takes an empty term to be or stand in for a collection of terms, where *those* terms in the collection are each non-empty. It is because those terms are non-empty that the original empty term can be made analyzable in the right way. Exactly this move occurs in David Charles's analysis of a different hard case in Aristotle: whether and how empty terms signify anything—in other words, how can empty terms have meaning?[37] Charles interprets Aristotle on signification, such that a name gets its signification

[35] Crivelli is ambivalent about whether his analysis of the 'cloak' case generalizes to all empty terms. He often speaks as though it does, writing, "As for those utterances that seem counter-examples to the laws of the Square of Opposition, they are not real counter-examples. Despite appearances, they are not quantified predicative assertions. They are assertions, and as such are truth-evaluable, but they are composite assertion" (2004, 175-6). Yet when he explicitly addresses generalization, he speaks more reservedly, "Aristotle does not show how every utterance which appears to be a predicative assertion involving an 'empty' name can be analysed as a composite assertion. In fact, had he tried to do this, he would have encountered challenging, perhaps insurmountable, difficulties" (2004, 175). Anyway, it is not necessary for my purposes that Crivelli's analysis works for every case. What I want to extract his analysis is merely the fact that Aristotle has a tendency to treat empty terms in this way.

[36] Crivelli therefore finds that such composite assertions do not follow Aristotle's rule of contradictories, where one contradictory must always be true and the other false. For, Crivelli finds, "A cloak is white" and "A cloak is not white" can both be false in the case where every horse is white and no man is (2004, 174). Again, this is no problem for Aristotle, Crivelli figures, since the rule of contradictories is only meant to apply to quantified predicative assertions, and composite assertions are no such thing.

[37] Through he is interested in the issue of signification, Charles also puts forward what I presented as Crivelli's conclusion that an apparently single affirmation with a would-be empty subject or predicate is not a genuinely single affirmation (93).

in virtue of an immediate relation that the name bears to a thought, and, because the thought is a likeness of and produced by an object in the world, in virtue of a mediate relation to an object in the world. So, Charles worries, how do empty names have signification, since they bear no such mediate relation?

To solve this, Charles appeals primarily to the *De Interpretatione* 2, 16a20–6, analysis of the signification of compound terms. There, says Charles, the significance of 'goatstag' comes about through a complex thought combining goat and stag, where these two thought-items, goat and stag, are each originally likenesses of and formed by the objects in the world, goats and stags. Because the thought-item, goatstag, which is immediately signified by the empty name, 'goatstag,' is a combination of thought-items, goat and stag, and because *those* are likenesses of objects in the world, it is possible to tell a story about the signification of the empty term, 'goatstag.'

Crivelli and Charles both solve their respective problems in part by finding that an empty term is a compound of terms, where *those* terms are non-empty.

This point brings me back to my analysis of how Aristotle may be able to prove the nonexistence of void by demonstration. Look closely now at the empty term, 'void.' Aristotle will declare void to be 'place deprived of body,' where he takes place here to be extension (διάστημα), such that void is extension deprived of body. And critically, *these* terms, 'deprived of body,' and 'extension,' are non-empty. After all, Aristotle would want to affirm that there are things in the world unoccupied by body, e.g., a point, and that there are extensions in the world, e.g., the extension of a wooden cube.[38] So, the empty term, 'void,' can be analyzed as a positive relation of

[38] Someone might object that in fact neither of these terms are non-empty on Aristotle's picture. Firstly, she will object that an extension (διάστημα) is not itself something on Aristotle's picture. She may cite *Physics* IV 4, 211b14-18 in defense of this and thus claim that the term is empty. Instead, she may suggest, there is for Aristotle just the property that bodies have of *being extended*. Yet however we interpret 211b14-18 (and in fact I do not think we should interpret it as denying the existence of the extension), we should see that Aristotle is happy to use words like διάστημα and χωρίον to refer to distances, regions, or openings in which

the two non-empty terms, 'extension' and 'unoccupied by body': there is void just in case being unoccupied by body holds of extension. And it is because being unoccupied by body does not hold of extension that void does not exist. So, to show the nonexistence of void, Aristotle can show that unoccupied by body holds of no extension.

Aristotle's answer to what void's essence is, if it exists, can then be used in a demonstration of void's nonexistence like this: it offers an articulated conception of void that may be prized apart into two non-empty terms, 'extension' and 'unoccupied by body,' where one can be shown not to hold of the other. Should he prove by demonstration that unoccupied by body does not in fact hold of extension, he reaches a proxy-conclusion tantamount to "void does not exist"—and he does so without ever using the empty term, 'void,' in the demonstration. Nor, for that matter, is the unscientific proposition "void is place deprived of body, if it exists" a premise in the demonstration.

---

bodies travel (e.g., *Physics* IV 8, 216a15, 216a35, *GA* 787b4), where he clearly does not have in mind the mere extendedness of a body but rather some apparently emergent entity. In fact, Aristotle's own account of place is a similar case of emergence. According to Aristotle's account of place, the place of a thing is the inner surface of the body or bodies that surround it. Aristotle often calls that inner surface just 'the container' (το περιέχον). Yet, when there are many surrounding bodies, 'the container' is the inner surfaces of numerous surrounding bodies taken together. The container is then not a property of just any one body, but rather, like the distance or region, an emergent entity that comes to be from an aggregation of bodies. Now, how the fact that Aristotle speaks in these ways coheres with his own philosophy of mathematics and substance-based ontology is another question. But it is clear that he does recognize such entities. Secondly, someone might also object that the other term, "deprived of body" (ἐστερημένον σώματος), is an empty term on Aristotle's picture. One would appeal to *Categories* 10, where Aristotle argues that some x is rightly called "deprived of y" if and only if x is the sort of thing naturally constituted so as to possess y. Yet, the objection goes, nothing that is naturally constituted so as to possess body (i.e., a place or extension) could ever be deprived of it, since there exists no void, and so "deprived of body" is an empty term on Aristotle's picture. Again, my response to this objection is similar to my response to the first. What Aristotle says in the *Categories* may not be whole story for him. After all, outside of the *Categories,* Aristotle is happy to use ἐστερημένον and στέρησῐς to describe things x that are deprived of y, where x are not the sort of thing to ever have y. Consider, for instance, his claim at *EN* 1178b28 that non-human animals are "deprived of happiness" (τῆς τοιαύτης ἐνεργείας ἐστερημένα). He maintains this even though he knows (indeed the whole point of the passage is that:) non-human animals could never be happy. I thank Ursula Coope and Marko Malink for raising these objections, respectively.

Indeed, the arguments of the latter two chapters of *Physics* IV 6-9 inquiry could be expressed in just this way. Take for instance Aristotle's arguments at *Physics* IV 8, 215a24-16a19, which show that bodies must move through resistant media (otherwise they would move infinitely fast). The result of the physical argument, namely that all extensions must have resistance, could then be used in a Celarent demonstration showing that being unoccupied by body holds of no extension:[39]

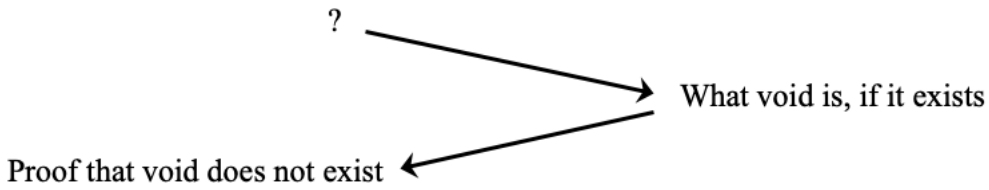
P1. Unoccupied by body holds of no resistant media	(AeB)
P2. Resistant media holds of all extension	(BaC)
C. Unoccupied by body holds of no extension	(AeC)

So, no extension is unoccupied by body in virtue of the fact that no resistant media is unoccupied by body and all extensions are resistant media. And to say that no extension is unoccupied by body is just to say that there exists no void, since extension unoccupied by body was our answer to what void's essence is, if it exists. In this way, the answer to what void is, if it exists, not only specifies a target for the nonexistence arguments of the second half of the inquiry, but it moreover offers two non-empty terms that could be used in a scientific demonstration of nonexistence.

Just as the what-it-is question is the critical turning point in the *APo.* roadmap, the what-it-is (or rather the what-it-is, if it exists) question is the critical turning point in the counterpart roadmap Aristotle that follows in *Physics* IV 6-9. It offers Aristotle his target for the refutations that follow, such that his arguments will show that void does not exist precisely because *that* thing does not exist. Further, as I have shown, the answer can offer Aristotle two non-empty terms that he could use in a demonstration of nonexistence.

[39] Cf. fn. 33 above, where I discuss whether Celarent is a legitimate mood for demonstration.

Yet here now arises the question with which the latter half of this chapter will be principally concerned: how can Aristotle in the void case get going with the search for that answer, and indeed arrive at and settle upon any particular answer? That is also to ask, how can the outbound journey unfold in the counterpart case of a nonexistent? I have in what preceded got clear about the return journey for the nonexistent. I have also resolved the *Demonstration Dilemma*. I have not yet however got clear about the outbound journey and so not resolved the *What-it-is Dilemma*. How can Aristotle get going with the inquiry and settle upon an answer to what void is, if it exists, given that he does not think it exists? As things stand, I have filled out the counterpart, void inquiry only to this extent:



In the latter half of this chapter, I will show how the outbound route unfolds in *Physics* IV 6-9, and I will show how Aristotle resolves the *What-it-is Dilemma*. In doing so I will find that Aristotle has considered grounds he employs for determining what a nonexistent is, if it exists.

4. Resolving the *What-it-is Dilemma*

I now look at *Physics* IV 6-7 to see how Aristotle actually arrives at what he takes to be the correct answer to what void is, if it exists. I show that he does so with an eye to the three steps of his plan at 213a12-14 and so also with an eye to the outbound journey of the *APo.* roadmap.

However, it is not straightforward how the outbound journey can work in the case of nonexistence. Aristotle insists that we can be wrong about void. He writes at 214a14 that those

who call void formless matter "do not speak well" about void. But Aristotle also thinks that there is no void. So, how can he justify *his* answer as best? Why should that justification be any good?

What is more, it is also not clear how an inquirer can even get going with the inquiry when her subject is presumed nonexistent. The *APo.* roadmap prescribed that the inquirer begin with a *gnôsis* ("grasp") that the subject exists, which she uses to arrive at an answer to what it is. The role of the initial *gnôsis* in the inquiry is key: in true Aristotelian fashion, by postulating this *gnôsis* Aristotle solves a problem akin to the famous problem of Plato's *Meno*: anyone asking what something is necessarily does not already know what that thing is. But if you do not know what the thing is, how do you get started with asking what it is? The *gnôsis* or grasp that something of such a sort exists is the solution and what gets that search off the ground. This grasp offers the basic material, so to speak, about which she can then seek and produce an answer to what the thing is. It is *gnôsis* that the subject exists that gets the inquiry going.

But Aristotle lacks *gnôsis* that void exists. This is true for the simple reason that *gnôsis* is veridical. Aristotle cannot have *gnôsis* that void exists because no one can, since it does not exist. But the quasi-Meno problem is deeper still: Aristotle does not even have *belief* that void exists when he sets out to write the void inquiry. For in what had just preceded, the *Physics* IV 1-5 treatise on place, Aristotle's account of place was straightforwardly incompatible with the existence of void.[40] While it is true that the void inquiry seeks "whether or not" void exists and is guided by the racetrack structure, such that Aristotle does not prove that void cannot exist until the return journey, and so also while Aristotle may for dialectical purposes appear agnostic about void's existence until that proof, it will nevertheless be the case that Aristotle himself does not have

[40] Aristotle acknowledges as much in the void inquiry at *Physics* IV 7, 214a16-20 (T10 below).

reason to believe that void exists when he begins his inquiry. Yet without this, how can Aristotle avoid being a casualty of the quasi-*Meno* problem?

I have just described two problems that apparently prevent Aristotle from offering a correct answer. The second is a problem about how the inquiry can get off the ground at all if the inquirer has no basis for thinking that the subject exists. Call this the Investigation Problem. The first is a different problem. It occurs down the line once one is choosing between candidate answers to what the thing is. Namely, if the thing does not exist, Aristotle cannot appeal to his usual resources for choosing one answer over another. He needs another basis for choosing. Call this the Justification Problem.

There is a further, third problem that must be resolved.[41] Namely, as I established in my part 2, Aristotle is centrally seeking an answer to what void is, if void exists. Yet void does not and cannot exist. The question therefore has an impossible antecedent, and so too does the answer. Void is place deprived of body, *if* something impossible happens. Yet how can Aristotle say what something is on the basis of an impossible antecedent? What sort of search is that? Call this the Impossible Antecedent Problem.

Resolutions to the investigation, justification, and impossible antecedent problems require respectively:

(1) Something about which we can then ask what its essence would be if it exists
(2) A justification for why one answer is better than another
(3) A way that Aristotle can say what something is given an impossible antecedent

In 4.1, I show how Aristotle gets (1). In 4.2, I find Aristotle's answer to (2). In 4.3, I find Aristotle's answer to (3)

[41] Cf. my fn. 30 above, where I first raise this problem, which I attribute to Gabriel Shapiro.

4.1 Getting started without *gnôsis* — or even belief

Just after Aristotle begins the void inquiry with his familiar plan at *Physics* IV 6, 213a12-14, he puts some flesh on its bones by offering a second plan, which I will argue details what getting started with the first will look like. Recall, the first plan at 213a12-14 sought

(a) whether or not void is
(b) how void is

and

(c) what void is

Aristotle follows up on this first plan just afterwards by offering at 213a19-22 an apparently unconnected, second plan:

> [T5] We must begin the inquiry by taking in (λαβοῦσιν) what those claiming [void] exists say, what those claiming it does not say, and third the common opinions among them
>
> Ἄρξασθαι δὲ δεῖ τῆς σκέψεως λαβοῦσιν ἄ τε λέγουσιν οἱ φάσκοντες εἶναι καὶ πάλιν ἃ λέγουσιν οἱ μὴ φάσκοντες, καὶ τρίτον τὰς κοινὰς περὶ αὐτῶν δόξας.

That is, the inquirer must begin by taking in (*laboûsin*)

(i) what those claiming void exists say
(ii) what those claiming void does not exist say

and

(iii) the common opinions (κοινὰς δόξας) among them

Note briefly Aristotle's use of *laboûsin* for describing how one should approach the claims of void's believers and nonbelievers. This verb *lambánein* can be translated as "take in," as I prefer, or "assume" or "apprehend." Unlike *zêtein* ("inquire") and similar verbs, which imply that one intends to investigate or critique whatever those verbs are set over, *lambánein* tends to suggest that the inquirer takes the verb's object for granted, perhaps using it as a tool for later investigation.

Aristotle's use of *lambánein* here is one key to understanding how this second plan at 213a19-22 links up with the first at 213a12-14.[42]

APo. II 1-2 prescribed that the inquirer begin with a *gnôsis* that the subject exists. It is this *gnôsis* that gets an existence inquiry off the ground, offering up the subject for the inquiry, about which the inquirer can ask, what is this? Yet Aristotle does not have this *gnôsis* nor even mere belief when it comes to void. Still, hope for a resolution to the investigation problem is not lost. In *APo.* II 8, during a discussion of how the inquirer arrives at what something is, Aristotle at 93a27-28 notes that "If we apprehend something of the object, it is easier." While Aristotle cannot, say, rely on his perception to apprehend something about void, as he would in the case of thunder, one thing that Aristotle does have in our case is what void's proponents and opponents had said up until that point. And he has not just their polemical points about void's existence or nonexistence, (i) and (ii) above, but also their common opinions about void, as in (iii). (That those who disagree must have some views about void in common is clear. After all, there can only be a true disagreement between two parties if they do agree on one matter: what it is they are talking about.) Aristotle wants to 'take in' (*lambánein*) these common opinions. This verb suggests that he is not intent on challenging them but wants rather to add them to his stockpile for getting going with the inquiry. Why is this? Can 'taking in' the common beliefs of proponents and opponents be enough to do what a *gnôsis* that the thing exists does, that is, to offer up a subject for the inquiry and serve as the material to be used when getting clear on the subject? This is what Aristotle thinks and does.

In the first chapter of the inquiry, chapter 6, Aristotle outlines what those who think void exists say and what those who think it does not say, treating its opponents at 213a22-213b2 and its

[42] Neither Ross (1936) nor Hussey in their commentaries attempt to explain the connection between the two plans. But it is otherwise a mystery why Aristotle should offer two plans in quick succession.

proponents at 213b2-213b29. Chapter 7 then begins with Aristotle's attempt to find an answer to what void's essence would be, if it existed. He offers a first pass, writing at 213b31-34,

> [T6] Indeed void seems (δοκεῖ) to be place in which there is nothing. The reason is they think (οἴονται) what is is body, and every body is in place, and void is place in which there is no body. Thus, if there is no body somewhere, there is nothing there.
>
> δοκεῖ δὴ τὸ κενὸν τόπος εἶναι ἐν ᾧ μηδέν ἐστιν. τούτου δ᾽ αἴτιον ὅτι τὸ ὂν σῶμα οἴονται εἶναι, πᾶν δὲ σῶμα ἐν τόπῳ, κενὸν δ᾽ ἐν ᾧ τόπῳ μηδέν ἐστι σῶμα, ὥστ᾽ εἴ που μὴ ἔστι σῶμα, οὐδὲν εἶναι ἐνταῦθα.

Aristotle's first pass is "void seems to be place in which there is nothing." (He will not stick with this answer—in part for reasons that I make clear in 4.2.2). Note Aristotle's justification for this first pass. He arrives at his answer by using what *they think* (οἴονται). They think three things, what is is body, every body is in place, and void is place in which there is no body. These claims are not out of the blue but arose during the preceding ch. 6 discussion of what void's proponents and opponents say (specifically at 213a27-31). It is by using what they say that Aristotle produces a first pass answer. What they think is the material on the basis of which Aristotle in turn gets clear about void. Just as the initial *gnôsis* was meant to, it gets the inquiry going. It is the void inquiry's resolution to the Investigation Problem.

4.2 Choosing the correct answer

I have argued that Aristotle is able to begin the inquiry without a *gnosis* or belief that void exists by using the common opinions about void shared by proponents and opponents. This allows him a sense of something to be inquiring after, from which he can proceed to get clear about that thing. It solves the investigation problem.

But the views of others on void do more than this. For, what speakers about void think not only gets the inquiry going but has *justificatory* power when it comes to getting clear about void.

What they say void is is decisive. This is not surprising. After all, if I want to prove that Santa Claus does not exist, but instead train my sights on St. Nicholas of Myra (the historical person whose generosity earned him the name 'Sinterklaas') and argue that *he* never existed, I will fail to engage with those who talk about Santa Claus and fail to show that Santa Claus does not exist. These two failures are connected. The reason I fail to show that Santa Claus does not exist is in part because I fail to engage with the people who talk about him. Were someone to object to me, "Obviously Santa Claus is not St. Nicholas," and were I to ask why not, she would respond, "Because that is not who people say Santa Claus is." My proof fails because the people who talk about Santa Claus hold that he is someone different than who I assumed. If I want to prove his nonexistence, I must prove the nonexistence of what the people who talk about him talk about.

Aristotle recognizes that something like this applies to his discussion of void. First, note that Aristotle explicitly takes issues of language and meaning to be important when getting clear about nonexistents. Consider his claim at *APo.* II 7, 92b5-8.

> [T7] For no one knows what 'what is not' is. Rather, while [one may know] what the word or name means when I utter "goat-stag" (ἀλλὰ τί μὲν σημαίνει ὁ λόγος ἢ τὸ ὄνομα, ὅταν εἴπω τραγέλαφος), it is impossible to know what the goat-stag is.

While we cannot know what nonexistents like the goat-stag are, we can however know what the corresponding word means, say, what "goat-stag," means. Grappling with the meaning of the word is our way to get at the goat-stag. This should apply to void no less. We cannot know what void is. But we can know what "void" means. Indeed, after laying out what void's proponents and opponents have said in *Physics* IV 6, Aristotle begins the search in ch. 7 for an answer to what void's is, if it exists, in precisely this way. Just before my T6 above, Aristotle writes at 213b30,

> [T8] To see which of these views hold, we must take in what the name means (δεῖ λαβεῖν τί σημαίνει τοὔνομα). [T6] Indeed void seems to be place in which there is nothing. The

> reason is they think (οἴονται) what is is body, and every body is in place, and void is place in which there is no body. Thus, if there is no body somewhere, there is nothing there.

We must begin by taking in "what the name means." Note that in the next sentence, that starting with "Indeed…", Aristotle straightaway drops the semantic language of the first sentence and simply declares what void seems to be (δοκεῖ εἶναι). It is a swift inference from the semantic to the metaphysical. As T8 indicates, Aristotle takes looking at what the word means to be the way to get at void. But why should this be the case? How is seeking what the word means serviceable when inquiring about what the thing's essence would be, if it exists? I want to suggest that the relation between the two questions is such that the latter borrows the former's *structure of justification*. That is, just as we look to what people say when seeking the meaning of a word, so too we look to what people say when getting clear about what a nonexistent would be, if it existed.

But it is not just anyone Aristotle defers to here. After all, not all people had the same idea about what void is. Some Pythagoreans theorized about a void breathed in from outside the cosmos, which, once inside, exists to individuate ordinary objects (213b22-29). Aristotle notes that some thinkers (we know from elsewhere he means Plato and his allies)[43] held that unformed matter, an ingredient in all worldly things, is the void and place of those things (214a11-16). In both these cases, the thinkers are believers in the existence of void. Yet what they say is not treated as authoritative. Aristotle in the Pythagorean case simply ignores the suggestion that void is such a thing, and in the Platonic case explicitly rejects the suggestion that unformed matter is void. But on what grounds? Both are proponents of void, theorizing about a world in which void exists. What justifies his ignoring or critiquing them?

[43] We know that Aristotle links this account of void to Plato because Aristotle cites the same view in his place treatise and there explicitly attributes it to Plato (*Physics* IV 2, 209b6-11). Ross (1936, 585) calls the statement that certain thinkers take void to be the matter of body "unhistorical." It is not relevant for my chapter to weigh in on whether this is indeed an accurate statement of e.g., Plato's view.

So, simply saying that the speakers about void have authority cannot be the full story. We have not completely filled out Aristotle's justification for why one account of void is better than another. I try to do this now.

4.2.1 The dominant position on void

I will show now that Aristotle makes systematic appeal to one school of thought on void in particular, to which he defers when rejecting other accounts of void and choosing an answer to what void's essence would be, if it existed. I will argue that Aristotle takes this school of thought to be the dominant school of thought on void, where what I mean by "dominant" is that this group is the one setting the terms of the debate about the existence of void.

First, in order to see that Aristotle systematically defers to one group, consider at 214a11-16 when he dismisses the account of void by Plato (at least on Aristotle's interpretation of him):

> [T9] Another way [of conceiving of empty extension] is that in which there is no 'this' or corporeal substance. This is why some say (φασίν τινες) that void is the matter of body, just as with place also. Yet they do not speak well. For matter is not separable from things, but they seek void as separable (τὸ δὲ κενὸν ζητοῦσιν ὡς χωριστόν).
>
> Ἄλλον δὲ τρόπον, ἐν ᾧ μὴ τόδε τι μηδ᾽ οὐσία τις σωματική. διό φασί τινες εἶναι τὸ κενὸν τὴν τοῦ σώματος ὕλην, οἵπερ καὶ τὸν τόπον, τὸ αὐτὸ τοῦτο λέγοντες οὐ καλῶς· ἡ μὲν γὰρ ὕλη οὐ χωριστὴ τῶν πραγμάτων, τὸ δὲ κενὸν ζητοῦσιν ὡς χωριστόν.

Plato's rendering of void is rejected as incompatible with what an anonymous but authoritative "they" seek (ζητοῦσιν) for void. Because void according to Plato is the matter of bodies, it is inseparable from them, such that wherever void is, a body is there. But this authoritative group takes void to be something separable from bodies.[44]

[44] Note there is a reading of this passage on which pseudo-Plato is included in the subject of ζητοῦσιν. I am also happy to accept that alternative reading, in which case the charge against pseudo-Plato is that his account violates its own tenets.

Or consider another instance of this deference. When Aristotle offers his final answer to what void's essence would be, if it existed, namely place deprived of body, he notes that the relevant account of place in this quasi-definition cannot be the one he himself just offered in his preceding inquiry, *Physics* IV 1-5. He writes at 214a16-20 (T3 above with fuller context).

> [T10] Since regarding place an account was laid down, and void must, if it exists, be place deprived of body, and we have stated both how it is and how it is not, it is clear that in this way void does not exist, whether inseparable or separated. For void is meant to be not body but rather an extension apart from body (σώματος διάστημα βούλεται εἶναι).[45]
>
> Ἐπεὶ δὲ περὶ τόπου διώρισται, καὶ τὸ κενὸν ἀνάγκη τόπον εἶναι, εἰ ἔστιν, ἐστερημένον σώματος, τόπος δὲ καὶ πῶς ἔστι καὶ πῶς οὐκ ἔστιν εἴρηται, φανερὸν ὅτι οὕτω μὲν κενὸν οὐκ ἔστιν, οὔτε ἀχώριστον οὔτε κεχωρισμένον· τὸ γὰρ κενὸν οὐ σῶμα ἀλλὰ σώματος διάστημα βούλεται εἶναι.

Aristotle's account of place in *Physics* IV 1-5 had it that the place of some thing, x, is the inner limit of the body (or bodies) that surrounds x. As I swim in the pool, my place is the inner limit of the pool with respect to me, i.e., the inner outline of the pool where it makes contact with me.[46] A place on Aristotle's account is then itself part of a body (i.e., part of the body surrounding that of which it is the place)—albeit a razor-thin part. But, as Aristotle indicates in T10, "void is meant to be not body but rather an extension apart from body." That is, according to what void is "meant to be" (βούλεται εἶναι), the sort of place with which void is identified must be non-bodily. So, the account of place relevant when identifying void as "place deprived of body" cannot be Aristotle's own. Briefly note the remarkable extent to which Aristotle yields to this authority on void: namely, to the extent that he (temporarily) brackets his own account of place and assumes another. Instead

[45] I take σώματος to be a genitive of separation and translate the claim, σώματος διάστημα βούλεται εἶναι, as "it is meant to be extension *apart from* body." It cannot be translated as "it is meant to be an extension *of body*," since the sense of this is just the Pseudo-Platonic void that Aristotle rejected. Hussey translates it σώματος διάστημα as "extension between body" (33). This is another option.

[46] This is a mere gloss of Aristotle account of place. On Aristotle's account, see Morison (2002), Sedley (2012), Hankinson (2012).

of his own account of place, the account of place relevant in "place deprived of body" must be one according to which place is separate from bodies, as in T9, which is also to say, as T10 had it, an extension apart from bodies. In fact, Aristotle considers this account of place before rejecting it in his treatise on place (see e.g., *Physics* IV 4, 212a7-14). He notes there that proponents of this account take place to be the non-bodily extension that, say, sits between the walls of a container like a room. When this extension is empty, they call it void.[47]

Who, then, are the thinkers with this view, and why is *their* view the one to which Aristotle defers here? I will suggest now that Aristotle takes their view to represent the dominant school of thought on void. In order to see this, we can look at least to Aristotle's discussion of Anaxagoras's failed attempt to prove the nonexistence of void. The relevant text is *Physics* IV 6, 213a22-31:

> [T11] Now, those trying to prove that there is no void train their sights not on this, i.e., what people (οἱ ἄνθρωποι) really want to call void, but they speak mistakenly, just like Anaxagoras and those training their sights in this way do. For, they show that air is something by straining wine skins, proving that air is strong, and by trapping it in clepsydras. But people really want void to be an extension in which there is no perceptible body. Yet thinking that everything that is is body, they say that that in which there is nothing at all, this is void. This is why that full of air is void.
>
> Οἱ μὲν οὖν δεικνύναι πειρώμενοι ὅτι οὐκ ἔστιν οὐχ ὃ βούλονται λέγειν οἱ ἄνθρωποι κενόν, τοῦτ᾽ ἐξελέγχουσιν, ἀλλ᾽ ἁμαρτάνοντες λέγουσιν, ὥσπερ Ἀναξαγόρας καὶ οἱ τοῦτον τὸν τρόπον ἐλέγχοντες. ἐπιδεικνύουσι γὰρ ὅτι ἔστι τι ὁ ἀήρ, στρεβλοῦντες τοὺς ἀσκοὺς καὶ δεικνύντες ὡς ἰσχυρὸς ὁ ἀήρ, καὶ ἐναπολαμβάνοντες ἐν ταῖς κλεψύδραις. οἱ δ᾽ ἄνθρωποι βούλονται κενὸν εἶναι διάστημα ἐν ᾧ μηδέν ἐστι σῶμα αἰσθητόν· οἰόμενοι δὲ τὸ ὂν ἅπαν εἶναι σῶμα φασίν, ἐν ᾧ ὅλως μηδέν ἐστι, τοῦτ᾽ εἶναι κενόν· διὸ τὸ πλῆρες ἀέρος κενὸν εἶναι.

Aristotle again in T11 cites this authoritative group, those who think that void is extension deprived of body. In T11 Aristotle tells us that Anaxagoras takes on this group in his attempt to prove the nonexistence of void, yet he does so unsuccessfully. Anaxagoras in part targets their misguided

[47] I discuss this account of place at length in my Chapter 2.

view that air is nothing, whereby they think that a wineskin empty of wine is a void. When Anaxagoras shows that air is something, he shows that the wineskin is not in fact empty. But in showing only this, Anaxagoras fails to engage with the thrust of their position. What they really want to call void is extension deprived of body, and, while showing that air is a body rules out certain homely cases like the wineskin, it does not address the question—what about the existence of an extension *truly* deprived of body?

Now, Anaxagoras is aiming to prove void's nonexistence. He does not believe that void exists. Yet he has views about what void would have to be, if it did exist. By targeting the wineskin Anaxagoras targets a case of what his interlocutors take to be an extension deprived of body, and he does so because, he himself must think, extension deprived of body would be void, if void existed. Anaxagoras and his interlocutors agree on at least one thing: void is or would be extension deprived of body. It is then *this* view of void as extension deprived of body (and not the Pythagorean or pseudo-Platonic views) that opponents of void's existence like Anaxagoras assume when seeking to prove the nonexistence of void. It is this view, in other words, that is getting uptake and setting the terms of the debate. The discussion and controversy surrounding the existence of the void takes at least one thing for granted: void is or would be extension deprived of body. This is the dominant view. And insofar as Aristotle is aiming to contribute to this controversy, it is fitting that he too takes this for granted.

Note moreover how Aristotle refers to those embracing the dominant view here in T10. He calls them simply "people" (οἱ ἄνθρωποι). This is not a way to refer to *some particular* people in Aristotle's Greek. To refer to some particular people, he would likely use the particularizing pronoun *tines*. Consider in T9 when Aristotle glosses the account of void that he attributes to Plato and his allies. He describes it as something "some people say" (φασίν τινες at 214a13). But he

does not use *tines* here in T11. For this group is not some particular set of thinkers. Rather, Aristotle must take the view to which they subscribe to be the mainstream view, such that it does not require specification in terms of what particular group holds it.[48]

The upshot is this. In the void inquiry, one answer to what void's essence must be, if it exits, is better than another if it reflects the dominant position on void. Aristotle rejects Plato's void and brackets his own account of place because they conflict with this position. It is what the dominant position on void holds that (in part) determines what makes for a good answer to what void's essence would be, if it existed. This solves the Justification Problem.

Now, I say "in part" in the parenthetical above because what those who subscribe to this position say does not *exhaustively* determine what makes for a good answer. Sometimes these subscribers talk about void vaguely and misarticulate their own views. Yet in order for the answer to be serviceable for the arguments of chapters 7-8, Aristotle considers it necessary that the answer (at least) be rid of ambiguity. I noted above in my treatment of T6 that Aristotle does not stick with the first pass answer at the start of chapter 7. It is for this reason. For after that point Aristotle fine-

[48] See also when Aristotle glosses these views in the place treatise (208b29-33), he attributes them to οἱ πολλοί, "the many." Indeed, this position may be (or be continuous with) a *popular*, non-scientific position on void. In fact, that this group thinks air is incorporeal, such that it is nothing, suggests that Aristotle cannot simply be speaking of, say, the atomist view. For the atomists were well aware that air was corporeal and so not to be identified with void (cf. e.g., ATOM. D110, D118 in Laks & Most). What is more, there is reason to believe that non-philosophers thought about something like voids at Aristotle's time. When Aristotle outlines what those who think void exists say, he cites everyday observations that people took to involve voids (213b15-22). Two of these, a case with ash in jars and a case with wine in jugs, are observations that homemakers would have been likely to make. If ordinary people assumed the existence of something like voids in such cases, they would have had some sense of what that thing was. Granted, the non-philosopher would not have called it "the void" (*to kenon*). That noun did not occur in common Greek usage. It is a coinage and substantivation of the common adjective, *kenon,* "empty" (Algra, 1994, 38-39). Nor perhaps would the non-philosopher have been talking about something absolutely empty. He may merely say that something is empty of some relevant thing. The wine bottle is empty (of wine). Still, whether the homemaker gestures to the empty pocket in his rising dough and calls it "*to kenon*" or another name, and whether he means absolutely empty or empty of yeast, what he took that pocket to be may have been something like extended space in which there is nothing (of the relevant sort). This is continuous with the dominant scientific position. I argue that this view reflects what I call "common sense space" in my Chapter 2. I return to it in both my Chapters 2 and 3.

tunes the views about void of those who subscribe to the predominant position. In 4.2.2 below I show how Aristotle goes about this fine-tuning work.

4.2.2 Making the answer serviceable for theoretical argument

Recall Aristotle's first pass answer that opens chapter 7 at 213b31: "Indeed void *seems* (δοκεῖ) to be place in which there is nothing." Note his use of the tentative, "seems" (*dokeî*), when offering his first pass answer here and how this compares to his language when offering his considered answer at 214a16-17: "void *must* (ἀνάγκη), if it exists, be place deprived of body." Far from tentative, Aristotle uses the Greek *anánkē* ("must"), a term he reserves for assertions of certainty or necessity. What transpires between the "seems" of 213b31 and the "must" of 214a16-17 is Aristotle putting the views of the group under a microscope, showing where their ambiguities and correlative views yield misleading formulations about void. Aristotle's scrutiny here involves three lines of questioning. I do not have space to consider all three. I will examine just the first. Recall again T6, beginning with Aristotle's first pass answer:

> [T6] Indeed void seems (δοκεῖ) to be place in which there is nothing. The reason is they think what is is body, and every body is in place, and void is place in which there is no body. Thus, if there is no body somewhere, there is nothing there.

Notice something peculiar about Aristotle's reasoning here. He infers that void seems to be place in which there is nothing on the basis of three views that the authoritative group have: what is is body; every body is in place; and void is place in which there is no body. In the last line of T6, he makes explicit the move from there being *no body* somewhere to there being *nothing* there. But it is curious, if the group already think that void is place in which there is no body, why not simply call *that* void. Why make the additional move, using their view that all that is is body, from 'no body' to 'nothing,' such that their final view according to Aristotle is that void is place in which

there is nothing? He must reckon that they believe that a place in which there is no body counts as void *only because* they believe that everything that exist is just body, such that if there is no body somewhere, there is nothing there. To this extent, Aristotle must think that for these people "place in which there is nothing" is explanatorily prior. So, the first pass Aristotle offers is rightly not "place in which there is no body" but rather "place in which there is nothing."

Yet Aristotle takes issue with their major premise that all that exists is is just body. After T6, at 213b34-14a6, Aristotle in a condensed passage raises a challenge to it:

> [T12] But again they think every body is tangible. But that sort of thing could have heaviness or lightness. Then it follows by syllogism that this is void: that in which there is nothing heavy or light. So, just as we said now, this follows by syllogism. But it is absurd for a point to be void. For place must have an extension in it like that of a tangible body.[49]
>
> σῶμα δὲ πάλιν ἅπαν οἴονται εἶναι ἁπτόν· τοιοῦτο δὲ ὃ ἂν ἔχῃ βάρος ἢ κουφότητα. συμβαίνει οὖν ἐκ συλλογισμοῦ τοῦτο εἶναι κενόν, ἐν ᾧ μηδέν ἐστι βαρὺ ἢ κοῦφον. ταῦτα μὲν οὖν, ὥσπερ εἴπομεν καὶ πρότερον, ἐκ συλλογισμοῦ συμβαίνει· ἄτοπον δὲ εἰ ἡ στιγμὴ κενόν· δεῖ γὰρ τόπον εἶναι, ἐν ᾧ σώματός ἐστι διάστημα ἁπτοῦ.

T12 opens with Aristotle attributing to this authoritative group the further view that every body is tangible. He challenges them, if they want to say that everything that exists is only body, but that bodies are tangible and so also bear further things called heaviness and lightness, then what can they say *those* things are, and how can they distinguish between places lacking body and places lacking anything heavy? Since void is that in which there is no body, void should also be that in which there is nothing heavy or light, such that they are committed to the syllogism,

> P1. Void is place in which there is no body
> <u>P2. But bodies (and only bodies) have heaviness or lightness</u>

[49] Hussey (125-126) does not see that T12, 213b34-214a3, is meant to be a challenge to the initial formulation of void as "place in which there is nothing." Because he does not see this, he calls 213b34-214a3 "suspect" in the overall pattern of argument and actually suggests moving the text to 213a27-31.

C. So, void is [place] in which there is nothing heavy or light[50]

Admitting only bodies as existents yet introducing the tangible and so the heavy and light into the fray, they have no resources for stopping a progression from 'bodies' to 'the tangible' to 'the heavy or light' in describing that of which voids are empty. They are defenseless for resisting the conclusion's formulation, "void is place in which there is nothing heavy or light."

But Aristotle takes there to be a problem with this formulation. For, he reckons, should someone take up this formulation, she might think that a point could count as void. And Aristotle takes empty points to be absurd. Now, to see why such a problem should arise for this formulation in particular, we need to realize that someone hearing that void is "place in which there is nothing heavy or light" may be inclined to think of a new, wider set of void-eligible things than she would when hearing that void is "place in which there is no body." That is, when she first hears that void is a place without body, she is inclined to think that the things eligible for being void are the sorts of places that could contain bodies and presumably sometimes do (but at present lack body). This would limit void-eligible things to whatever can fit bodies. Similarly, when she hears that void is a place in which there is nothing heavy or light, she looks to what could fit something heavy or light. But this may well be a different set of void-eligible things than before, as the set of things that may be heavy or light may be a different set than the set of things that may contains bodies.[51] And this new set may include points. That points could have mass just was one stipulation in ancient mechanics when finding balancing points.[52] If people think of points as the sort of things

[50] It is no worry that the empty term, void, features in a syllogism here, since Aristotle is merely reciting what someone else would say.

[51] At this point in the inquiry, "place" has not yet been identified with extension, and so it is an appropriate worry at this stage that a (nonextended) point may be a place with nothing heavy or light.

[52] Cf. Prop. 3 of Archimedes's *On the Equilibrium of Planes.* Granted, Archimedes flourished a century after Aristotle and is known for his originality in mechanics. But the field (τὰ μηχανικὰ) predated him, originating in 4th c. BCE. Diogenes Laertius cites a Pythagorean associate of Plato as the applying mathematics to mechanics (VIII 83-4). Aristotle himself included τὰ μηχανικὰ among sciences requiring

that could be heavy or light, then they are void-eligible things according to the formulation "void is place in which there is nothing heavy or light." And a point with no heaviness or lightness would count as void. But importantly, Aristotle thinks that points being voids (or places) is absurd. It is absurd because, Aristotle notes in the final sentence of T12, the places relevant when we talk about voids are extended things able to fit bodies. Yet points are by definition non-extended. Therefore, the major premise, what exists is only body, must be rejected, and the formulation of void it supported, the first pass answer, place in which there is nothing, must too be rejected.

I have shown that while Aristotle defers to those who subscribe to the dominant position on void for guidance, their authority is a qualified one. While what they think about void is justification for choosing one answer over another, it is not sufficient for the best answer. Aristotle must offer an answer that does the most justice to that void to which their views are committed, but which they do not always best articulate.

4.3. The impossible antecedent

Aristotle therefore settles on place deprived of body as the best answer. This is the answer that does justice to the views on void held by the dominant position on void, while correcting for imprecisions on their behalf. Now, 'place deprived of body' is an answer to what void is, if it exists. And I promised to discuss what to make of the impossible antecedent: void exists. Aristotle answers what void is given the impossible supposition that it exists. Yet how can anyone determine anything on the basis of the impossible? What would it even mean to do this?

abstraction (*APo.* 78b37, *Meta.* 1078a16). So, it is possible that at Aristotle's time there was a practice by which points were the hosts of weight. I thank Benjamin Morison for bringing to my attention the fact that points were treated as hosts of weight.

In order to answer this question, consider two roles that an impossible antecedent might play in an inquiry. First, one may suppose an impossible antecedent with the aim of saying something about *our* world. So, for instance, one may produce a thought experiment in which two people's brains are fused in order to make inferences about personal identity, where what we seek is knowledge about personal identity in *our* world.[53] Alternatively, one may use an antecedent that is impossible in our world to make inferences about the world in which the antecedent *does* hold. So, one may say, if the Big Bang had not happened, we humans would not be here. Of course, we *are* here, and so in this case the consequent is describing the foreign world in which the antecedent is true. In these two cases, the impossible antecedent is gearing up for a different sort of inference.

The point of the foregoing two cases is to show that there are different levels, closer and further from the actual world, at which an impossible antecedent can be used to say something. Now, if Aristotle were looking to discover what void is in his actual world, if it exists, he would need to search among existent things in his world and find one to identify as "void"—perhaps matter in contrast to form, or some such thing. That is, he may think to himself, "if I have to admit the existence of something called 'void,' given my actual world, what among it should I call 'void?'" In this case, the antecedent 'if void exists' would be an impossible supposition, but rather an impetus for finding within the actual world an entity to call 'void.'

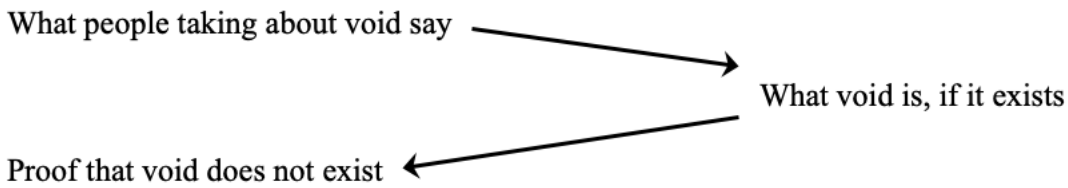
But this is not what Aristotle does, nor is it the shape the inquiry takes. Rather, as I have now shown at length in my Part 4, Aristotle looks at the world of the void theorists and determines what void is in *that* world. I flagged above in my 4.2.1 that when saying that void is place deprived of body, if it exists, Aristotle brackets his own account of place and assumes another, which he

[53] Cf. also Aristotle's thought experiment with the sun in *Metaphysics* VII 15, 1040a28-b5, which supposes an impossibility in order to tell us something about the nature of the sun in the actual world. I thank Jessica Moss for bringing this passage to my attention.

does not endorse. Indeed, straightaway when setting out to find an answer at the start of his *Physics* IV 7, the tools that Aristotle uses to get at that answer are *other* people's views. As I showed in my 4.2.2, he makes precise their views on their behalf in order to do the most justice to them. He is then searching for his answer among a world that is not his own. In this way, Aristotle is not using an impossible antecedent to make a claim about what void is given his world. He is making a claim about what void is in the world in which void—understood according to the dominant position on void—exists. This is necessarily not his own world. So, 'void is place deprived of body, if it exists,' is tantamount to saying, 'should the world postulated by the void theorists obtain, void in that world is placed deprived of body.'

Final remarks

I have now filled out both the outbound and return journeys for the counterpart, nonexistence inquiry of *Physics* IV 6-9. We have:



As the original *APo.* existence inquiry had the inquirer getting started with her *gnôsis* that the thing exists, here in the counterpart, nonexistence inquiry, Aristotle gets started with what people who talk about the thing say. He takes the dominant position about what void is (i.e., the position on which the majority of proponents and opponents of void's existence agree) to be authoritative over other positions on what void is, if it exists. He then refines that dominant position, making it serviceable for theoretical argument, and arrives at his answer to what void is, if it exists. This answer, void is place or extension deprived of body, if it exists, then offers Aristotle a target for

the arguments that follow. He shows that void does not exist precisely because he shows that place or extension deprived of body does not exist. Moreover, I showed that Aristotle's answer offers two non-empty terms, 'extension' and 'deprived of body,' that could serve in a demonstration of the nonexistence of void.[54] Aristotle could demonstrate that being deprived of body holds of no extension,[55] and since an extension deprived of body just was his answer to what void is, if it exists, Aristotle could offer a proxy-demonstration of the nonexistence of void.

In this chapter I thus found that Aristotle has a considered method for proving nonexistence, where that method is a counterpart of the method for proving existence that he outlines in *Posterior Analytics* II, 1-2. Aristotle implements this counterpart, nonexistence method in the *Physics* IV 6-9 void inquiry. While tracing the implementation of this method in *Physics* IV 6-9, I further found that Aristotle has certain considered grounds for determining what a nonexistent item is, if it exists. In addition, I found that Aristotle can use his own logic to demonstrate the nonexistence of something without violating the existence entailments of that logic.

[54] Note that Aristotle's first pass answer using the dominant position—before he makes the answer serviceable for theoretical argument, did not offer non-empty terms, since "nothing" is an empty term.
[55] That "deprived of body" is a non-empty term was for instance shown just now by being implicitly predicated of points.

Chapter 2.

What void is, if it exists

Introduction

Chapter 1 asked how Aristotle the metaphysician could say what void is, given that he does not think void exists, and given that Aristotle's usual resources for answering a what-it-is question are unavailable in the case of a nonexistent. It asked how Aristotle's inquiry could even get off the ground and how, by his own lights, he could offer an answer to what the nonexistent void is. I showed that Aristotle answers the question, what void is, if void exists, by appealing to a view on what void is that was dominant in debates about void's existence. Aristotle articulates the view and refines it, correcting for imprecisions in what those who embrace it say. He thus declares that if void exists, void is place deprived of body, where 'place' is understood as non-bodily extension.

The current chapter now looks at that answer itself. What is *this,* place deprived of body? Aristotle will in the course of his arguments against the existence of void address two apparently different sorts of entity, what he calls a "separated void" and an "inseparable void." How do these sorts of void differ, while each being places deprived of body? A treatment of what Aristotle thinks void is, if it exists, must address this interpretive question. In this chapter I show that Aristotle consistently retains the same account of what void is, if it exists, throughout *Physics* IV 6-9.

Getting clear about what Aristotle took void to be, if it exists, is critical not only for Aristotelian scholarship but for understanding why a part of the history of science has unfolded as it has. In fact, no less influential in the history of science than his arguments against the existence

of void was Aristotle's answer to what void is, if it exists.[56] For millennia, Aristotle's answer would go on to set the standard for what anyone seeking to prove the existence or nonexistence of void must target. When Evangelista Torricelli in 1643 and Blaise Pascal in 1647 created voids, what they created—and what they understood themselves to have created—were just what Aristotle took voids to be: places or extensions deprived of body. In Torricelli's case, he first found that when you fill up a test tube with mercury, cover the open end, flip it, and dip the covered end into a bowl of more mercury, then release the cover, the mercury in the tube sinks down slightly into the bowl of mercury, raising the level of mercury in the bowl. More precisely, the mercury in the tube sinks only to the extent 'permitted' by the atmospheric pressure of the air outside the tube that is also pushing down on the mercury in the bowl. Once the outside pressure on the mercury in the bowl equals the pressure exerted by the remaining mercury in the tube, the mercury in the tube stops sinking and stands still. And what Torricelli found was that the space left above the mercury in the tube, which was full before the sinking began, is a void. That is, as the mercury sank inside the tube, above it there came to be more and more empty extension inside the tube—extension deprived entirely of body, whether mercury or air or some other gas.[57] Torricelli and Pascal thereby took themselves to have created void precisely because they created an extension between the walls of the tube that is deprived of body. Thus, did Aristotle's answer to what void is, if it exists, set the accepted definition of the void for millennia to come. Even today, one common way of talking about the quantum vacuum, a region deprived of as much as energy as is possible, is a distant descendant of Aristotle's own answer.

[56] Cf. Edward Grant (1981), "Despite the denial of existence, Aristotle had, in medieval terms, formulated the accepted *quid nominis*, or definition, of the vacuum" (10). Grant offers a conceptual history of space and void from Aristotle to Newton, with emphasis on the role of the scholastic tradition.
[57] Strictly speaking the mercury in the tube vaporizes a bit, and so the space above will have bits of vapor.

Yet answering what void is, if it exists, is no small feat. Certain general puzzles arise at the outset when we try to wrap our mind around a void. There is a layman's puzzle that anyone thinking about void might run up against—namely, is a void a nothing or a something? Is it a something that bears the right relationship to some nothing? If you asked me if there is anything in my empty thermos flask, and I responded—'yes, a void'—did I make a conceptual mistake? In general, resolving what void is does not (just) amount to resolving the empirical question of whether there is one. It amounts to resolving the partly prior, conceptual question: what would we want to call a true void, should we discover it? No doubt there is feedback in both directions between relevant empirical discoveries and our conceptual apparatuses. What we expect a void to be, should we find one, will surely draw upon and be informed by the physical constraints of our universe, insofar as we understand them.

In the present day, we say that there is void, and we say that void is a region of space deprived of as much energy as possible. Yet the self-reflecting scientific discourse is happy to acknowledge that this is not a *true* void, but rather a void 'in effect,' because there is after all still something there: some energy.[58] Indeed, the uncertainty of quantum mechanics tells us that a void will always contain so-called zero-point energy, as this is the lowest possible state of energy that could obtain in a region deprived of matter. Because there are regions with just this, and to the extent we are happy to call such regions voids, voids exist. But this is not a true void—it is after all buzzing with something. What instead might be a true void? Something—that is deprived of everything, matter and energy? But what is *that thing* like? If the existence of such a thing violates the uncertainty principle, is it even meaningful to ask what it would be like? We may be tempted to speculate that a true void is space with absolutely nothing in it, neither matter nor energy, but if

[58] See e.g., Close (2007, 126). Frank Close offers a conceptual history of void, with emphasis on the post-Newtonian period and the quantum vacuum developments of the 20th century.

we think as some do today that space is just the set of constraints on the shortest distance between two points, constraints which are determined and warped by the matter and energy present, then what is space with absolutely nothing present—but the absence of space itself? As Frank Close said of Einstein: "Empty space for him was an oxymoron" (52). So maybe the true void by our terms today is not a something, nor a something bearing the right relationship to nothing, but nothing at all.

These puzzles make apparent some of the difficulties that arise, and still do arise, when we try to imagine void. In this chapter I will examine Aristotle's answer to what void is, if it exists, and will show just what sort of entity he took it to be. I begin by considering a recent debate in the scholarship over two apparently distinct ways that the ancients might have conceived of void.

1. Sedley's two voids

Writing on void in classical antiquity, David Sedley (1982) distinguishes what he takes to be two possible sorts of void. These voids are: (1) Void as an occupant in place; (2) Void as place. To imagine the first void, the occupant sort, Sedley asks us to imagine a void in the thermos flask I carry with me (175). When I carry my thermos around to some new place, so too does the void in the thermos travel to that new space. This void is an occupant *in* place, Sedley says. It is an entity, some 'non-being,' with a purely negative characterization that moves around from place to place. It should be contrasted, he thinks, with void as *place*, where this latter sense of void is like a room or expanse that bodies might move into. It is an empty preexistent space available for a body to enter. Sedley maintains that the presocratic atomists operated only with void as occupant, since

they call void 'non-being' and make it an element alongside 'being' (the atoms), and, Sedley claims, both elements are meant to move around and combine to create composite bodies.[59]

Keimpe Algra (1994) rejects the claim that the presocratic atomists operated with void as occupant—what is more, he presses against the distinction Sedley wishes to draw among voids and maintains that, in fact, it may fail to demarcate two truly sorts of entity. Algra suggests that these supposedly different kinds of void may just be two perspectives we can take on one and the same void. Consider again Sedley's position. Sedley takes the 'void as occupant' voids to be like pockets of void in air—void surrounded by bits of being. For the atomists Sedley thinks that there is only an 'internal admixture of void,' such that reality is spongy, with bits of being and non-being bumping up against one another. In such a reality, 'being' does not move into an 'external' void, that is, into some external void expanse (178). So, says Sedley, such a reality does not require void as place, since what is required are internal voids contained in being, i.e., voids contained, and thus 'voids as occupants in place.'

Here is how Algra responds: "Even if it were admitted that we are here dealing exclusively with an internal void… it does not necessarily follow, otherwise than Sedley seems to suggest, that such an internal void is not an empty place" (42). Indeed, while the void in my thermos may be internal to and an occupant of my thermos, it will also itself be a place for my coffee to move into as I pour it into the flask. Every void, whether itself an occupant or not, is a place for something else to go into. The vacuum in my thermos may be an occupant or a place, depending on how I choose to see it. For the atomists, Algra presses, what is really going on is the motion of atomic matter in a fixed, preexisting void space. The voids in the atomist universe are only occupants insofar as we consider them occupants of the composite bodies that they are in. A composite body,

[59] Cf. also Sjoerd Hasper (2013), who has a similar view of the atomist void to Sedley.

say, a cow, is composed of the atoms and void that occupy it. But this is just a way of speaking, Algra thinks. Really, we just have atomic matter moving about in a fixed void space.

Does Sedley's distinction get a real division between possible voids as he hopes, or is it a mere perspective shift on one and the same void? I will return to this question at the end of this chapter, once I have laid out what Aristotle thinks void is, if it exists. Aristotle calls void "place deprived of body." What this sort of thing is needs clarifying. In particular, what sort of thing is this "place" here, which is considered deprived of body?[60]

2. The Candidates for Place Not Relevant in an Account of Void

To see what sort of place Aristotle has in mind, it is first worth laying out the four candidate accounts of place he considered in his treatise dedicated to place, *Physics* IV 1-5. There, Aristotle aimed to provide his own theory of place. He wanted to know, what do we take to be the answer to *where* something is, an answer that is more precise than this or that particular room or city? What, properly speaking, is its location, which changes when it moves even a tiny bit? And what is this framework, this fine-grained locator by which we can tell when it has moved even slightly? Aristotle argues for a single answer to what place is after considering four possible candidate theories of place. While he will settle on one candidate as his own and endorse it as the correct theory of place, it is a different candidate for place that turns out to be relevant in theories of void. In this section, I consider the three candidates for place that are not relevant, including Aristotle's own. In the next section, I turn to the relevant candidate.

According to the first candidate, the place of some placed body, x, is x's form or shape that contains x and bounds x's otherwise indeterminate matter. My place, then is my own two-

[60] I discuss what sort of place is at play very briefly in the previous chapter, primarily in my section 4.2.1.

dimensional surface (While my surface is extended in three dimensions, it is itself two-dimensional). Next, according to the second candidate, x's place is x's inner, three-dimensional extension, its matter or bulk, which is bounded and made determinate by x's form or shape. [61] However, Aristotle rejects these two candidates as the correct theory of place (209b22). For, both x's form and its matter move along with x when x moves, yet place is supposed to be independent of the body of which it is the place. If x's place were to move along with it, as x's form and matter do, then accounting for motion would be difficult. After all, how could we know that x moved, where 'moving' is just to say changing place, if x's place went with it? In fact, if x's place goes with it, x will always be in the same place. Aristotle therefore rejects these candidate accounts of place.

It is the fourth candidate for place that Aristotle will take up as his own. He calls place according to this candidate "the first unmoving boundary of what contains" (τὸ τοῦ περιέχοντος πέρας ἀκίνητον πρῶτον at 212a20). That is, the place of a body is the inner surface of its surroundings considered as unmoving. So, as I swim in an ocean, the inner surface of the whole ocean where it makes contact with my body is my place. (I say the whole ocean rather than the water because the water itself moves and may move along with me, but the whole ocean does not). When I move, the ocean rearranges itself around me, and I occupy a new inner surface. That I occupy a new surface is precisely how we can tell that I moved. This is Aristotle's account of place. However, for reasons I outlined in my Chapter 1, Aristotle will bracket his own account of place when getting clear about what void is, if it exists, and instead take up the account of place embraced by the dominant view about what void is in discussions of void. As I will now argue in section 4 below, the account of place that they embrace is the

[61] Aristotle attributes this second candidate place to Plato and his allies (*Physics* IV 2, 209b6-16).

third candidate Aristotle considers (and rejects) in his *Physics* IV 1-5. I will discuss this account at length, emphasizing its dominance in the history of philosophy and science.

3. Which Candidate is Relevant, and the Popularity of Common-sense Space

The third candidate Aristotle considers in *Physics* IV 1-5 is an "extension between the extremes" (διάστημά τι τὸ μεταξὺ τῶν ἐσχάτων at 211b7). According to this account of place, the place of some body x is the extension between the walls of the vessel that contains x. Place in this case is three-dimensional and so in this way is like a body's matter or bulk, yet it is not attached to the body of which it is the place. So, we can imagine the place of water in a jug. According to this sort of place, place is the extension between the walls of the jug, which 'penetrates' the jug's contents, e.g., water. And when the water moves around in the jug or is replaced with air, the extension between the walls of the jug remains. We can thus see why this sort of place would be helpful in explaining when something has moved. Since the place extension remains when the body of which it was place moves away, we can explain when a body has changed place. Namely, I am in a new place because I now occupy a new (bit of the) extension. Further, in virtue of its fine-grainedness, this extension is useful for saying precisely where I am. Someone wanting to determine whether I moved even an inch can tell by reference to this place. For, when I have moved an inch I now occupy a new (bit of the) extension.

Despite the apparent explanatory strength of this candidate, Aristotle rejects it as place. In one argument at 211b19-23, he claims that if place were such an extension between the walls of the vessel, then there would be an infinity of places in the same spot.[62] Imagine water is

[62] "If there were an extension naturally there and remaining, there would be an infinity of places in the same spot. For while the water and air replace one another, all the parts will play the same [role] in the whole as all the water did in the jug." (εἰ ἦν τι διάστημα τὸ πεφυκὸς καὶ μένον, ἐν τῷ αὐτῷ ἄπειροι ἂν ἦσαν τόποι·

poured out from a vessel and replaced with air. Before it is poured out, at t1, just so much of the extension, say, part x of it, is filled with the whole quantity of water. Throughout the pouring, the water occupies less and less of the extension—at t2 it occupies part y, where y is less than x; at t3 it occupies z, where z is less than y, and so on. It is also true that at t1, before the pouring began, the water not only occupied x, but also occupied those smaller parts of the extension, y and z. And, as the water is poured out, between t2 and t3 there is another time, t2.5 where the water occupies a part of the extension smaller than y, which it occupied at t2, but greater than z, say, a. And indeed, at some time between t2.5 and t3, say, t2.75, the water will occupy a part of the extension smaller than a, say, b, that is still greater than z; and so too, at some time between t2.75 and t3, another part, c, and so on. These infinitely many parts of the extension, y, z, a, b, c, etc., were all occupied by the whole water at t1 before the pouring out. So too, should we focus in on one of the lower fractions of water in the vessel before the pouring begins, we would find that at the very same moment it has infinitely many places, namely, the extension that is the same size as it as well all those infinitely many extensions that are just so slightly bigger than it. Yet this account of place has no resources for settling on any one of those extensions as the true place of that bit of water. So, we are left with an indeterminate number of redundant entities.[63] This, then, is one of two arguments Aristotle

μεθισταμένου γὰρ τοῦ ὕδατος καὶ τοῦ ἀέρος ταὐτὸ ποιήσει τὰ μόρια πάντα ἐν τῷ ὅλῳ ὅπερ ἅπαν τὸ ὕδωρ ἐν τῷ ἀγγείῳ·).

[63] It is true that given Aristotle's account of the infinite there would not actually be an infinity of places, since he thinks the infinite is actual only in a qualified sense, viz. 'like the day and the games' (*Physics* III 6, 216b12-15). I thank Mirjam Kotwick for raising this. Yet Aristotle's worry here is not so much with the fact of an actual infinity of places but with the existence of redundant entities. For discussions of Aristotle on the infinite, see e.g., Rosen (2021), Kotwick & Pfeiffer (2019). Cooper (2016), Nawar (2015), Coope (2012), Massie (2007), Bostock (2006), Lear (1979), and Hintikka (1966).

wields against this third candidate for place. He thereby rejects it as the correct theory of place.[64]

Yet it is this very account that will be relevant in Aristotle's answer to what void is, if it exists. In my Chapter 1 I asked the reader to take my word for this. I will now argue for this claim and, turning to the text, show that it is this account of place, the third candidate for place, that Aristotle has in mind when he gets clear about void.

In Aristotle's treatise on place, he mentions void twice. Consider a first instance when Aristotle is describing this third candidate for place at *Physics* IV 4, 212a7-14.

> [T1] Place is thought to be something great and hard to grasp…because the displacement of the moved body occurs in a stationary surrounding. For it seems possible that there is some extension between other than the magnitude of the moved bodies. And air too, thought to be incorporeal, contributes something [to this belief]. For it is not only the boundaries of the vessel which seem to be place, but also what is between as void.
>
> Δοκεῖ δὲ μέγα τι εἶναι καὶ χαλεπὸν ληφθῆναι ὁ τόπος… διὰ τὸ ἐν ἠρεμοῦντι τῷ περιέχοντι γίνεσθαι τὴν μετάστασιν τοῦ φερομένου· ἐνδέχεσθαι γὰρ φαίνεται εἶναι διάστημα μεταξὺ ἄλλο τι τῶν κινουμένων μεγεθῶν. συμβάλλεται δέ τι καὶ ὁ ἀὴρ δοκῶν ἀσώματος εἶναι· φαίνεται γὰρ οὐ μόνον τὰ πέρατα τοῦ ἀγγείου εἶναι ὁ τόπος, ἀλλὰ καὶ τὸ μεταξὺ ὡς κενόν.

Here, a belief that there is some extension beyond the magnitude of the bodies coming and going—that is, a belief in the third candidate for place—is explicitly linked with void. We are told that those who suggest that there is some extension beyond the bodies of which it is place consider that extension to be void when those bodies are not there. We are also told that they take evidence for their belief in such an extension from their belief that air is incorporeal. We see this same idea of place as extension, with corollary ideas about air, in the void inquiry as well. Take for instance

[64] I broadly follow Benjamin Morison's (2002, 125) interpretation of 211b19-23, though I differ from him in my interpretation of the lines b23-24 that follow, as I note below in fn. 75 in my section 4.

when Aristotle is explaining why Anaxagoras failed to show the nonexistence of void. Consider the passage at *Physics* IV 6, 213a22-31:

> [T2] Now, those trying to prove that there is no void train their sights not on this, i.e., that which people really want to call a void, but they speak mistakenly, just like Anaxagoras and those training their sights in this way do. For, they show that air is something by straining wine skins, proving that air is strong, and by trapping it in clepsydras. But people really want void to be an extension in which there is no perceptible body. Yet thinking that everything that is is body, they say that that in which there is nothing at all, this is a void. This is why that full of air is a void.
>
> Οἱ μὲν οὖν δεικνύναι πειρώμενοι ὅτι οὐκ ἔστιν οὐχ ὃ βούλονται λέγειν οἱ ἄνθρωποι κενόν, τοῦτ᾽ ἐξελέγχουσιν, ἀλλ᾽ ἁμαρτάνοντες λέγουσιν, ὥσπερ Ἀναξαγόρας καὶ οἱ τοῦτον τὸν τρόπον ἐλέγχοντες. ἐπιδεικνύουσι γὰρ ὅτι ἔστι τι ὁ ἀήρ, στρεβλοῦντες τοὺς ἀσκοὺς καὶ δεικνύντες ὡς ἰσχυρὸς ὁ ἀήρ, καὶ ἐναπολαμβάνοντες ἐν ταῖς κλεψύδραις. οἱ δ᾽ ἄνθρωποι βούλονται κενὸν εἶναι διάστημα ἐν ᾧ μηδέν ἐστι σῶμα αἰσθητόν· οἰόμενοι δὲ τὸ ὂν ἅπαν εἶναι σῶμα φασίν, ἐν ᾧ ὅλως μηδέν ἐστι, τοῦτ᾽ εἶναι κενόν· διὸ τὸ πλῆρες ἀέρος κενὸν εἶναι.

Here we are told that people want void to be "extension in which there is no perceptible body." Anaxagoras does not show the impossibility of such an extension. Instead, Anaxagoras shows to be false the further claim people make that air is nothing, such that the extension between the walls of the wine-less wineskin is filled with nothing. In showing that the wineskin is in fact full—by showing that air is something—Anaxagoras shows the wineskin's extension is not a case of void. However, because Anaxagoras does not show it to be impossible that there should ever be an extension deprived of body, he fails to show the nonexistence of void. Instead, Aristotle reckons, one must show that an extension deprived of body, whether of air or of some other body.

When Aristotle calls void place deprived of body, he means place to be extension. And he means place as extension not in the second candidate for place sense—the extension or bulk of the placed body itself—but rather, an extension independent of the body of which it is place. It is unaffected by and separate from the body placed in it. It is the third candidate for place that Aristotle had considered in his treatise on place.

Now, Aristotle tells us that "people" (οἱ ἄνθρωποι) want to call this entity void when it is deprived of body. As I note in my Chapter 1 (section 4.2.1), οἱ ἄνθρωποι is not a way to refer to some particular people in Aristotle's Greek. To refer to particular people, Aristotle would likely use the particularizing pronoun *tines*, as he does when describing a view of void that he claims Plato and his allies embraced. He describes their view as what "some people say" (φασίν τινες at 214a13). But he does not use *tines* here. For this group is not a particular set of thinkers. Rather, Aristotle must take the view to which they subscribe to be the mainstream view. And this may quite possibly be a *popular* mainstream (cf. my fn. 48 of Chapter 1). For, were Aristotle wishing to refer only to what the natural scientists at the time thought, he may well have used φυσιολόγοι, a term he deploys for generalizing over what the natural scientists of his time thought. Aristotle's language here thus makes a strong case for this view being common-or-garden. What is more, one of the beliefs associated with the position that void is place or three-dimensional extension is that air is incorporeal, which, as Aristotle claims in my T1 above, contributes to the view that void exists. Yet many natural scientists at the time, including most notably the void-theorizing atomists, realized that air was a body (cf. e.g., ATOM. D110, D118 in Laks & Most). This confusion concerning air then is most likely to be a popular confusion, which bread a popular belief in void.[65]

Or consider also when Aristotle cites what are the same views about place and void at the start of his place treatise, *Physics* IV 1, 208b25-33.

> [T3] Again, those saying there is void call it "place"; for void would be place deprived of body. From these [views] one may suppose that place is something beyond bodies, and that every perceptible body is in place. And it seems Hesiod also speaks correctly in making the abyss first. He says at least, "First of all things came the abyss into being, then broadbreasted earth," [thinking] that there must first be space subsisting for things, because he thought, like the many, that everything is somewhere and in place.

[65] I return to this point about the popular confusion concerning air in my Chapter 3, when I give reasons for thinking that the atomists may have felt they did not need to argue for the existence of void.

> Ἔτι οἱ τὸ κενὸν φάσκοντες εἶναι τόπον λέγουσιν· τὸ γὰρ κενὸν τόπος ἂν εἴη ἐστερημένος σώματος. Ὅτι μὲν οὖν ἔστι τι ὁ τόπος παρὰ τὰ σώματα, καὶ πᾶν σῶμα αἰσθητὸν ἐν τόπῳ, διὰ τούτων ἄν τις ὑπολάβοι· δόξειε δ᾽ ἂν καὶ Ἡσίοδος ὀρθῶς λέγειν ποιήσας πρῶτον τὸ χάος. λέγει γοῦν "πάντων μὲν πρώτιστα χάος γένετ᾽, αὐτὰρ ἔπειτα γαῖ᾽ εὐρύστερνος," ὡς δέον πρῶτον ὑπάρξαι χώραν τοῖς οὖσι, διὰ τὸ νομίζειν, ὥσπερ οἱ πολλοί, πάντα εἶναί που καὶ ἐν τόπῳ.

In T3 the view that place exists and is something beyond and separate to bodies[66] is attributed to "the many" (οἱ πολλοί). T3 further tells us that Hesiod made 'the abyss' or 'the gap' (χάος) first in his theogony, which existed as a space for bodies, such that everything is located in this pre-existing place. Thus, T3 attributes such views both to Hesiod's extremely influential theogony and to what Aristotle calls 'the many,' which we can take to refer to a popular majority.[67]

I think we can now make the following inference. At least according to Aristotle, there was in Greece a dominant idea of place as some non-bodily extension through which bodies move. This extension does not affect the bodies that move through it, nor is it affected by the bodies that move through it. I want to call this view about place "common sense space." Apparently prevalent along the Mediterranean in 4th c. BCE, I will suggest that we see it also in the Indian subcontinent with the development of Abhidharma Buddhism (ca. 5th c. BCE) and Jainism (ca. 7th c. BCE).[68]

---

[66] The language at b28 is ambiguous between 'beyond *all* bodies,' and 'beyond the bodies of which it is place.' The text that precedes T1 speaks only of place as something different from the bodies coming and going within it, which militates in favor of the latter. Yet the reasons for thinking the former instead are Aristotle's citation of χάος and the consideration that place is void, which would suggest beyond *all* bodies.

[67] Someone might object that place in T3 is not incorporeal extension as it was in T1 and T2. Rather, place in T3 is matter, along the lines of the second candidate for place (she may appeal to Aristotle's use in T3 of the Platonic term χώρα as evidence of this). So, the objection goes, in T3 place is underlying matter that provides the space and basis for the existence of corporeal substance or form. Because the matter itself is not corporeal substance or form, it can be taken as void. Aristotle cites this view—what he takes to be the Platonic conception of place and void—at *Physics* IV 2, 209b11-13 and IV 7 214a11-16, where void is matter deprived of "a this or corporeal substance" (τόδε τι μηδ᾽ οὐσία τις σωματική at 214a12). So, one might argue that Aristotle is citing just this here. I thank Mirjam Kotwick for raising this as an interpretive possibility of T3. Yet we should see that this cannot be what is going on here. For the void and place in T3 here is not described as a place of a corporeal substance or a this, but rather the place of mere body (σῶμα at 208b27, 28). In this way, while in the void-as-matter view the presence of corporeal substance was required to fill the void, here mere body is described as filling it.

[68] The origin of Jainism is obscure. Some estimates date it back to the 9th c. BCE.

Both Abhidharma Buddhism and Jainism prominently feature the entity, *ākāśa*,[69] which translators render "space." *Ākāśa* is a permanent, non-bodily, and independent entity, the distinct role of which is to make room for bodies. It does not affect nor is it affected by bodies. And when there are no bodies in it, it is empty. [70] Consider, for instance, the Buddhist philosopher Vasubandhu's (ca. 4th century CE) treatment of *ākāśa* in his Abhidharma Buddhist text, *Abhidharmakośa-bhāsya*. There, Vasubandhu outlines and comments on the views belonging to the Buddhist Abhidharma school, Sarvāstivāda-Vaibhāṣika. He lays out their view on space like this (1-5a-d):

> [T4] (5ab.) The truth of the path and also the three unconditioned (*asaṃskṛtam*) kinds are pure (*anāsravā*)
> What are the three kinds?
> (5c) Space (*ākāśa*) and the two cessations
> …
> What is the reason?
> "The fluxes (āsravā) do not adhere at all in them."
> Thus are the three sorts of unconditioned things described.
> (5d.) In this sense space is that which does not hinder
> Space's intrinsic nature is non-hindrance (*anāvaraṇa*), wherein there is motion of matter (*yatra rūpasya gatiḥ*).

The Sarvāstivāda-Vaibhāṣika view according to Vasubandhu characterizes space as that in which bodies move. It is non-bodily and does not affect the bodies that move through it—nor is it affected by the bodies moving through it. Such a view is repeated across Jain and Abhidharma Buddhist texts. This view of space, what I am calling common-sense space, is apparently consistent with the view Aristotle tells us was predominant in classical Greece. It is striking, and it may say something

[69] The earliest recorded use of *ākāśa* comes from neither tradition, however. It is found earliest in the Vedic text, the *Chāndogya Upaniṣad* (8th-6th c. BCE). There, ākāśa is that from which everything that exists comes to be (*sarvāṇi ha vā imāni bhūtānyākāśādeva samutpadyante*) and that into which everything perishes (I.9.1). In fact, some treatment of *ākāśa* appears in virtually all Indian traditions, though *ākāśa* resembles most closely what I am calling common-sense space in Abhidharma Buddhism and Jainism. What is more, across nearly all Indian traditions, there is close association between air and *ākāśa*. See Jhaveri (1956) for his conceptual history of *ākāśa.*

[70] An important exception to Abhidharma philosophers who subscribe to *ākāśa* is the Sautrāntika school, who did not take space to be a 'real entity' (*dravya*).

about how we human beings experience our surroundings, that this idea of space developed independently across the globe.[71] Perhaps the notion of there being some spatial extension through which we move, which is independent of us and other bodies, holds an intuitive grasp on us all. Indeed, over the 2000 years that followed in Europe, this very common-sense space would continue to weigh heavily on philosophical and scientific discussions of space. It would also remain the view of the popular majority, being labeled common and vulgar by Averroes, Pseudo-Siger of Brabant, and Albert of Saxony,[72] and would be decried by scholastics dedicated to protecting Aristotelian place. Yet it would thrive throughout enlightenment thought. Despite the objections of Descartes, who maintained that it makes no sense to talk of an extension existing apart from the extensions of bodies, in the 17th and 18th centuries we find at least Gassendi, Locke, and Newton all appealing to this same idea of space.

With Newton's writing, common-sense space flourished.[73] It would finally be dealt its death blow by Einstein with the discovery of relativity and the realization that space itself is warped by the matter passing through it. But below the level of general relativity and above the level of quantum physics, in our ordinary everyday experiences of the world, we default to common sense space. We experience space as some non-bodily extended thing, unaffecting and unaffected by us as we move. And even in scientific research into the quantum vacuum today, roughly formulated

[71] Alternatively, it may be worth noting that Democritus is reported to have traveled to India and associated with the so-called gymnosophists (cf. ATOM. P17, P18). Actually, the similarity between Abhidharma Buddhism and Democritean philosophy is striking. For instance, both thought that beyond the atomic *dharmas* (in the one case) and beyond atoms and void (in the other) everything else is convention (ATOM. D14). Obviously, any assertion of influence across the two traditions is speculation. I only wish to raise an alternative to my claim above that common-sense space developed independently across the globe.

[72] Cf. Grant, 9, 267.

[73] Cf. Grant, 245-45, "Newton's absolute, infinite, three-dimensional, homogenous, indivisible, immutable, void space, which offered no resistance to the bodies that moved and rested in it, became the accepted space of Newtonian physics and cosmology for some two centuries. It was, of course, the physical space inherited from the Greeks but given new significance in the early modern period by Patrizi and Gassendi."

as space deprived of as much energy as possible, the 'space' in that formulation is simply bracketed as non-bodily extension, albeit mutable. The usefulness of common-sense space dies hard.

It is this common-sense space that Aristotle appeals to when calling void "place deprived of body." That is, when Aristotle declares what void is, if it exists, the relevant place is non-bodily extension independent of, unaffecting, and unaffected by the placed body. Void is that extension when its empty. So much, then, is clear at this point about what Aristotle thought void is. But an interpretive puzzle arises when we look at how Aristotle proceeds to describe voids over the course of his arguments against it. I will spend the rest of this chapter resolving the interpretive puzzle.

4. Aristotle's two voids: An interpretive problem unsolved by Ross or Hussey

After calling void "place deprived of body" in *Physics* IV, Chapter 7, Aristotle proceeds to talk about two different sorts of void, a 'separated void' (κεχωρισμένον) and 'not separable voids' (μὴ χωριστα). He argues against the existence of a separated void in Chapter 8, and beginning shortly after the start of Chapter 9, argues against the existence of what he calls 'not separable voids."

More specifically, Aristotle begins the refutation contained in Chapter 8, announcing, "That there is no void separated in this way as some claim, let us say again" (214b12). The arguments that target this separated void treat void as an ever-present space through which all bodies travel. In one argument he calls it "a separated and permanent place" (κεχωρισμένῳ τόπῳ καὶ ὑπομένοντι at 214b26). Aristotle refers to it as "place having its own extension" (τόπον ἔχοντα διάστημα αὑτοῦ at 216b32). Before getting precise about what is going on here, we can for present purposes visualize the separated void as something like an unmoving and permanent frame in which bodies travel. Meanwhile, in chapter 9 Aristotle turns to arguments that rarity and density require voids in bodies, and we hear for the first time of 'inseparable voids.' Upon noting that

some people think that a body gets denser because matter enters the preexisting empty spaces within it, Aristotle begins to respond (216b30):

> [T5] If on the one hand they call the rare that having many separated voids, it is clear that, if there is not able to be a separable void just as there is no place having its own extension, there is no rare in this way. If on the other hand they mean not separable, but nevertheless there is some void within, this is less impossible.
>
> Εἰ μὲν οὖν τὸ μανὸν λέγουσι τὸ πολλὰ κενὰ κεχωρισμένα ἔχον, φανερὸν ὡς, εἰ μηδὲ κενὸν ἐνδέχεται εἶναι χωριστὸν ὥσπερ μηδὲ τόπον ἔχοντα διάστημα αὑτοῦ, οὐδὲ μανὸν οὕτως. Εἰ δὲ μὴ χωριστόν, ἀλλ᾽ ὅμως ἐνεῖναί τι κενόν, ἧττον μὲν ἀδύνατον

In T5 we are given two alternatives for what the voids found inside rarefied bodies might be. Either they are 'separated,' referring to the sort of void Aristotle rejected in chapter 8, or they are 'not separable.' It may be helpful to consider an example. Take for instance the rarefied body, a sponge. Aristotle seems to be saying that within the holes of the sponge there may on the one hand be separated void[74] and on the other inseparable voids. So, as far as determining what "separability" and "inseparability" means, the difference between the separated void and the newly introduced not separable voids cannot be that the latter are found within rarified bodies while the former is not. For T5 considers both in bodies. Where, then, lies the difference between them?

It is worth noting the thoughts of two *Physics* IV commentators, Edward Hussey (1983) and Sir William David Ross (1936), on this question. In their commentaries they offer different views that exhibit the various difficulties to be resolved.

Hussey claims that a separated void is "a receptive extension actually free of body" (128). He appears to think that this separated void just is what Aristotle thinks void is. He paraphrases

[74] Actually, Aristotle says separated voids, *plural* (κενὰ κεχωρισμένα). By this I take him to mean just, 'many bits of the separated void.' This is because the separated void is treated in Chapter 8 as the void through which all bodies move, and so it is strictly untrue that there are many such separated voids. I thank Benjamin Morison for raising the plural point with me.

what he calls Aristotle's definition of void as "that [extension] not full of tangible body (i.e., that which is capable of receiving tangible body but does not in fact contain any)" (126). By Hussey, both the separated void and the void that is captured by the quasi- definition are extensions receptive of bodies that are empty. They are also, he notes, both place on the third candidate for place, an extension independent of the bodies of which it is the place. Regarding voids in the rare, Hussey does not address what it means to have separated voids in rare bodies. He addresses only inseparable voids in the rare. On these, he writes, "inseparable void, i.e., void which could not exist independently of the body inside which it is. This might be true in various ways: the void might be trapped as 'bubbles' inside the body or be present as an inseparable ingredient in a mixture or compound" (135). For Hussey, inseparable voids are inseparable because they cannot exist independently of the bodies inside which they are. Presumably, then, he thinks that the difference between the separated voids and the inseparable voids is that one is independent of all bodies while the other is trapped within a body and dependent upon that body. Yet he does not explain how the separated void could also be in bodies, as it T5 shows it should be. Further, he does not explain how the inseparable voids are truly voids on Aristotle's quasi-definition, nor does he explain how they are 'places deprived of body.'

Ross takes a different view. He argues that Aristotle considers "three types" of void (59). The first is separated voids outside body; the second is separated voids within body; and the third is inseparable voids. The separated voids may or may not be in bodies, and when they are, they are "little pockets of void capable of receiving body" (593). The inseparable voids, he says, are always found within bodies, are necessarily full, and are 'diffused throughout' bodies. Ross thus unlike Hussey explains the difference between separated voids being in the rare and inseparable voids being in the rare. However, his notion of inseparable voids—full voids diffused throughout

a body—is obscure. Moreover, since void is just place deprived of body, it is difficult to see how necessarily full voids are voids at all.

Consideration of Ross and Hussey's views makes clear that there are a number of variables that need to be accounted for in an interpretation of what Aristotle thinks void is. If Aristotle uses "void" consistently, then both the 'separated' void in Chapter 8 and the 'not separable' voids of Chapter 9 must be "place deprived of body" on the third candidate for place, that is, they must both be extensions independent of the bodies of which they are place. Yet what could 'separated' and 'inseparable' mean, such that both are these extensions? In fact, if the inseparable voids are also extensions independent of the bodies of which they are place, in what way are they 'inseparable'? Further, as noted above, the 'separated' void must no less than the 'inseparable' void be able to be in rarefied bodies—in what sense then is that void still 'separated' while being in a body? Again, Aristotle repeatedly notes that targeting the 'separated' void is to target those saying place is "something separated." The inseparable voids are introduced by contrast with separated voids, where the latter are there likened to "place having its own extension." So, while the separated voids are likened to place having its own extension and place as something separated, the inseparable voids are not. How could both voids fit one sort of 'place deprived of body,' yet appear different sorts of places entirely? These, then, are the difficulties an interpretation of the 'separated' and 'inseparable' voids must resolve.

In order to see what these two voids are, I want to return to Aristotle's presentation of the third candidate for place. When Aristotle discusses the candidate in the place treatise, he almost always refers to it as 'an extension *between*,' i.e., between the walls of some vessel like a jug. When Aristotle first introduces it, he speaks about it as follows (*Physics* IV 4, 211b14-17),

> [T6] Because what is contained and divided off frequently changes, for instance water from the jug, while that containing remains, the extension between seems to be something, as something beyond the body displaced.
>
> Διὰ δὲ τὸ μεταβάλλειν πολλάκις μένοντος τοῦ περιέχοντος τὸ περιεχόμενον καὶ διῃρημένον, οἷον ἐξ ἀγγείου ὕδωρ, τὸ μεταξὺ εἶναί τι δοκεῖ διάστημα, ὡς ὄν τι παρὰ τὸ σῶμα τὸ μεθιστάμενον.

That is, an inner extension between the walls of the jug persists while water that fills the jug comes and goes. Aristotle rejects this extension as the place of the water. He argues at 211b19-23 that if such an extension were its place, the water in the jug would occupy a potentially infinite number places, and so there would be an indeterminate number of redundant places. As I discussed in my section 4 above, to argue this he imagines the jug pouring out the water. Now, we should consider what the extension between the walls of the jug is doing during this pouring process. It is there between the walls of the vessel, serving as that interval by which we tell just how much water is left in the vessel. When the water is poured from the jug, the jug tilts over and so too, presumably, this extension tilts with the jug. That the extension itself moves is suggested by the next lines of the text (211b23-24). Here, Aristotle appears to give a further, second argument against the view that such an extension could be place. And this second argument draws an absurdity from the extension's own movement.[75]

> [T7] At the same time the place will be changing. Thus there will be another place of the place, and there will be many places together.
>
> ἅμα δὲ καὶ ὁ τόπος ἔσται μεταβάλλων. ὥστ᾽ ἔσται τοῦ τόπου τ᾽ ἄλλος τόπος, καὶ πολλοὶ τόποι ἅμα ἔσονται.

[75] This is where I differ from Morison's reading, who takes these lines to be in support of the argument that preceded (127). He is in part able to interpret it this way by translating ὥστ᾽ ἔσται τοῦ τόπου τ᾽ ἄλλος τόπος not as "there will be another place of the place," as I did, but as "there will be a place other than the place."

Since the jug is tilting as it pours out the water, the extension itself, the place, is likewise tilting. But then the extension is in a different place than it was before, and in order to explain this, that is, the change of place of the extension, the place itself must have a place, and there will be many places together. Aristotle takes this result also to be absurd.

So, here is what we know about the jug's extension. We know that it is independent of the bodies of which it is the place. Water and air go in and out of the jug, while the extension remains between the walls of the jug. It moves around with the jug and serves as place for the contents of the jug even when the jug itself moves. It is then an extension that, while independent of the bodies of which it is the place, is 'tethered' to and dependent upon the vessel, e.g., the jug, that delimits it. The extension is a place of bodies in virtue of its relation to a vessel into and out of which the placed bodies go. We can see why this sort of tethered extension is explanatorily appealing as place. We may talk about where some contents are in a moving vessel, say, where some passengers are within a car—who is in the front driver's seat, in the back, and so on. And we do so by reference to the extension between the extremities of the car. When a car with passengers moves at 20mph, the passengers are moving at 20mph with respect to the parked cars nearby. They are not however moving at 20mph with respect to one another. They may all be still with respect to each other. Or they may also be moving in slight ways within the car, e.g., one passenger shifts her seat backwards. And we can explain these subtle movements in the car by reference to the extension that travels with them. Indeed, something much like this is what Newton had in mind when he spoke of relative inertial frames.

I want to suggest that while this tethered extension is the third candidate for place in its paradigmatic form in the place treatise, Aristotle in the void inquiry will also use what I want to call a 'maximally stretched' application of that candidate. For I am now going to suggest that

Aristotle also considers an extension completely untethered to any vessel—perhaps only the 'vessel of the universe,' so to speak. It is a maximally stretched, universe-spanning extension, and Aristotle will use it in addition to the tethered extension in the void inquiry.

That Aristotle does not always consider the extension as tethered to a jug or vessel was already clear from my T3, where he cites Hesiod and the *hoi polloi* as embracing this third candidate. There, the place extension is described as preceding all things, or as he quotes Hesiod in T3: "First of all things came the abyss into being, then broadbreasted earth." Here, unlike the case of the jug, the extension is independent not only of the bodies of which it is the place, but independent of all bodies altogether. While in the case of the jug the extension is tethered to the vessel within which it was found, here the extension is tethered to no vessel—no jug or room. In fact, on the view presented in T3, it is described as prior to bodies, such that all bodies in the universe could go out of existence, and this apparently universe-spanning extension would remain. Here, the extension counts as place not in virtue of an ontological relation it bears to some particular bodily vessel, as with the jug. Rather, the extension is a place simply in virtue of its being just that: an extension that can be occupied by bodies. While the extension tethered to a vessel is akin to a relative Newtonian frame, this extension is akin to an absolute Newtonian frame. It is that in relation to which all bodies move.

In what follows, I want to suggest that this maximally stretched, universe-spanning extension, when deprived of body, is the so-called 'separated void.'[76] And the individual extensions tethered to particular vessels, when deprived of body, are the 'inseparable voids.'

[76] Note that the Greek for "separated" Aristotle uses is the perfect κεχωρισμένον, perhaps suggesting 'having been separated,' or indeed having been stretched. This is in contrast to the Greek that Aristotle uses for "inseparable," the verbal adjective χωριστα. I thank Mirjam Kotwick for raising this point.

To compare the two, consider the behavior of both within rarefied bodies, as both are considered in Chapter 9. First take the case of the separated voids within bodies. Consider what this would look like on the atomist picture of bodies, where "bodies" is just to say, "aggregates of atoms." These aggregates of atoms move around within the void extension that spans the universe. When these aggregates are rare, i.e., when there are less atoms relative to void in the aggregate, this is simply to say that the atoms of the aggregate are farther apart from one another in the universe-spanning void. Or imagine instead of the atomist aggregates, a sponge floating in the separated void. What is 'in' each hole of the sponge is just some bit of the universe-spanning void. When the sponge moves, it moves into a different part of the universe-spanning void. It is not as though for each hole in the sponge there is a special and particular void, which moves along with the sponge. It is rather that the sponge moves through the void—as the sponge moves you can 'see through' its holes to ever-different bits of the universe-spanning void, as it were. [77]

Contrast this with the 'inseparable voids.' These voids are too the third candidate for place, yet as its paradigmatic articulation would have them: extensions tethered to particular vessels. Recall again the sponge and say it has fifteen holes. In this case, the internal surfaces of the sponge that surround its fifteen holes are like the walls of fifteen vessels. Now, for each of these fifteen little vessels, there is an individual extension between the walls of the hole tethered to that particular hole. This extension may either be empty, when the hole is empty, or full, when, say, the sponge has been soaked with water. For, since the extension is independent of the bodies of which it is place (in this instance the incoming water), it persists throughout the soaking up water. When the sponge itself moves, the fifteen little void extensions move with it. All these extensions are dependent upon and tethered to the sponge. They are places only in virtue of their relation to

[77] Cf. my understanding of the plural in T5 (fn. 74 above). In a rarefied body, there are many separated voids in that there are many bits of separated void.

the sponge on which they are dependent. Should the sponge cease to exist, so would they. With the inseparable voids Aristotle may have in mind not the atomists but Empedocles's pores in bodies. [78] Sometimes the Empedoclean pores are empty. Sometimes they are full. The extensions of these pores belong to and move along with their host body as it travels around in what is otherwise a plenum.[79]

We can also now explain why the separated void is likened to place 'having its own extension' in T5, while the inseparable voids are not. For in the case of the inseparable voids, place does not actually have its own extension—it is true that there is a place extension there, but the extension is only place in virtue of its relationship to and dependence upon the vessel, into and out of which the placed bodies move. In contrast, the universe-spanning separated void is place as extension precisely in virtue of its being just that, an extension that exists in its own right. It is true to say in this case only that place has its own extension.

We can then also see why Aristotle calls the inseparable voids 'less impossible' (ἧττον μὲν ἀδύνατον at 216b33) than the separated voids in T5. Aristotle elsewhere denies the possibility of a mere geometrical entity that is separated from bodies, dependent upon and delimited by no body.[80] Yet the separated universe-spanning extension of the separated void is meant to exist

[78] See GC I 8, where Aristotle calls Empedocles's pores in bodies 'basically voids.' Empedocles himself likely did not call the pores voids, as Empedocles denies that anything is empty (Cf. EMP. D49, D50).
[79] It is possible that the atomists also sometimes spoke as if they embraced the inseparable void. I thank Hendrik Lorenz for raising this possibility with me. Namely, they may have spoken as if there were inseparable voids when theorizing at the level of the composite body, and so spoke about bodies' voids and voids moving along with their composite bodies. This would only be a manner of speaking however, since at the level of the atoms, i.e., the ultimate constituents, there is just separated void.
[80] Aristotle argues for the impossibility of mathematical entities, numbers or magnitudes, 'being separated' from bodies at *Metaphysics* XIII 2 and XIV 3, e.g., at 1090a29, "Also it is clear that mathematical objects are not separated" (καὶ δῆλον ὅτι οὐ κεχώρισται τὰ μαθηματικά). In general, for an exposition of Aristotle's view that items in non-substance categories such as quantity depend upon substance, see e.g., Frede (1987).

independently of all bodies. In contrast, the inseparable extensions of the inseparable voids, being dependent upon and delimited by bodies, are not themselves impossible entities.

Aristotle is distinguishing between two genuinely different sorts of void. The point of difference lies at whether the extension in question is attached to bodies that move around or is the absolute extension within which all bodies move, whether it is inseparable or separated. Aristotle's distinction can now illuminate the debate between Algra and Sedley that I began with. Recall, Sedley distinguished between void as occupant and void as place. Now, if Sedley meant by void as place void as separated place, the fixed extension spanning the breath of the universe, among which all bodies move, then it is indeed true that such a thing will never move nor itself occupy space. Perhaps this is what Sedley meant, in which case the difference between the two voids Sedley outlines is not simply a matter of perspective. Still, taking into account the Aristotelian inseparable voids shows us that what Sedley called voids as occupants, voids which move around, can too be voids as places—just not as separated place. A void extension will always be a place for a body to enter, though whether that extension is itself attached to a body or is the independent extension that locates all bodies in the universes will make the difference.

In arguing that the 'inseparable' and 'separated' voids both track the third candidate for place, I have aimed to show that both are truly "places deprived of body" on the third candidate for place and so truly voids by Aristotle's own lights. I tried to do this in a way that makes the distinction between 'separated' and 'inseparable' voids meaningful, with each being same sense of place yet belonging to a very different sort of universe. In one, bodies act as vessels bearing individual void extensions, which travel around with the bodies that delimit them. In the other, a void extension existing in its own right spans the breadth of the universe, being the expanse among which all bodies move. Yet on each of these pictures, place is deprived of body, and place is a

three-dimensional extension independent of and unaffected by the bodies of which it is the place. That extension when empty is just what void is. And with this Aristotle launches the *quid nominis* for void, into the next 2000 years of science: void is common sense space when it is empty.

Chapter 3

What Proponents of The Existence of Void Argued (And What They Didn't)

Introduction

In my Chapter 1 I argued that Aristotle has a method for conducting inquiries that aim at proving nonexistence. Aristotle applies this method for proving nonexistence in his *Physics* IV 6-9 treatment of void. According to the method, when seeking to prove the nonexistence of some thing, the inquirer must first get clear about what that thing is, if it exists. Arriving at that answer requires doing justice to what the people who talk about the thing say about it. Thus, after laying out what proponents and opponents of void's existence think void is (or would be) in the first half of his inquiry, *Physics* IV 6-7, Aristotle finds that void is place or extension deprived of body, if it exists.

In Chapter 2 I then closely examined that answer, place or extension deprived of body. I showed that Aristotle consistently retains the same account of what void is, if it exists, throughout the refutations of the second half of the inquiry, *Physics* IV 8-9. That is, when Aristotle in *Physics* IV 8-9 addresses and argues against two apparently different sorts of entity, a "separated void" and an "inseparable void," each are in fact cases of place and extension deprived of body. So, Aristotle sticks to his quasi-definition of void throughout, which, as I showed in Chapter 1, he arrived at in the first place using what void's proponents and opponents say about void.

Aristotle's engagement with void's proponents in particular is extensive. Seeking to do justice to the void they imagine, he considers at length what they have said about void. They make several claims that support the existence of void. Aristotle lays out their claims at *Physics* IV 6, 213b2-29, which he uses to arrive at his answer to what void is, if it exists. After arriving at his answer, he revisits their claims at *Physics* IV 7, 214a16-b11 in order to show that they do not in fact support the existence of the void to which they are committed. So far, however, I have not

offered any treatment of the proponents' claims in support of the existence of void, which Aristotle takes so seriously.[81] The present chapter is dedicated to analyzing Aristotle's discussion.

In Part 1 of the chapter I offer an analysis of the claims in support of void's existence. I analyze both Aristotle's initial *Physics* IV 6, 213b2-29, presentation of the claims and his second treatment of them at *Physics* IV 7, 214a16-b11. In Part 2 I draw out an upshot of my analysis. I argue against the orthodox reading of *Physics* IV 6, 213b2-29, which holds that the claims Aristotle presents there include arguments for the existence of void offered by the atomists. Instead, I argue that they were not intended to be arguments for the existence of void. Rather, I maintain that they were explanations of physical phenomena that presupposed the existence of void. I then argue that the reason why Aristotle does not cite any atomist arguments for the existence of void in *Physics* IV 6-9 is because the atomists likely never gave any such arguments.

1. Analyzing the claims by void's proponents

Aristotle recounts four claims[82] that those saying void exists make. The first three claims concern void's role in

1. bodies changing in respect of place
2. bodies coming together and collapsing
3. nutrition

The fourth claim is a theory of void held by an unnamed Pythagorean or Pythagoreans.

[81] Aristotle takes the proponents' support for the existence of void to be more compelling than the opponents' support for the *non*existence of void. Aristotle writes at *Physics* IV 7, 213b2-4, "These people, then, have not reached even the threshold of the problem, but rather those who say that the void exists" (Οὗτοι μὲν οὖν οὐ κατὰ θύρας πρὸς τὸ πρόβλημα ἀπαντῶσιν, ἀλλ᾽ οἱ φάσκοντες εἶναι μᾶλλον).

[82] It is controversial whether there are four claims or five. The controversy stems from whether to take the claim about ashes at 213b21 as support for the claim about nutrition or as itself a separate point. Ross (1936, pp. 582-3) appears to take them to be two separate points. Hussey (1983, 124) appears undecided on this. I return to this question in my sections 1.1.3 and 1.2.3 and defend my interpretation that the claim about the ashes is not a separate point from the nutrition claim.

In 1.1 I consider Aristotle's initial treatment of the claims at *Physics* IV 6, 213b2-29. In 1.2 I consider his second treatment of the claims at *Physics* IV 7, 214a16-b11.

1.1. Aristotle's initial *Physics* IV 6, 213b2-29, treatment

Aristotle treats all four claims when he lays them out first at *Physics* IV 6, 213b2-29. (He treats only three when he returns to them at *Physics* IV 7, 214a16-b11—for reasons that I will outline later). In 1.1.1-1.1.4 I consider Aristotle's first treatment of the four claims at *Physics* IV 6, 213b2-29. I take each of the claims in turn.

1.1.1 The claim about change in respect of place

Aristotle addresses the first claim at 213b4-15:

> [T1] They say, for one, that change in place (i.e., locomotion and growth) would not occur. For change would seem not to be if there were no void. For it is impossible for what is full to receive anything. If it were to receive [a body] and two bodies were in the same spot,[83] any number of bodies could also be there together. For we cannot say the difference beyond which that would not be true. And if this were possible, even the smallest would receive the greatest. For many smalls make a large. Then, if many equals can be in the same spot, so too many unequals. In fact, Melissus shows from these considerations that the whole is unmovable. For he says, if it were moved, there must be void, but there is no void. So, that void is something they show in one way from these considerations.
>
> λέγουσι δ᾽ ἓν μὲν ὅτι κίνησις ἡ κατὰ τόπον οὐκ ἂν εἴη (αὕτη δ᾽ ἐστὶ φορὰ καὶ αὔξησις)· οὐ γὰρ ἂν δοκεῖν εἶναι κίνησιν, εἰ μὴ εἴη κενόν· τὸ γὰρ πλῆρες ἀδύνατον εἶναι δέξασθαί τι. εἰ δὲ δέξεται καὶ ἔσται δύο ἐν ταὐτῷ, ἐνδέχοιτ᾽ ἂν καὶ ὁποσαοῦν εἶναι ἅμα σώματα· τὴν γὰρ διαφοράν, δι᾽ ἣν οὐκ ἂν εἴη τὸ λεχθέν, οὐκ ἔστιν εἰπεῖν. εἰ δὲ τοῦτο ἐνδέχεται, καὶ τὸ μικρότατον δέξεται τὸ μέγιστον· πολλὰ γὰρ μικρά ἐστι τὸ μέγα· ὥστ᾽ εἰ πολλὰ ἴσα ἐνδέχεται ἐν ταὐτῷ εἶναι, καὶ πολλὰ ἄνισα. Μέλισσος μὲν οὖν καὶ δείκνυσιν ὅτι τὸ πᾶν ἀκίνητον ἐκ τούτων· εἰ γὰρ κινήσεται, ἀνάγκη εἶναι φησί κενόν, τὸ δὲ κενὸν οὐ τῶν ὄντων. Ἕνα μὲν οὖν τρόπον ἐκ τούτων δεικνύουσιν ὅτι ἔστι τι κενόν.

[83] I offer an analysis of this locution, ἐν ταὐτῷ or ἐν τῷ αὐτῷ, as well as its counterpart, ἅμα, in my next chapter, Chapter 4, which is dedicated to interpreting the difficult 'cube argument' against the existence of void in *Physics* IV 8, 216a26–b20. The locution, ἐν ταὐτῷ, will figure centrally in that argument. In my Chapter 4 treatment, I defend an interpretation of ἐν ταὐτῷ and ἅμα offered by Emily Katz (2022) that ἐν ταὐτῷ and ἅμα should both be understood as meaning 'have the same relative position,' such that when two bodies are ἐν ταὐτῷ this is to say they have the same relative position. I neutrally translate ἐν ταὐτῷ as 'in the same spot' and ἅμα as 'together.'

This is an argument that change in place, glossed as locomotion and growth, requires void. This is not the first time in the *Physics* that Aristotle notes that change (of one sort or another) ostensibly requires void. At the start of his treatment on change in *Physics* III, after claiming that change appears to require the infinite, Aristotle remarks at 200b20-21 that change also seems impossible without place and void and time. These four apparent conditions of change structure the discussion of Books III and IV of the *Physics*. After his treatment on change, Aristotle discusses the infinite in *Physics* III and place, void, and time in *Physics* IV.

In T1 above Aristotle returns to the claim that change requires void. Specifically, he writes that locomotion and growth seem to require an empty space into which traveling and growing bodies can move or expand. Aristotle's explicit positive reason in T1 for why such empty space is necessary for the traveling and growing body is that what is full (τὸ πλῆρες) cannot receive anything while remaining full. In a recent paper, Gábor Betegh (2016) finds that τὸ πλῆρες, fullness or solidity, is offered in antiquity as a brute, positive reason for the inability of two bodies to interpenetrate, including by Melissus, whom Aristotle cites here. Aristotle thus uses the fact of the solidity or fullness of bodies to explain why empty space is necessary in T1. That is, if a body is already somewhere, a new body cannot arrive there while the first body remains, interpenetrating it, since the first body is full and cannot receive anything.[84] So, an empty space is necessary instead.

[84] As Betegh notes (409), Aristotle apparently does not consider it an option that the first body simply get denser, with the matter of the second body being 'added' to the first. Instead, as Betegh also notes, Aristotle's claims here are suggestive of a commitment to the conservation of volume, such that, if a body is added to another, the resulting volume must equal the sum of the volumes of the two bodies. Indeed, I believe that Aristotle's treatment of all three of the void proponents' claims in *Physics* IV 6-7 are suggestive of (though do not necessitate) some commitment to the conservation of volume of bodies. I suspect that a paper could be written on this commitment, which I think would show that while Aristotle is committed to the conservation of volume in some cases, he is not committed to conservation in the case of elemental transformation. I return to this hypothesis in my dissertation's conclusion, where I discuss some possible implications of my research.

Now, Aristotle does not stop his exposition of the argument that change in place requires void at this point.[85] Rather, Aristotle offers a second, negative reason, namely, if there were no void and two bodies were to interpenetrate, our notions of size and equality would be eroded. His argument here takes the form of *reductio ad absurdum*. Namely, if there is no void and two bodies interpenetrate, then any number of bodies could be there interpenetrating at once, since, Aristotle claims, it would be arbitrary to limit the interpenetration of bodies to two bodies or five or any number. And if any number can be in the same spot, then, he claims, 'Even the smallest [body] would receive the greatest [body]. For many [small bodies] make a large [body].'' He maintains that further, "if many equals can be in the same spot, so also can many unequals." These two consequences, that the smallest body could receive the greatest body and that many unequal bodies could collocate, are taken to be absurd. Thus, the original premise for *reductio*, that there is no void, is to be rejected.

Consider in detail the *reductio*'s progression. First, the thought is seemingly that while a place that is exactly the same size and shape of a body may contain that body and be fitted to it, when granting interpenetration, we can imagine another body, which is also the same size and shape of that place, entering into the place and becoming coincident with the first body. Yet since it is arbitrary to limit interpenetration to two bodies, we can imagine any number of bodies of that size coinciding there. But, Aristotle remarks, this would mean that the smallest place could contain the largest body—say, the whole earth could fit into a vase. For, on the scenario imagined, we could chop up the earth into vase-sized bits and place each bit into the vase, one after another. In this way, the vase could contain the earth. And this is absurd. Aristotle does not tell us why he takes it to be absurd. Most likely, I reckon, he thinks that it is absurd because it does away with

[85] I follow Betegh's (404-405) analysis of *Physics* IV 6, 213b4-15, in thinking that Aristotle offers both a positive and a negative reason.

any usefulness of distinctions in size. Aristotle then continues in T1, "if many equals can be in the same spot, so also can many unequals." This is to say, while all the bodies coinciding in the place (to which they are equal) are equal to each other, an aggregate body made up of any of those bodies together has a size unequal to each. In this way, many equals coincide with many unequals. Aristotle too takes this to be absurd, though again he does not tell us why. Presumably, it is absurd because it does away with the notions of equality and inequality

Aristotle then in T1 holds that it is "from these considerations" (ἐκ τούτων) that Melissus showed the cosmos to be unchanging. Which considerations is Aristotle referring to? We know from surviving fragments that Melissus took change to require void and void to be impossible, and that he used these claims to show that the cosmos is unchanging (MEL. D10 in Laks & Most). We also know that Melissus took change to require void because he thought that what is already full cannot receive an additional body, thereby endorsing what I called Aristotle's positive reason above.[86] While we cannot say for certain, perhaps Melissus also considered what I call Aristotle's negative reasons as well. In any case, when Aristotle says that it is "from these considerations" that Melissus shows the cosmos to be unchanging, we can take the considerations Aristotle has in mind here to be at least the point that change requires void and the point that what is full cannot receive anything.

1.1.2 The claim about coming together and collapsing

Consider now what Aristotle next presents as the second claim of those affirming the existence of void at 213b15-18:

[86] MEL. D10 (excerpt): "Nor is there any void; for void is nothing; and what is nothing cannot be. Nor does [the cosmos] change; for it cannot withdraw in anywhere but is full. For if there were void, it would withdraw into the void; but there being no void there is no withdrawing."

> [T2] —in another way that some bodies seem to come together and collapse, e.g., they say that casks receive the wine even with the skins, as the condensing body comes together into the voids within.
>
> ἄλλον δ᾽ ὅτι φαίνεται ἔνια συνιόντα καὶ πιλούμενα, οἷον καὶ τὸν οἶνόν φασι δέχεσθαι μετὰ τῶν ἀσκῶν τοὺς πίθους, ὡς εἰς τὰ ἐνόντα κενὰ συνιόντος τοῦ πυκνουμένου σώματος.

Aristotle in T2 cites a belief that a body's coming together and collapsing require void. Those who believed this use as evidence what they think explains why a cask (*pithos*) that would otherwise be filled to the brim with a certain quantity of wine can on another occasion hold both that quantity of wine and the skins containing the wine.[87] These observers would have had occasion first to notice the wine in the cask alone without skins. Namely, during the fermentation period, wine was left to ferment by itself in *pithoi,* heavy, half-buried ceramic casks. These casks facilitated circulation and the mild temperatures needed for fermentation. During the first ten says of fermentation the wine would undergo active, gaseous fermentation in these casks. It would then continue fermenting in the casks for thirty days, after which it is left for however long the vintner wishes to age it.

Once the wine was ready for consumption, a laborer would undertake the difficult task of ladling the wine out of the cask, which was deep and fixed in place in the ground, and pouring the wine into an animal skin sack. Such animal skin sacks made the wine readily transportable. The wine-filled skin sack would enable the vintner to deliver the wine to the market. However, if he did not plan to go to the market straightaway, he would likely order the skin containing the wine to be put *back* into the cask—not for fermentation purposes, but rather in order to store the wine in an environment that was protected from excessive heat and animals. Wine needed to be stored in a cool environment lest it should be damaged. And rats were a known problem in the storage of

[87] I am grateful to Caroline Cheung for her help elucidating the context in which someone would observe the same quantity of wine in a *pithos* on these two different occasions.

food and wine. So, the vintner would have ordered the animal skin containing his newly fermented wine to be stuffed back into the cask (he would not have ordered the wine to be poured out of the skins and into the cask directly, since getting wine out of these casks is such a laborious task). And because it was unlikely for the skins to be completely full of wine, such that they would be blown up like a wine-filled balloon, the skins would remain floppy and flexible, able to be smushed back into the cask despite their new contents. At this point an observer may have found it remarkable that the very same cask that was filled with the wine alone during fermentation now also fit the skins containing that same wine.

I say 'vintner' above, but in fact an ordinary homemaker may have made wine. The expensive casks may have been passed down through families, and records reveal them at small farms. So, there is reason to think that observing wine at these two stages in the same pithos was common enough. People may have sought to explain how the cask seemingly fit more the second time. Their explanation then made it back to Aristotle.

Their explanation, Aristotle tells us in T2, goes roughly like this. When the wine-filled skins are smushed back into the cask, the wine itself comes together and collapses (συνιόντα καὶ πιλούμενα) by withdrawing into its own internal voids. So, the wine had voids in it all along, and under the added pressure of being smushed into the cask with the skin, the wine retreats into its voids, thereby getting denser (πυκνουμένου) and shrinking in volume. In this way the cask can fit the wine-filled skins just as it fit the wine alone.

It is worth pausing to consider Aristotle's choice of words when he recounts their explanation above, specifically σύνειμι and πιλέω at 213b16, as well as my translations of them. Importantly, these are technical terms in Aristotle's *Meteorology* that pick out different processes. Seeing what these words mean in the *Meteorology* will enable us to better understand Aristotle's

treatment of the claim here at *Physics* IV 6 213b15-18, as well as what he says when he returns to the void proponents' claim at *Physics* IV 7 214a32-b1. In the *Meteorology* we find that some things are able to συνιέναι but not able to πιλεῖσθαι. And while everything that can πιλεῖσθαι can also συνιέναι, not everything that can συνιέναι can πιλεῖσθαι. What is more, in order for something to πιλεῖσθαι, it must at the same time συνιέναι, but it is not the case that in order to συνιέναι, a thing must at that time πιλεῖσθαι. Let us consider in detail what these terms mean. Take first just the case of συνιέναι. For something to συνιέναι is for its parts to come together more closely—for it to gather itself together, such that the gaps between its parts become smaller. In this way, what was scattered or spread out becomes less scattered or spread out. So, we would say that a crowd 'comes together' when its various members get closer to one another. Or we would say that my body comes together when I curl up in a ball. Or take some examples from the *Meteorology* itself. In his *Meteor.* II.9 discussion of thunder and lightning, Aristotle writes that when clouds come together and unite (συνιόντων καὶ συγκρινομένων at 370a31), the dry exhalation that was present in the clouds is squeezed out, and that swift ejection causes thunder and lightning. In this way, what was scattered about comes together (συνιέναι), such that its various bits close in.

Now, as I glossed, not all things that can συνιέναι in this way can πιλεῖσθαι. Liquids, for instance, can come together as I have sketched but cannot πιλεῖσθαι. Aristotle describes liquids as being able to συνιέναι in the *Meteorology* (e.g., at II 9, 370a4, in a discussion of what water does when it cools; also at IV 9, 387a14 in a discussion of viscous things). However, he clearly indicates that liquids are not πιεστὰ (I translate this as crushable) at 386b11, and, because he tells us at 387a16 that what is not πιεστὰ is not πιλητὰ (collapsible), liquids are therefore not collapsible, that is, they are not able to πιλεῖσθαι. Why does Aristotle say that liquids such as water are not crushable, and so not collapsible? He claims at 386b1-5 that what is crushable must have pores

inside it, empty of its own material, such that the body can come together into them.[88] His examples for crushable things are sponges, wax, and flesh. What is not crushable cannot come together into pores, or as he writes at 386b9-11:

> [T3] Things that cannot be crushed are those which are not naturally such as to come together into their own pores upon being forced (μὴ πεφυκότα συνιέναι ὥσει εἰς τοὺς ἑαυτῶν πόρους), since either (1) they have none or (2) they are full of a material harder than themselves. So, neither iron, stone, water, nor any liquid is crushable.

In T3 Aristotle gives two reasons why something may not be crushable (1 and 2). Presumably, liquid is not a case of (2), i.e., what cannot be crushed because there is harder material inside. Rather, liquid must be a case of (1). It cannot be crushed because it lacks any pores into which it can come together. And because we learn that what is uncrushable (ἀπίεστα) is not collapsible (πιλητὰ), liquids are not collapsible (πιλητὰ) and cannot πιλεῖσθαι.

To better envision the difference between a case of mere συνιέναι and a case of συνιέναι into pores (and so πιλεῖσθαι), imagine the difference between water droplets scattered about the air, on the one hand, and a sponge, on the other. When a sponge comes together—say, when it is squeezed by a hand—it comes together into tiny holes internal to it. In this way, the sponge caves in on itself by filling its own pores. It is thus crushable and collapsible. Compare this with the way that water droplets comprising mist might come together in the air. When air cools, Aristotle would say, the bits of water get closer together, causing the liquid in the air as a whole to shrink. It would be inappropriate to say that the liquid comes together by collapsing into pores—for there are no such pores. Rather, the liquid just displaces the air that permeates it.

[88] Aristotle nowhere defines 'pores.' But he likely takes them to be microscopic channels semi-permanent to a thing's structure.

So, then, Aristotle would *disagree* with the claim he recounts at *Physics* IV 6, 213b15-18, when it assumes that wine, a liquid, is a genuine case of πιλεῖσθαι. Because the authors of the claim think that wine has voids or pores, it follows that in their view when the wine or water comes together, it πιληταί. For, they say, wine comes together into preexistent pores, and this is just what πιλεῖσθαι *means* according to Aristotle. This is why Aristotle fittingly recounts their claim with this term.[89] Now, were Aristotle himself describing what he thinks the wine does, he would not use πιλεῖσθαι, since for him wine lacks the pores necessary. One quarrel between Aristotle and the proponents of this view is then over whether wine could be a genuine case of πιλεῖσθαι, a disagreement they have in virtue of their different assumptions about wine's underlying physical structure. (It is not a disagreement about the meaning or account of πιλεῖσθαι).

Another point of disagreement worth noting between Aristotle and the authors of the view is that for Aristotle when something πιληταί into its pores, those pores were never strictly speaking empty—since of course for Aristotle pores cannot be little voids. Rather, when something πιληταί according to Aristotle it is crushed into pores that were filled with some material other than the material of the thing being crushed. Nonetheless, while Aristotle would disagree that wine has pores into which it may be crushed and that there could ever be empty pores, since the proponents of the view he recounts here at *Physics* IV 6, 213b15-18, in fact believe this, and since he is recounting *their* view, it is appropriate that he use πιλεῖσθαι in recounting it.

Finally, I wish to note why I translate συνιέναι and πιλεῖσθαι as I do. I translate συνιέναι as "to come together" since συνιέναι, as we have seen, cannot for Aristotle bear an implication that its subject is crushed into its own pores. And "coming together" is neutral enough not to suggest any such crushing. Meanwhile, πιλεῖσθαι must bear such an implication of being able to

[89] It is no problem that the authors of this view may not have used the term πιλεῖσθαι themselves. When recounting a predecessor's view, Aristotle often uses his preferred language and concepts.

be crushed into internal pores, since this is what makes something able to πιλεῖσθαι. I find that "to collapse" most nearly bears that implication.

1.1.3 The claim about nutrition

Aristotle next at 213b18-22 presents the third claim void's proponents make:

> [T4] And further also growth seems to everyone to come about through void. For food is a body, but it is impossible for two bodies to be together. And they use as evidence for this what also happens with ashes, which receive as much water as an empty jar.
>
> Ἔτι δὲ καὶ ἡ αὔξησις δοκεῖ πᾶσι γίγνεσθαι διὰ κενοῦ· τὴν μὲν γὰρ τροφὴν σῶμα εἶναι, δύο δὲ σώματα ἀδύνατον ἅμα εἶναι. μαρτύριον δὲ καὶ τὸ περὶ τῆς τέφρας ποιοῦνται, ἣ δέχεται ἴσον ὕδωρ ὅσὸ κενόν.

This is a claim that nutrition requires voids. The thought is, since food must go somewhere inside us when we eat, and it cannot go where body already is, as this would involve two bodies collocating, there must be void spaces inside us into which our food goes. The difference between this claim and the previous claim about liquid shrinking is that, while in the latter a body collapses into its own preexistent voids, here a new body enters into another body's preexistent voids. That is, in the previous claim, wine is able to shrink under added pressure by collapsing into its voids. Here in T4, we are able to be nourished because food enters preexistent void spaces within us.

Aristotle then goes on in T4 to discuss what he calls evidence with ashes, which he says, "receive as much water as an empty jar." There is controversy about the status of the ashes evidence (cf. my fn. 82 above): what exactly is it meant to be evidence for? This is also to ask, what is its relation if any to the nutrition claim? I will maintain that it is support for the claim about what happens in nutrition. While this fact will become still more clear when Aristotle revisits the nutrition claim at *Physics* IV 7, 214b1-10, since he states there that his response to the nutrition claim applies to the ashes as well, we can still that it is the case here in T4. After all, if we think

about the picture envisioned in T4, in which an empty jar receives just as much water as it does when containing ashes, this is presumably a case of the water filling void spaces in the ashes, just as the food fills void spaces in us. So, the ashes case and the claim it supports here in T4 are analogous insofar as, since in both there cannot be two bodies in the same spot, yet new matter is coming in (food in the one case and water in the other), there must be empty bits to accommodate the new matter (in the one case empty bits in the body and in the other empty bits in the ashes).

1.1.4 The claim about the Pythagorean theory

Before concluding his initial treatment of those affirming the existence of void, Aristotle cites unnamed Pythagoreans who maintained the existence of void at *Physics* IV 6, 213b22-29:

> [T5] The Pythagoreans too say there is void and it comes upon the cosmos from an infinite breath, as if by actually inhaling the void, which distinguishes natures—the void being a certain separation and distinguishing of discrete units. And this holds first in numbers. For void distinguishes their natures.
>
> Εἶναι δ᾽ ἔφασαν καὶ οἱ Πυθαγόρειοι κενόν, καὶ ἐπεισιέναι αὐτῷ τῷ οὐρανῷ ἐκ τοῦ ἀπείρου πνεύματος ὡς ἀναπνέοντι καὶ τὸ κενόν, ὃ διορίζει τὰς φύσεις, ὡς ὄντος τοῦ κενοῦ χωρισμοῦ τινος τῶν ἐφεξῆς καὶ [τῆς] διορίσεως· καὶ τοῦτ᾽ εἶναι πρῶτον ἐν τοῖς ἀριθμοῖς· τὸ γὰρ κενὸν διορίζειν τὴν φύσιν αὐτῶν.

T5 reveals that some Pythagoreans claimed that a void is breathed in from an infinite breath existing outside the cosmos, which serves to distinguish things from each other. We know from Stobaeus that Aristotle again cites this same view in his lost work *De Pythagoreis*. Stobaeus (PYTHS. ANON. D29) notes:

> [T6] In the first book of his De Pythagoreis, [Aristotle] writes that the heavens are one, but into them, coming from the unlimited, were introduced time, breath, and also the void, which always produces a distinction in the spaces of each thing.

The Pythagorean message is obscure, but one way of reading their claims is to think that what individuates any two distinct bodies is a thin layer of void that persists between them. That is, we

can know that there are two objects as opposed to one or any other number somewhere because there is a thin layer of something between them. Perhaps the Pythagoreans here thought that, even if you were to place the two objects on top of each other, there would nevertheless persists a thin void between them, which would serve to individuate them. A clump of matter uninterrupted by void is continuous throughout and one body. But if it is pervaded by a fine layer of void, it is two separate bodies. In this way the void serves to distinguish natures from one another.[90]

Which Pythagoreans held this view, and so which Aristotle has in mind, is a matter of speculation. Laks and Most place 213b22-29 and the passage from *De Pythagoreis* under "Pythagorean Doctrines Not Attributed By Name" (PYTHS. ANON. D29 and D30, respectively). We might speculate that Aristotle had in mind Ecphantus, since Stobaeus (ECPH. D2) notes that Ecphantus affirmed void, writing, "Ecphantus of Syracuse, one of the Pythagoreans, [affirmed] indivisible bodies and the void of all things (πάντων τὰ ἀδιαίρετα σώματα καὶ τὸ κενόν). For he is the first to have declared that the Pythagorean monads are corporeal."

Aristotle will not return to the Pythagorean claim in his subsequent treatment of the claims at 214a16-b11. It is worth saying a bit about why not. I argued in Chapter 1 that Aristotle arrives at his answer to what void is, if it exists, by appealing to the dominant view of what void is or would be, namely, place or extension deprived of body. I argued that according to Aristotle what makes a particular position the dominant one is that it is the one setting the terms of the debate. That is, when people debate whether or not void exists, they share roughly one position about what it is or would be, if it existed. That position is the dominant one. I argued in Chapter 1 that Aristotle does not give the Pythagorean view of void any further uptake in his second treatment because it does not conform to this dominant view on void, which is just what Aristotle thinks void would

[90] I thank Benjamin Morison for suggesting this interpretation of the Pythagorean view.

be, if it exists. So, were Aristotle to take up the Pythagoreans in his second treatment and argue that void as he himself understands it does not in fact, say, serve to individuate ordinary objects as the Pythagoreans say, he would be talking past them. For what Aristotle takes void to be, if it exists, is not what they bore in mind. Instead, then, Aristotle returns to the first three claims, since they reflect the dominant view of void as extension deprived of body. When Aristotle shows in his second treatment of the three claims that void—as he has now understood it—is not in fact necessary for the physical phenomena they outline, neither growth nor shrinking nor nutrition, he does engage with them on their terms, since it is that very void they bore in mind as necessary.

1.2. Aristotle's *Physics* IV 7, 214a16-b11, second treatment of the claims

When Aristotle in *Physics* IV 7 revisits the first three claims from *Physics* IV 6, he will show that the three claims do not in fact support void. He will also now put to work the quasi-definition for void that he achieved between the two treatments, at *Physics* IV 7, 213b30-214a26. Aristotle found that void, if it exists, is place or extension deprived of body. Now, with a clear sense at hand of the subject in question, he can properly return to the claims of void's proponents and show that such a subject is not in fact required. Indeed, we should note that the reason Aristotle does not immediately critique the claims of void proponents after laying them out in *Physics* IV 6 is that he considered it necessary to first get clear on exactly what it is they were talking about (an exercise which, as I argued in Chapter 1, was in the first place informed by his *Physics* IV 6 presentation of the claims of void's proponents and opponents). It is for this reason that the first and second treatments of the proponents' claims are bracketed by a discussion of what void is, if it exists.

Aristotle transitions to his second treatment by noting that, though void's proponents insist on a connection between change and void, void is not necessary for change in general. He writes at *Physics* IV 7, 214a26-28:

> [T7] But it is not necessary that there is void if there is change—indeed not at all for change in general. This is why it escaped Melissus. For a plenum can undergo alteration.
>
> Οὐδεμία δ᾽ ἀνάγκη, εἰ κίνησις ἔστι, εἶναι κενόν. ὅλως μὲν οὖν πάσης κινήσεως οὐδαμῶς, διὸ καὶ Μέλισσον ἔλαθεν· ἀλλοιοῦσθαι γὰρ τὸ πλῆρες ἐνδέχεται.

Aristotle interprets Melissus such that Melissus took void to be necessary for change in general. He claims that Melissus thought this precisely because he neglected to consider (ἔλαθεν) alteration. Alteration is change in quality. While changes like locomotion and growth may at a glance appear to require an empty place, surely alteration can occur without there being empty places around.

1.2.1. The claim about change in respect of place

Aristotle then moves to consider what he before gave as the first claim by void's proponents, that concerning locomotion specifically (T1 at *Physics* IV 6, 213b4-15). He writes at 214a28-32:

> [T8] —but not even change in respect of place. For things can simultaneously yield to each other,[91] there being no separable extension beyond the moving bodies. And this is plain also in the rotations of continuous things, as in those of liquids.
>
> ἀλλὰ δὴ οὐδὲ τὴν κατὰ τόπον κίνησιν· ἅμα γὰρ ἐνδέχεται ὑπεξιέναι ἀλλήλοις, οὐδενὸς ὄντος διαστήματος χωριστοῦ παρὰ τὰ σώματα τὰ κινούμενα· καὶ τοῦτο δῆλον καὶ ἐν ταῖς τῶν συνεχῶν δίναις, ὥσπερ καὶ ἐν ταῖς τῶν ὑγρῶν

Aristotle in T8 revisits the argument about change in respect of place. Recall, certain theorists thought that there must be an empty extension into which things travel and expand. They thought this, Aristotle reckons, since they did not realize that a body can go from here to there because another goes from there to here. That is, bodies can move and expand because others get out of

[91] I translate ἀλλήλοις as 'to each other,' such that the relationship is reciprocal, as most translators do. It is worth nothing, though, that ἀλλήλοις does not always suggest reciprocity. For instance, in *Categories* 1b16 and 1b21 he uses ἄλληλα, where the relationship in question is subordination, so ἄλληλα must be translated 'one to the other.' I thank Hendrik Lorenz for raising this alternative translation with me.

their way, just like when liquid rotates. For it rotates without needing some additional empty extension that his interlocutors assume, as each part gets out of the way.

1.2.2. The claim about coming together and collapsing

He then revisits the claim about bodies coming together (T2 at *Physics* IV 6, 213b15-18). He writes at *Physics* IV 6, 214a32-b1:

> [T9] And things can also be condensed not into a void but because they squeeze out what is inside (e.g., the air inside when water is pushed together).
>
> Ἐνδέχεται δὲ καὶ πυκνοῦσθαι μὴ εἰς τὸ κενὸν ἀλλὰ διὰ τὸ τὰ ἐνόντα ἐκπυρηνίζειν (οἷον ὕδατος συνθλιβομένου τὸν ἐνόντα ἀέρα).

We will recall, some people thought that a body is able to come together and collapse because it has voids into which it retreats. Because the body fills its own voids, its volume shrinks (it also thereby gets denser). Aristotle instead raises the alternative that what is inside the water is squeezed out when the water is pushed together (συνθλιβομένου).

Briefly, note that Aristotle uses the verb, συνθλίβεσθαι, to describe what the water does. So, when speaking here *in propria persona* (that is, when not simply describing the belief in question as he did at 213b16), he does not use his technical term, πιλεῖσθαι. This is because, as I showed using the *Meteorology*, Aristotle does not believe that water can πιλεῖσθαι, since liquids lack the requisite internal pores. Here he uses instead συνθλίβεσθαι to describe what happens to the water. Aristotle uses συνθλίβεσθαι elsewhere to mean something like 'apply surrounding pressure to.' He for instance uses it when identifying the different uses of human strength at *Rhetoric* 1361b17. There, συνθλίβεσθαι is as a case of strength alongside 'pulling,' 'pushing,' and

'lifting,' and translators render it 'grip.'[92] I translate συνθλίβεσθαι here as 'push together' because it captures the sense of what surrounds pressing inward and because it bears no implication of internal pores. For, as I have shown, Aristotle maintains that liquids have no such pores.

We should next note that, when suggesting that a substance's coming together occurs because it squeezes out what was inside, Aristotle is not tossing out any random suggestion. Rather, this is itself one Aristotelian explanation for a thing's being able to shrink. In his *Meteor*. I 4 discussion of lightning, Aristotle claims at 342a14-32 that lightning occurs because cooling causes clouds to come together (σύνειμι) and condense (πυκνόω), which in turn forces the air that was inside the clouds to be ejected (ἐκκρίνω). Upon being ejected that air combusts into fire. Here, then, we are told that when a thing comes together and condenses what was inside it (which was not part of it) is expelled. Aristotle gives the same description at *Meteor*. II 9, 369b26-29:

> [T10] But if any of the dry exhalation is caught in the process as the air cools, it is squeezed out as the clouds come together (αὕτη συνιόντων τῶν νεφῶν ἐκκρίνεται), and, being carried by force and colliding with the neighboring clouds it strikes a blow, and the sound of which we call thunder.

T10 describes clouds coming together (σύνειμι), where what was inside is squeezed out. Taking stock, it is not a leap to suggest that a thing's coming together and condensing is able to occur precisely because what was inside is squeezed out. And by this explanation we have just what Aristotle says occurs with water at *Physics* IV 7, 214a32-b1. We should realize, then, that he is not merely throwing any explanation out there, but one that he himself would affirm.[93]

---

[92] Cf. also *On Respiration* 472a12-b1, when Aristotle considers the view that breathing occurs because what surrounds presses inward (συνθλίβεσθαι).

[93] As with claim 1, Aristotle's treatment of claim 2 is suggestive of a commitment to the conservation of volume of bodies (cf. my fn. 84 above). According to void's proponents in T2, when a body comes together and collapses into itself, it is able to do so because it has internal, preexistent voids within it, into which it retreats. Because it fills its own voids, it is able to shrink in volume without losing any matter. Aristotle rejects the existence of void. So, in T9 he offers an alternative explanation for what happens when bodies come together and collapse. This is possible, rather, because when the body comes together it pushes out

1.2.3. The claim about nutrition

Aristotle lastly revisits the argument regarding nutrition (T4 at *Physics* IV 6, 213b18-22), writing at *Physics* IV 7, 214b1-10:

> [T11] And it is possible to grow not only by something coming in but also by alteration, e.g. if air comes to be from water. In general, both the argument about growth and that about water poured on ashes hinder themselves. For either not every part of the body grows, or bodies may grow otherwise than by the addition of body, or there may be two bodies in the same spot (then they would claim to solve a common difficulty, but they would not indicate that void is), or the whole body must be void, if it grows in every part and grows by means of void. The same argument applies to the ashes.
>
> καὶ αὐξάνεσθαι οὐ μόνον εἰσιόντος τινὸς ἀλλὰ καὶ ἀλλοιώσει, οἷον εἰ ἐξ ὕδατος γίνοιτο ἀήρ. Ὅλως δὲ ὅ τε περὶ τῆς αὐξήσεως λόγος καὶ τοῦ εἰς τὴν τέφραν ἐγχεομένου ὕδατος αὐτὸς αὑτὸν ἐμποδίζει. ἢ γὰρ οὐκ αὐξάνεται ὁτιοῦν, ἢ οὐ σώματι, ἢ ἐνδέχεται δύο σώματα ἐν ταὐτῷ εἶναι (ἀπορίαν οὖν κοινὴν ἀξιοῦσι λύειν, ἀλλ᾽ οὐ κενὸν δεικνύουσιν ὡς ἔστιν), ἢ πᾶν εἶναι ἀναγκαῖον τὸ σῶμα κενόν, εἰ πάντῃ αὐξάνεται καὶ αὐξάνεται διὰ κενοῦ. ὁ δ᾽ αὐτὸς λόγος καὶ ἐπὶ τῆς τέφρας.

Aristotle first notes that void's proponents did not consider that things may grow not by the addition of something (such as food), but by alteration. In fact, Aristotle makes it a requirement of his own account of growth in *GC* A5 that things do grow by the addition of something. Apparently, Aristotle here recognizes that it is not necessary for him to offer a correct account at this stage, but only to show that there exists a plausible alternative to the explanation given by his interlocutor.

Aristotle in T11 points out that moreover their explanation evoking void backfires. For, he explains, assuming that every part of the body grows, and that a part grows owing to the addition of food, and given their claim that the food fills preexisting voids wherever it goes, the whole body would need to be void. Briefly, we should note that the two requirements Aristotle outlines here for the explanation of growth (i.e., that the body grows in every part and that it grows by the

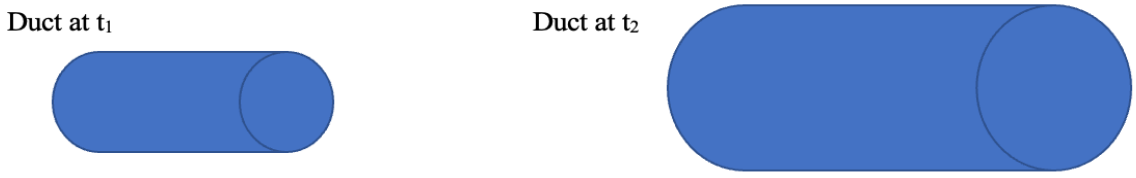
matter that had been inside it. In other words, it shrinks by losing matter. The alternative that it should instead shrink while getting proportionally denser (and so not need to push out any matter) is not considered.

addition of food) will be familiar to readers of Aristotle's *GC* A5, where he lists these same conditions as requirements for his own explanation of growth. He writes at *GC* 321a17-21:

> [T12] For our account of growth must preserve what belongs to the growing or diminishing thing. And this is threefold: every part of the growing magnitude gets bigger, e.g., if flesh, every bit of flesh; it gets bigger by the accession of something; and it does so with the growing thing preserved and persisting.

So, Aristotle thinks that for any explanation of growth, it must at least be the case that the growing thing grows in every part, such that it grows proportionally (ἀνάλογον at 321b28), and that the growth occurs due to the addition of a body. The difficulty for Aristotle's interlocutors in T11 is that in seeking to meet those conditions, their added claim that growth in a given spot requires void in that spot yields a picture where not just any bit of the body is void but the entire body.

Briefly, we can note by comparison how Aristotle's own account of growth will satisfy these conditions (as well as a third condition that there be no void) at *GC* 321b17-322a33. There, he distinguishes between the growing thing's figure (εἶδος) and its matter. The growing thing's figure is its limit, while its matter is the stuff limited by that figure. Aristotle argues that every bit of the growing thing's *figure* (and only the figure) gets bigger, such that the figure grows proportionally. Food is added—meaning that there is more matter than there was before—but it is not true to say that the matter itself grew. And there is no need for a void into which the new food arrives. This is because the figure (the εἶδος) itself grew, which in turn made 'room' for the new material. Aristotle explains this picture by drawing a simile with a duct (αὐλός) at 322b29-31. Consider a duct that grows from time t1 to t2 (below).



The duct, Aristotle claims, is analogous to the growing thing's figure. Before the growth, at t1, the duct is smaller. It is completely filled with matter at t1. It then grows proportionally (i.e., it grows all over), reaching its larger size at t2. The matter that was there at t1 persisted and remains there at t2. However, new matter has been added. The duct at t2, like the duct at t1, is filled completely with matter. It is filled both with the matter that was there at t1 and the food that was not yet there at t1. Thus, Aristotle's account of growth has met all three conditions: the growing thing grows by the accession of food; it grows all over (proportionally); and there is no void. His is far and away superior to the account of his interlocutors here at *Physics* IV 7, 214b1-10. Because they think that the matter (not the form) grows everywhere, that it grows due to the accession of food, and because they think that some bit of matter is able to accommodate the incoming food because there is a void there, voids will be everywhere throughout the matter.

Finally, note that in Aristotle's treatment of the nutrition claim in T11 he groups together the claim about nutrition and the claim about the ashes, writing at b3-5, "In general, both the argument about growth and that about water poured on to the ashes hinder themselves." For, he tells us at 214b9-10, just as the account of nutrition backfired, a parallel backfiring affects their claim about ashes. While Aristotle does flesh out how the parallel backfiring would work, we can presume that it is this. Because they think that a jar full of ashes can take on as much water as it otherwise would without ashes, and it can do this because the water fills empty spaces in the ashes, the ashes must be void all over. Note, the fact that the objection to the nutrition claim and the ashes claim is the same, such that the claims fail in the same way, reaffirms my claim in fn. 82 and section 1.1.3 above that what the ashes were meant to be evidence for was the nutrition claim.

Aristotle now concludes his treatment of void's proponents. He writes at 214b10-11,

> [T13] It is clear then that those [claims] from which they indicate that there is void are easy to solve. (Ὅτι μὲν οὖν ἐξ ὧν δεικνύουσιν εἶναι τὸ κενὸν λύειν ῥᾴδιον, φανερόν.)

2. Claims 1-3 in their historical context

I turn now to considering claims 1-3 in their historical context. Thinkers before Aristotle did much with the postulation of void. We know of the famed atomists in particular for such use. In the *Physics* IV 6-7 inquiry on void, however, Aristotle explicitly references the atomists just once and in passing. Namely, after rebuking Anaxagoras for failing to show the nonexistence of void, Aristotle states at *Physics* IV 6, 213a31-b2, that to show the nonexistence of void, one must show the nonexistence of an extension separable from bodies, whether interspersing the cosmos ("as Democritus and Leucippus say") or outside it. This is the extent of Aristotle's explicit references to the atomists in *Physics* IV 6-9. We should pause to note how surprising this is—at least at a glance. Aristotle is well aware of atomist theories. He very frequently cites Democritus and Leucippus on atoms and void elsewhere in the corpus. He wrote a book on Democritus (now lost). So, why are they mentioned sparingly in the inquiry that Aristotle dedicates to void itself?[94]

To answer this, I wish to revisit Aristotle's first treatment of the claims of void's proponents (which I discussed in 1.1). I believe that we will achieve a clearer picture of the intellectual context around void, which I expect will in turn explain why Aristotle cites predecessors in the way he does here (or doesn't).

2.1 Rejecting the orthodox interpretation

Let us turn back to the text of 213b2-29. There, as we saw, Aristotle presents four claims that those affirming the existence of void made. I want to bracket the Pythagorean claim and revisit the first

[94] I thank Mirjam Kotwick for partly raising this question.

three. I will argue that, against the orthodox interpretation of 213b2-29, what Aristotle cites here were never meant by their proponents to be arguments for the existence of void.

Recall the first claim that Aristotle presents, that regarding change of place, at 213b4-15:

> [T1] They say, for one, that change in place (i.e., locomotion and growth) would not occur. For change would seem not to be if there were no void. For it is impossible for what is full to receive anything. If it could, and two bodies were in the same spot, then any number of bodies could also be there at once. For we cannot say the difference beyond which this would not be true. And if this were possible, even the smallest would receive the greatest. For many smalls make a large. Then if many equals can be in the same spot, so too many unequals. In fact, Melissus shows from these considerations that the whole is unmovable. For he says, if it were moved, there must be void, but there is no void. So, that void is something in one way they show from these considerations.

We might at first glance think that here Aristotle presents an argument for the existence of void, specifically, an argument from the fact of locomotion and growth to the existence of void. After all, the section of the inquiry in which Aristotle discussed those denying void (*Physics* IV 6 213a22-b2) included a proof against the existence of void. We might be led to think that the counterpart section, that concerning those who affirmed the existence of void, will contain arguments for the existence of void in parallel.

This is how Laks and Most treat *Physics* IV 6 213b2-29 in their Loeb edition. They take 213b2-29 to contain arguments for void given by Democritus and Leucippus. In their Volume VII on the atomists, they mark 213b2-29 as "ATOM. D39" and label them "Arguments in favor of the existence of the void." Hussey (1983) too in his commentary on 213b2-29 calls them "Arguments for void" (124). So too, Ross (1936) calls them "arguments for void" (377-8).[95] I call the view that

[95] Ross paraphrases the first step of Aristotle's plan for the inquiry at 213a19-22 as "stating the arguments for a void" (377). But the Greek actually reads λαβοῦσιν ἃ λέγουσιν οἱ φάσκοντες εἶναι. That is, what Aristotle plans to do is outline the more neutral, "what those who claim void exists say."

the claims Aristotle describes at *Physics* IV 6 213b2-29 were intended by their authors to be arguments for the existence of void the **Orthodox Interpretation** of *Physics* IV 6 213b2-29.

It is easy, then, to think that Aristotle is now introducing arguments for the existence of void and it is thus tempting to read T1 in this way, such that its argument structure would run:

1. Change according to place exists
2. If change according to place exists, then void exists
C. So, void exists

But this is not what happens. What Aristotle says in T1 is that void's proponents explained locomotion and growth by recourse to void. The direction of argument as presented in T1 is not "if change, then void," such that the argument runs from the fact of locomotion and growth to the fact of void. Rather, the fact of void is an assumption used in the explanation of the possibility of locomotion and growth. In fact, it is to the atomists' predecessor Melissus that the conditional "If change, then void" is attributed in T1 (see MEL. D10). Melissus maintained this conditional as part of an argument not in favor of void but in a *reductio ad absurdum* against the possibility of change. The *reductio* ran:

1. If change exists, then void exists.
2. Void does not exist
C. So, change does not exist

While void's proponents in T1 use the existence of void to explain change according to place, it was Melissus who articulated the conditional from the existence of change to the existence of void.

Indeed, Aristotle tells us elsewhere that the atomists were happy to take up this conditional. Consider the following passage from *Generation and Corruption* I 8, 325a24-29, during Aristotle's discussion of acting and being acted upon:

> [T14] But Leucippus thought he had a theory that agreed with perception and did not abolish generation and corruption or change and the plurality of things. Conceding these to the appearances (ὁμολογήσας δὲ ταῦτα μὲν τοῖς φαινομένοις) and that there is no change without void to those postulating the One (τοῖς δὲ τὸ ἓν κατασκευάζουσιν ὡς οὐκ ἂν κίνησιν οὖσαν ἄνευ κενοῦ), he calls void not-being, and not-being is no part of being.[96]

In T14 Aristotle tells us that "Conceding [change and plurality] to the appearances and that there is no motion without void to those postulating the One, [Leucippus] calls void not-being, and not-being is no part of being." First, note Aristotle's use of "conceding" or "agreeing" (ὁμολογήσας) in describing Leucippus's relation to the Eleatic claim that there is void if there is change. Leucippus is not described as putting forward and arguing for the conditional himself. He is described as agreeing with or conceding the conditional as instead put forward by the Eleatics. Second, note the participial structure, suggesting that the content of the dependent clause is the circumstance upon which that of the independent clause occurs. It is upon conceding that there is no change without void to the Eleatics and upon conceding that there is change and plurality to the appearances that Leucippus says void is non-being and no part of being. That Leucippus should move to say what void is on the basis of the Eleatic claim and on the basis of the appearances may suggest that he did not do further work of his own in arguing for void's existence. Leucippus thus takes for granted as his starting points both the fact of change and plurality as well as the Eleatic claim that void exists if change exists. Thus, I maintain, T1 is not an atomist attempt to argue for the existence of void from the fact of motion. Rather, it is an attempt to explain motion using void. The move from motion to void is rather attributed to Melissus.

[96] Λεύκιππος δ᾽ ἔχειν ᾠήθη λόγους οἵτινες πρὸς τὴν αἴσθησιν ὁμολογούμενα λέγοντες οὐκ ἀναιρήσουσιν οὔτε γένεσιν οὔτε φθορὰν οὔτε κίνησιν καὶ τὸ πλῆθος τῶν ὄντων. ὁμολογήσας δὲ ταῦτα μὲν τοῖς φαινομένοις, τοῖς δὲ τὸ ἓν κατασκευάζουσιν ὡς οὐκ ἂν κίνησιν οὖσαν ἄνευ κενοῦ, τό τε κενὸν μὴ ὄν καὶ τοῦ ὄντος οὐδὲν μὴ ὄν φησιν εἶναι.

Consider next what Aristotle presented as the second claim of void's proponents. This concerned a body's ability to come together and collapse upon itself. This claim also, I maintain, is not meant to be an argument for the existence of void. Recall the claim at 213b15-18:

> [T2] —in another way that some bodies seem to come together and collapse, e.g., they say that casks receive the wine even with the skins, as the condensing body comes together into the voids within.

Here void is employed as an explanation for how a body's coming together and collapsing are possible. The claim is not an attempt to prove the existence of void from the fact of coming together and collapsing. Rather, it assumes the existence of void in order to explain this phenomenon. Indeed, the question of how liquid shrinks to accommodate skins was evidently popular enough to have featured in the collective Peripatetic work, *Problems*. The discussion at *Problems* XXV 8, 938b14-24 is dedicated to the problem of shrinking liquid. There, one explanation offered is the presence of internal voids. Another is air bubbles. In any case, T2 does not show a fact about liquid shrinking being utilized in order to prove the existence of void. On the contrary, T2 is an explanation of the fact of liquid shrinking that appeals to void.

A similar analysis applies to what Aristotle presents as the third claim of void's proponents at 213b18-22:

> [T4] And further also growth seems to everyone to come about through void. For food is a body, but it is impossible for two bodies to be together. And they use as evidence for this what also happens with ashes, which receive as much water as an empty jar.

We are told that void's proponents think that nutrition is possible because voids present in our bodies receive the food. Again, T4 does not have the shape of an attempt to prove void's existence. Rather, T4 presents an attempt to resolve a problem about how nutrition works. The attempt avails itself of void, the existence of which is assumed.

That the claim Aristotle presents in T4 depicts an attempt to solve a common problem about nutrition, was the opinion of the commentary tradition (Philoponus and Simplicius). Granted, the availability of atomist work to commentators was scarce due to poor transmission, and it is likely that neither Philoponus nor Simplicius had access to atomist texts. However, they did have access to sources that we do not, and *those* sources had access to the atomist corpus. For instance, Simplicius and Philoponus unlike us had access to Theophrastus's *Physics*.[97] Theophrastus received Aristotle's library and would have had access to the atomist corpus no less than Aristotle.[98] Further, Theophrastus's treatises characteristically provide rich intellectual context, extensively outlining views of predecessors. While it is speculative to assume that Theophrastus would have mentioned that T4 was an attempt to solve a problem about nutrition using void, we cannot discount the possibility that he may have, and that Simplicius and Philoponus would have seen it. Indeed, it is striking that Simplicius and Philoponus use very similar language in their commentary on the claim T4. Simplicius writes at 662, 1-3:

> [T15] So those assuming void do not show that there is void, but in trying to solve the common problem of food by means of the void, they make it more intractable.[99]

Simplicius tells us that those making the claim about nutrition and void were trying to solve a common problem about food. For this reason, they assumed or hypothesized (ὑποτίθημι) void. So too, Philoponus in his commentary on the claim about nutrition writes at 629, 23… 629, 25):

[97] The majority of Theophrastus's *Physics* if not the entirety is lost to us. I allow for the possibility that we have some of it only because we have access to Theophrastus's *De Sensibus*, which itself may or may not have been part of Theophrastus's *Physics*. On the history of the *De Sensibus* text, see Baltussen (2000).
[98] The story that Theophrastus inherited Aristotle's library is the standard narrative. Jonathan Barnes (1997) subjects this story to scrutiny. I thank Hendrik Lorenz for bringing both this point and the point about *De Sensibus* to my attention. Either way, Theophrastus was highly familiar with pre-Aristotelian work.
[99] ὥστε οἱ τὸ κενόν ὑποτιθέμενοι οὐκ ὅτι ἔστι κενόν δεικνύουσιν, ἀλλά τήν περί τῆς τροφῆς ἀπορίαν κοινήν οὖσαν λύειν ἐπιχειροῦντες διά τοῦ κενοῦ ἀπορωτέραν αὐτήν ποιοῦσι.

> [T16]—the problem of the natural scientists, which they tried to solve when they assumed void. This problem, he says, those who assume void claim to solve… (629, 25) [But] in assuming the existence of the void they do not solve the problem about growth. [100]

Philoponus tells us that those responsible for the claim about growth were trying to solve a problem common to scientists. In trying to solve it they assumed void (ὑποτίθημι again). While my appeal to Philoponus and Simplicius is speculative, it is noteworthy that these commentators, who had access to more material than we do, said the same thing about T4. Namely, T4 depicts an attempt to solve a common problem using void. So too, *Problems* XXV 8, 938b24-a9, confirms the existence of experiments (πειραί) predominant at Aristotle's time that sought to explain what was considered the peculiar behavior of ashes in water. Void in ashes as evoked as one explanation.

Thus far, I have argued that in Aristotle's treatment of void's proponents, he is not citing arguments for the existence of void. Rather, he is citing explanations of natural phenomena that appeal to the existence of void. I have yet to make the stronger claim I promised in this chapter's introduction that the atomists likely never argued for the existence of void, whether along the lines of *Physics* IV 6, 213b2-29, or otherwise, such that the reason Aristotle does not offer arguments for the existence of void here is that there are none to cite.

But it is not a stretch to get to this stronger claim. For, were the atomists to have mobilized the explanations of natural phenomena in *Physics* IV 6, 213b2-29 in order to achieve the conclusion that there exists a void, Aristotle would have said so. Instead, what Aristotle presents are explanations of natural phenomena that employ void. Moreover, it is unlikely that void's proponents argued for the existence of void on grounds other than the explanations of 213b2-29. It would be the ultimate act of uncharity for Aristotle in his very inquiry against void's proponents,

[100] Η τῶν φυσικῶν ἀπορία ἣν λύειν ἐπιχειροῦντες τὸ κενόν ὑπετίθεντο. Ταύτην οὖν, φησι, τήν ἀπορίαν, ἀξιοῦσι λύειν οἵ τὸ κενόν ὑποτιθέμενοι… (629, 25) οὐδέ γάρ ὑποτιθέμενοι εἶναι τὸ κενόν λύουσι, τήν περί τῆς αὐξήσεως ἀπορίαν

when promising to outline what void's proponents had said up to that point, to omit the arguments they waged as proof of its existence, especially when he did on the opponents' side include Anaxagoras's proof of void's nonexistence. This would be an affront to Aristotle's characteristic practice of charity—indeed even to a minimal practice of charity. So, bracketing the possibility that there were atomist texts to which Aristotle did not have access, we can maintain that not only is Aristotle not citing arguments for the existence of void at 213b2-29, but moreover, it is likely that the atomists never argued for the existence of void, whether along the lines of *Physics* IV 6, 213b2-29, or otherwise.

It is true that Laks and Most cite one other example (what they call ATOM. D40) under their heading, atomist "Arguments in favor of the existence of void." Namely, they point to 308b30-309a12 of Aristotle's *De Caelo* IV 2, a passage which falls in the midst of Aristotle's treatment of "the heavy and the light." Yet a quick look at the passage again reveals no arguments for the existence of void. In the context of the passage, Aristotle is trying to get clear about what the heavy and light are. Prior to doing so he lays out the views of his predecessors on the heavy and light. He first considers Plato's view in the *Timaeus*, where according to Aristotle Plato argues that possessing a greater number of homogenous parts, e.g., triangles, makes a body heavier. He then turns to the atomists. It is in this bit that the Laks/Most passage arises, which goes as follows:

> [T17] [. . .] although they were more ancient in terms of chronology, they thought in a more modern way about the subjects mentioned just now. [. . .] [309a2] Among composite bodies, since [. . .] we see that many things that are smaller in volume are heavier, like bronze compared to wool [. . .], some people think and say that the reason is different; for they say that the void contained in the interior makes the bodies light and sometimes has the effect of making bigger things lighter; for they contain more void. For this is the reason why the volume is often superior while the bodies are composed of solids in the same

> number or even fewer. And generally speaking, the explanation for any body being lighter is that there is more void in it [. . .].[101]

In T17, the atomists (though they are not named) are presented as giving a different explanation than Plato for heaviness and lightness. Namely, "the explanation for any body being lighter is that there is more void in it" (καὶ παντὸς αἴτιον εἶναι τοῦ κουφοτέρου τὸ πλεῖον ἐνυπάρχειν κενόν). Again, there is no argument for the existence of void here. Rather, void is appealed to as an explanation for physical features we take for granted, in this case heaviness and lightness. To say that we can read T17 as outlining an argument for the existence of void would be no different than claiming that Aristotle indicates in the preceding bit on Plato that Plato used the fact of heaviness and lightness to argue for the existence of the triangles. But no one thinks that that is what Aristotle was saying there. So too, the orthodox interpretation is not a plausible reading of T17.

2.2 An objection appealing to Aristotle's framing

One may object that I have ignored or misunderstood how Aristotle frames the *Physics* IV 6-7 discussion of what void's proponents say. Namely, as the objection goes, Aristotle *does* tell us when he frames the three claims that they were meant to be arguments for the existence of void. The objection will appeal to the fact that Aristotle states at *Physics* IV 7, 214b10-11 (T13 above), that it is through these very claims that void's proponents indicate that void exists (δεικνύουσιν εἶναι τὸ κενὸν). Someone with the orthodox interpretation may even translate δεικνύουσιν there as "seek to prove," such that Aristotle is saying that it was by using these very explanations about

[101] [. . .] ἀλλὰ καίπερ ὄντες ἀρχαιότεροι ταῖς ἡλικίαις καινοτέρως ἐνόησαν περὶ τῶν νῦν λεχθέντων. [. . . cf. D68] [309a2] τῶν δὲ συνθέτων, ἐπειδήπερ [. . .] πολλὰ βαρύτερα ὁρῶμεν ἐλάττω τὸν ὄγκον ὄντα, καθάπερ ἐρίου χαλκόν [. . .], ἕτερον τὸ αἴτιον οἴονταί τε καὶ λέγουσιν ἔνιοι· τὸ γὰρ κενὸν ἐμπεριλαμβανόμενον κουφίζειν τὰ σώματά φασι καὶ ποιεῖν ἔστιν ὅτε τὰ μείζω κουφότερα· πλεῖον γὰρ ἔχειν κενόν. διὰ τοῦτο γὰρ καὶ τὸν ὄγκον εἶναι μείζω συγκείμενα πολλάκις ἐξ ἴσων στερεῶν ἢ καὶ ἐλαττόνων. ὅλως δὲ καὶ παντὸς αἴτιον εἶναι τοῦ κουφοτέρου τὸ πλεῖον ἐνυπάρχειν κενόν [. . .]

growth, etc., that void's proponents *sought to prove* that void exists. (It would be inappropriate for my objector to translate it merely 'prove,' rather than 'seek to prove,' since Aristotle would of course not want to say that they proved the existence of void).

The contested framing in question occurs after Aristotle returns to the three claims in *Physics* IV 7. Aristotle concludes at *Physics* IV 7, 214b10-11 (my T13 above):

> [T13] It is clear then that those [claims] from which they indicate that there is void are easy to solve. (Ὅτι μὲν οὖν ἐξ ὧν δεικνύουσιν εἶναι τὸ κενὸν λύειν ῥᾴδιον, φανερόν.)

By the orthodox interpretation, void's proponents evoked the three claims precisely in order to show that void exists. Subscribers to this interpretation would then read T13 above in this way, translating it "from which they seek to prove that there is void," Rather than my "from which they indicate that there is void."

To respond to this objection, we need a way of reading "they indicate that there is void" (δεικνύουσιν εἶναι τὸ κενὸν), such that it does not entail that void's proponents are making the claims about locomotion, shrinking, and nutrition, in order to prove that void exists. In fact, I believe that Aristotle uses δεικνύουσιν here exactly in the way I need, and indeed we cannot possibly take it as 'seek to prove.' To establish this, I want to bring our attention to another case just before where he uses δεικνύουσιν εἶναι τὸ κενὸν (or its negation). Namely, recall Aristotle's second treatment of their third claim about nutrition. He wrote at *Physics* IV 7, 214b1-10:

> [T11] And it is possible to grow not only by something coming in but also by alteration, e.g. if water comes to be from air. In general, both the argument about growth and that about water poured on ashes hinder themselves. For either not every part of the body grows, or bodies may grow otherwise than by the addition of body, or there may be two bodies in the same spot (then they would claim to solve a common difficulty, but they would not indicate that void is) (ἀπορίαν οὖν κοινὴν ἀξιοῦσι λύειν, ἀλλ᾽ οὐ κενὸν δεικνύουσιν ὡς ἔστιν), or the whole body must be void, if it grows in every part and grows by means of void. The same argument applies to the ashes.

As part of his treatment in T11, Aristotle lists the alternatives available to someone seeking to explain nutrition. One possibility is that not every part of the body grows. Another is that bodies grow in a way other than by food. Another is what void's proponents say, namely, that food fills preexisting voids, though, Aristotle challenges, they would then have to claim the whole body is void. Now, Aristotle says, a further option for theorists grappling with nutrition is to admit that two bodies can be in the same spot. Aristotle says in T11, if they find that it is indeed possible for food to interpenetrate our body, then "they solve a common difficulty," i.e., they find that it is possible for bodies can interpenetrate. Yet, he says in the parenthetical, while they solve the interpenetration difficulty, "they do not indicate that void is" (ἀλλ᾽ οὐ κενὸν δεικνύουσιν ὡς ἔστιν). Now, if we read οὐ κενὸν δεικνύουσιν ὡς ἔστιν as my objector would, then Aristotle is claiming in the T11 parenthetical that these hypothetical people, those who solve the interpenetration problem, do not seek to prove that void exists by their interpenetration explanation. Yet these people are not at any point described as engaged in an exercise where they would be trying to prove or disprove void. They are trying to explain how nutrition works. This is precisely why they maintain interpenetration, i.e., in order to explain how food can join with our body. Of course, in maintaining that bodies interpenetrate they are not aiming to prove the existence of void. For why would they be? This is not the exercise they are engaged in. A parenthetical adding "but they do not seek to prove the existence of void" would make little sense here.

Rather, what they do not do with respect to void in offering their interpenetration explanation is reveal a commitment to the existence of void by showing a need for it. Those who use void in their explanation of nutrition meanwhile do indicate void, where this is just to say, their explanation shows a need for void existing and reveals their commitment to its existence. This is in contrast to an explanation of nutrition whereby two bodies interpenetrate, which does not require

that void exists. This explanation does not show a need for void or reveal a commitment to void. So, given that we cannot read οὐ κενὸν δεικνύουσιν ὡς ἔστιν in T11 as "they do not seek to prove that there is void," we should not read δεικνύουσιν in T13 as "seek to prove" either. Rather, In T13, what the void proponents did when offering their explanations of various physical phenomena was indicate that there is void, where this is to say, reveal a commitment to it.

2.3. An objection appealing to engagement with the Eleatics

The supporter of the orthodox interpretation may present a new objection. Namely, given the fact that the atomists were engaged with the Eleatics, who denied the existence of void, any atomist claims that certain phenomena require void should be taken as made in the context of that engagement with the Eleatics. That is to say, they should be taken as waged with the knowledge of their interlocutors' denial of void's existence and so as (or as doubling as) arguments for void's existence.[102]

In order to reply to this, I will deny my objector's presumption that the atomists would have sought to argue against the Eleatics with the claims at 213b2–29.[103] While it is true that the atomists were engaged with the Eleatics—indeed my analysis of T14 alone showed that Leucippus

[102] I am grateful to Ursula Coope for raising this objection.

[103] Cf. Barnes (1982) who notes that 213b2–29 fall "shamefully flat" as arguments against the Eleatics, insofar as the claims talk past them. Barnes writes, "Yet no ancient source attributes any of the arguments of the *Physics* to the Atomists; and the arguments are dialectically inapposite: Melissus rejects the void, and therefore motion; the Atomists, seeking to rehabilitate motion, restore the void. If they do so merely because motion requires it, their argument falls shamefully flat" (318). Rather than thinking the atomists offered 213b2–29 as arguments for the existence of void against the Eleatics, Barnes suggests that instead the atomists may have used what he calls the '*ou mallon* principle' to establish its existence. That is, Barnes sees an argument for the existence of void in the atomists' claim the "something exists no more (*ou mallon*) than the no-thing" (ATOM. D33). But, I would note, there is just as much reason if not more for thinking that D33 is simply a statement of the view that there is void as there are atoms, rather than an argument for void. In any case, I refer to my point that it would be the ultimate act of uncharity for Aristotle in promising to discuss what void's proponents have said to omit an argument for the existence of void that they gave and that he knew about. Yet he makes no mention of D33 or an argument from D33. Moreover, I give reasons now in the present section for thinking that the atomists did not find it necessary to argue for void.

concedes a point to Melissus—I will maintain that such engagement would not have consisted in arguing for the existence of void. For the atomists likely did not take themselves to need to do so. In order to pursue this line, I will attempt to establish two things: there was at the atomists' time a popular belief in the existence of void; the atomists took their starting points in what is apparent and in conformity with nature.

I have argued in my Chapter 1 and Chapter 2 that dominant among discussions and debates about the existence of void was a particular view about what void is (if it exists). Namely, void is or would be extension that is deprived of body. I further argued that this view about what void is was likely a popular view on void and was not merely one embraced by natural scientists. Indeed, I suggested, even non-scientists took void to be something like an extended space or gap deprived of body. I have not yet, however, argued that there was a popular belief in the *existence* of such a thing. That is, I have not sought to show that there was a mainstream, non-scientific view that spaces deprived of body exist. But I think that evidence in Aristotle's *Physics* IV supports this.

To start, consider again what Aristotle presented in *Physics* IV 6 as Anaxagoras's attempt to prove the nonexistence of void, which I considered in my Chapters 1 and 2.[104] The passage at 213a22-31 was as follows:

> [T18] Now, those trying to prove that there is no void train their sights not on this, i.e., that which people really want to call a void, but they speak mistakenly, just like Anaxagoras and those training their sights in this way do. For, they show that air is something by straining wine skins, proving that air is strong, and by trapping it in clepsydras. But people really want void to be an extension in which there is no perceptible body. Yet thinking that everything that is is body, they say that that in which there is nothing at all, this is a void. This is why that full of air is a void.

[104] For much of my arguments here that there was a popular view that void exists, cf. my fn. 48 of Chapter 1 and section 3 of Chapter 2, where I make related points.

In T18, Aristotle tells us that Anaxagoras does not show the impossibility of void. Instead, Anaxagoras shows to be false a further claim that people (οἱ ἄνθρωποι) who believe in the existence of void make, namely, that air is nothing. Because they thought that air was nothing, they took the extension between the walls of the wine-less wineskin to be filled with nothing and so to be instance of void. In showing that the wineskin is in fact full—by showing that air is something—Anaxagoras shows that the wineskin's extension is not an instance of void.

As I noted in my Chapter 2, we see this same association between a belief that air is nothing and a belief in the existence void in Aristotle's treatise on place as well. Aristotle wrote at *Physics* IV 4, 212a10-14:

> [T19] For it seems possible that there is some extension between other than the magnitude of the moved bodies. And air too, thought to be incorporeal, contributes something [to this belief] (συμβάλλεται δέ τι καὶ ὁ ἀὴρ δοκῶν ἀσώματος εἶναι). For it is not only the boundaries of the vessel which seem to be place, but also what is between as void (ἀλλὰ καὶ τὸ μεταξὺ ὡς κενόν).

In T19, Aristotle tells us that people are led into thinking that place is an extension beyond the magnitude of bodies coming and going, and that that extension is void when bodies are not there. He tells us that they are led into thinking this by their further belief that air is incorporeal. In both T18 and T19, then, we are presented with people who think that void exists and are (at least partly) led into thinking this because they think that air is incorporeal. Indeed, given that these people think air is incorporeal and nothing, and presumably also think that such 'air' is all around them, they must think that void is all around them, suggesting a belief in the ubiquity of void.

Now, most natural scientists at the time—including the atomists—were not confused about whether air was corporeal and something (cf. e.g., ATOM. D110, D118). They were confident it was. Who, then, is being led into believing in the existence of void by the apparent incorporeality

of air? If they were not natural scientists, we should think that it was a popular, i.e., non-scientific, confusion about air, which in turn bred a popular belief in void. What is more, this may have been a fairly mainstream popular belief. Aristotle calls its proponents in T18 just "people" (οἱ ἄνθρωποι) and again "the many" (οἱ πολλοί) at *Physics* IV 1, 208b25-33. There is after all reason to believe that non-scientists thought about something like void. The claims of void's proponents Aristotle lays out in *Physics* IV 6 cite everyday observations that people took to involve voids. Two of these, a case with ash in jars and a case with wine in jugs, would have been observations that ordinary homemakers might have been likely to make. Indeed, he notes in his discussion of the nutrition claim that nutrition "seems to everyone" (δοκεῖ πᾶσι) to require void. No doubt again this will not mean "to all natural scientists," since we can think of at least Anaxagoras, and probably also Empedocles, who would have denied this claim about nutrition. In any case, the takeaway so far is this: we have some reason to think that there was at the time a popular and fairly mainstream belief in the existence of void.

The fact of a potentially widespread, popular view that void exists already goes some way towards mitigating the force of the objector's claim that the atomists would have felt it necessary to argue for the existence of void. Yet it is still more relevant given what we know about the atomists' methodology. This is what I mean. That void should have a popular appeal may suggest that the existence of void was considered apparent. And the testimony Aristotle offers us on the atomists reveals that they took what is apparent, τὰ φαινόμενα to be their starting points.[105] To see this, consider first my T14 above. There, Aristotle wrote at *GC* I 8, 325a24-29:

[105] That the atomists conceded to appearances as Aristotle suggests is not to negate their skepticism about the products of φαντασία like sweetness or bitterness or white or black (cf. e.g., ATOM. D14, D64). After all, consider T20 below, where the atomists acknowledge variations in perceptions of the same thing from person to person, while finding truth in the apparent fact of the variation itself.

> [T14] But Leucippus thought he had a theory that agreed with perception and did not abolish generation and corruption or change and the plurality of things. Conceding these to the appearances (ὁμολογήσας δὲ ταῦτα μὲν τοῖς φαινομένοις) and that there is no change without void to those postulating the One (τοῖς δὲ τὸ ἓν κατασκευάζουσιν ὡς οὐκ ἂν κίνησιν οὖσαν ἄνευ κενοῦ), he calls void not-being, and not-being is no part of being.

As I suggested in my analysis of T14 above, it is precisely upon the basis of both conceding to the appearances (τοῖς φαινομένοις) the existence of motion and plurality as well as conceding to the Eleatics the inference from motion to void, that the atomists said that void is non-being and different from being. Or consider slightly earlier in the *GC*, at I 2, 315b8–12, when Aristotle is discussing the Democritean shapes of atoms. He writes,

> [T20] But because they thought that truth is in what appears (ἐπεὶ δ’ ᾤοντο τἀληθὲς ἐν τῷ φαίνεσθαι), and that appearances are contrary and unlimited, they posited shapes unlimited, so that the same thing would appear contrary to different people because of changes in the aggregate…

In T20, Aristotle claims that the atomists made the shapes of atoms infinite in number because they took the truth to be in what appears, and what appears to people is infinitely various. Consider also in *De Anima* 1.2 404a27–29 when Aristotle discusses what Democritus took the soul to be. He writes, “[Democritus claims] that soul and mind are simply the same. For what is true is what appears (τὸ γὰρ ἀληθὲς εἶναι τὸ φαινόμενον).”

The testimony from Aristotle therefore suggests that the atomists took for granted what appears as basic, including the fact of motion, plurality, and variation. Such things did not require further argument for their existence. Now, I have sought to establish that void too was apparent at this time. For there was, I argued, a popular view that void exists—indeed that it exists ubiquitously. Given this context, we may be justified in thinking that the atomists’ engagement with the Eleatics did not include arguments waged against them for the existence of void.

Chapter 4

The Cube Argument Against the Existence of Void

Introduction

I argued in Chapter 1 that upon finding that void—if it exists—is extension deprived of body, Aristotle will proceed to target *that*, extension deprived of body, in the return journey of his inquiry, when he undertakes his arguments against the existence of void. But I have yet to offer a dedicated treatment of any of those arguments of the return journey. In this chapter I will focus on what is possibly the most difficult of those arguments and perhaps the most difficult passage of all of *Physics* IV 6-9. It takes place at *Physics* IV 8, 216a26–b20 and centers on a wooden cube placed in the void. I will offer a reconstruction of this argument.

According to the reconstruction I will present, Aristotle spends the first half of the passage setting up a scenario, in which he draws out initial consequences of supposing that there is void (216a27-b9). The scenario takes as its starting point the existence of void and focuses on a wooden cube placed in the void. Aristotle finds that the cube's magnitude will have the same relative position as the bit of void and place it occupies and be equal in extent to that bit of void and place. He notes, further, that the cube's magnitude—and implicitly too the void extension—are each ἀπαθὲς, that is, not a *per se* bearer of attributes. Both entities are 'bare' extension, equal in extent, and share the same relative position. Having established the foregoing, Aristotle then moves to pose a two-horned, exhaustive dilemma (b9). Either, p, the cube's magnitude and the equal bit of void and place are distinct entities (b10-12), or not-p, they are not distinct entities (b12-16). Because the disjunction is a logical truth, either p or not-p must be true. The argument then runs by showing that problems arise on either alternative. Acceptance of p leads to an impossibility, so not-p must be true. Yet acceptance of not-p involves rejecting the account of place on which the

theory of void depends, and so rejecting the existence of void. In this way the overall argument functions as a *reductio ad absurdum* against the original circumstance of the scenario, the existence of void.[106] In what follows I will offer an analysis of the text that I believe grounds this reconstruction.

1. The Scenario of the Cube Argument

Immediately prior to the cube argument, Aristotle had undertaken a lengthy proof showing that two absurdities concerning locomotion would result if bodies were to travel through the void. One absurdity was that any bodies travelling through void would move infinitely fast. This was because, Aristotle argued, the void offers no resistance, and bodies move with a speed in inverse proportion to the density of the medium. The other absurdity was that heavy and light bodies would move equally fast, which Aristotle takes to be absurd, since, he claims, heavier bodies move must faster than light bodies—in virtue of their ability to cleave the medium. Yet there is no 'medium' to cleave in the case of void, and so heavy and light bodies would travel at the same speed. Aristotle concludes from those arguments the presence of a void 'medium' would in fact make motion impossible, from which infers that a void "separated by itself" cannot exist (216a21-26).

He then transitions to what I am calling the cube argument as follows at 216a26-7:

[T1] Yet also by considering it in itself, the so-called void should appear truly fruitless.

[106] Hussey (1982) also appears to recognize that at play in the cube argument is a dilemma-like structure concerning whether the magnitude and the bit of void and place are identical or distinct (133). However, he does not fill out the consequences of each horn of the dilemma as I do, nor does he view the dilemma's role in the overall argument as I do. Hussey for instance takes the horns of the dilemma to be 'wrapped up' by b12, with the point about the superfluousness of the void as place (b12-16) being a further consideration outside the dilemma. I in contrast take b12-16 to be the articulation and pursuit of the second horn of the dilemma, the supposition that the magnitude and the equal bit of void and place extension are identical (not-p). For it is precisely upon supposing that they are identical that the role of void as place becomes superfluousness. Cf. my fn. 117, where I more directly challenge Hussey on this point.

καὶ καθ᾽ αὑτὸ δὲ σκοποῦσι φανείη ἂν τὸ λεγόμενον κενὸν ὡς ἀληθῶς κενόν.

Aristotle in T1 promises to consider the void καθ᾽ αὑτὸ. I take considering the void καθ᾽ αὑτὸ to be in contrast to the focus on motion in the arguments that preceded. That is, while the arguments that preceded generated absurdities about motion in the void, the cube argument will reveal absurdities stemming from the mere presence of a body in the void. The other thing worth noting in T1 is Aristotle's play on the word, κενόν, and the substantive point he trying to make with the word-play. The so-called void (τὸ κενόν), he says, will turn out to be truly κενόν. I translate the adjective here as 'fruitless,' where I take this to mean explanatorily useless.[107] This translation reveals a slight prediction on my part about some of what is to come in the cube argument. For the cube argument that follows is meant to justify this claim about the void being κενόν, as Aristotle begins the next sentence with γὰρ. So, whatever the cube argument ends up proving will reveal the void to be κενόν. And, as we will see, one outcome of the cube argument is that the void is an explanatorily useless entity, and so I translate κενόν here as 'fruitless.'

In the first bit of the cube argument Aristotle begins to lay out the scenario, which he will use to bring out consequences of supposing that void exists. He writes first at 216a27-33.

> [T2] For just as if someone were to place a cube in water, the water will be displaced to an amount equal to the cube, it is like this also in air, though it is not clear to the senses. Indeed, it is always the case with bodies able to make way, they must make way (if they are not compressed together) in that manner natural for them to make way, i.e., either always downwards, if their locomotion is downwards as with earth, or upwards, as with fire, or in either manner—whatever the body placed in it is like.
>
> ὥσπερ γὰρ ἐὰν ἐν ὕδατι τιθῇ τις κύβον, ἐκστήσεται τοσοῦτον ὕδωρ ὅσος ὁ κύβος, οὕτω καὶ ἐν ἀέρι· ἀλλὰ τῇ αἰσθήσει ἄδηλον. καὶ ἀεὶ δὴ ἐν παντὶ σώματι ἔχοντι μετάστασιν, ἐφ᾽ ὃ πέφυκε μεθίστασθαι ἀνάγκη (ἂν μὴ συμπιλῆται) μεθίστασθαι, ἢ κάτω ἀεί, εἰ κάτω ἡ φορὰ ὥσπερ γῆς, ἢ ἄνω, εἰ πῦρ, ἢ ἐπ᾽ ἄμφω, (a33) ἢ ὁποῖον ἄν τι ᾖ τὸ ἐντιθέμενον.

[107] Cf. *NE* I 2, 1094a19-22, where Aristotle claims that if we choose everything for the sake of something else, desire would be fruitless (κενὴν).

Here Aristotle introduces us to a fact about bodies (σώματα). He maintains that when a body like a cube is placed into another body, say, water, that second body is displaced to an amount equal to the magnitude of the first body. So, if the cube is two feet long, the water will be displaced two feet. This happens with air when the cube is placed in air too, though we do not see it. It is always the case for bodies able to make way (ἀεὶ δὴ ἐν παντὶ σώματι ἔχοντι μετάστασιν) that the body making way must make way in the direction of its natural motion. So, for instance, when water bubbles up from the earth into a hot spring, the earth it displaces in its path moves around it and downward.[108] Or, when a steel ball is placed in fire, the fire it displaces moves around it upward.

Aristotle then considers bodies who move ἢ ἐπ᾽ ἄμφω, that is, either down or up. I take the ἢ in the final clause at a33 to be epexegetic on the ἢ ἐπ᾽ ἄμφω, such that the clause that follows the ἢ, i.e., ὁποῖον ἄν τι ᾖ τὸ ἐντιθέμενον ("whatever the body placed in it is like"), details the condition upon which the displaced body would move up rather than down or down rather than up. That is, depending on what the body that is placed in the second, displaced body is like, the displaced body will be displaced either up or down. I take the displaced bodies in question here, i.e., those bodies that can move either up or down depending on what the body placed in them is like, to be water and air. This is fitting, since the body Aristotle that lists as always displaced upwards is explicitly fire the body always displaced downwards is explicitly earth, and Aristotle elsewhere frequently speaks of water and air as intermediate between fire and earth. And one of the reasons for that intermediacy is that while fire always moves up and earth always moves down, water and air can move either up or down. The epexegetic clause here tells us that whether they are displaced up or down depends on what the body placed in them is like. We can consider some

[108] I thank Benjamin Morison for the example of water bubbling up from the surface.

common-or-garden examples to motivate this position. For instance, when a stone is dropped into water, we might think that the water is displaced upward around the stone, while when an air bubble rises in water, the water is displaced below the air bubble. So too, we may think that if a fire builds in the air, the surrounding air is displaced below the fire, whereas when it rains, air is displaced above the water. In this way the displacing occurs in accordance with what the body placed in the displaced body is like.

The important upshot of what we have seen so far is this. Aristotle has established at this point that if a body, e.g., a cube, is placed into another body, e.g., water, the second body must be displaced to an amount equal to the magnitude of the first.

Aristotle then continues laying out the scenario of the cube argument at 216a33-216b2:

> [T3] but indeed this [i.e., displacement] is impossible in the void, for there is no body. But the equal extension, which was also previously in the void, will pass through the cube, just as if the water did not give way to the wooden cube, nor the air, but went all the way through it.
>
> ἐν δὲ δὴ τῷ κενῷ τοῦτο μὲν ἀδύνατον—οὐδὲ γὰρ σῶμα—διὰ δὲ τοῦ κύβου τὸ ἴσον διάστημα διεληλυθέναι, ὅπερ ἦν καὶ πρότερον ἐν τῷ κενῷ, ὥσπερ ἂν εἰ τὸ ὕδωρ μὴ μεθίστατο τῷ ξυλίνῳ κύβῳ μηδ᾽ ὁ ἀὴρ ἀλλὰ πάντῃ διήεσαν δι᾽ αὐτοῦ.

Here in T3 Aristotle draws a contrast with the displacement we saw in T2. That is, displacement will not occur within the void, since there is no body there to be displaced. Instead, unlike the water and the air of T2, Aristotle tells us here that an extension of the void equal to the cube will penetrate right through the cube. Note that Aristotle claims in the relative clause that this equal extension (the referent of ὅπερ) penetrating the cube 'was before also in the void' (ἦν καὶ πρότερον ἐν τῷ κενῷ). We should not think that this is a locative use of ἐν. For the void just is extension and the extension that is equal to the cube is just one part of the whole void extension. We should think instead, then, that when Aristotle says the extension is in the void, he means it is a part of the void.

And, since after the extension penetrates the cube it is still part of the whole void extension, we should take something like 'merely' to be understood when Aristotle claims the extension was before 'in the void,' such that it reads 'the extension that was before merely in the void now penetrates the cube.' In any case, the upshot of T3 is that displacement will not occur, since there is no body to be displaced. Instead, the bit of the void extension equal to the cube will penetrate through the cube.

It is also worth noting that here Aristotle flags that the cube he has in mind is wooden (ξυλίνος). Presumably, he adds this description to emphasize that the cube he has in mind is an enmattered body on a par with fire or air, that is to say, not a mere geometrical cube. Unlike water or air, the void will remain and penetrate the enmattered, wooden cube.

Aristotle next continues developing the scenario of the cube argument at 216b2-6:

> [T4] Indeed truly however much void the cube occupies, that is how much magnitude it has, which, even if hot or cold or heavy or light, is nonetheless different in being from all those attributes, even if it is not separable. I mean the bulk of the wooden cube.
>
> ἀλλὰ μὴν καὶ ὁ κύβος ἔχει τοσοῦτον μέγεθος ὅσον κατέχει τὸ κενόν· ὃ εἰ καὶ θερμὸν ἢ ψυχρόν ἐστιν ἢ βαρὺ ἢ κοῦφον, οὐδὲν ἧττον ἕτερον τῷ εἶναι πάντων τῶν παθημάτων ἐστί, καὶ εἰ μὴ χωριστόν· λέγω δὲ τὸν ὄγκον τοῦ ξυλίνου κύβου.

Aristotle begins T4 by telling us in the ὅσον… τοσοῦτον ("however much…that much") clause that the cube's magnitude (μέγεθος) is equal in extent to the bit of void it occupies. So, the bit of void that penetrates the cube is equal in extent to the cube's own magnitude. A neuter relative pronoun, ὃ, then follows this claim. Whatever the referent of ὃ is, we are told that even if that referent is hot or cold or heavy or light, nonetheless it is different from those attributes in being. We should think the referent of the relative pronoun is the magnitude at least because the referent of the relative pronoun is picked up by Aristotle's last sentence of T4: "I mean the bulk (τὸν ὄγκον) of the wooden cube." The two neuter nouns at the start of T4, which could each grammatically

speaking be the referent of the neuter relative pronoun, are μέγεθος and κενόν, i.e., the cube's magnitude and void. Yet Aristotle would not call the void the bulk of the wooden cube, while he would straightforwardly call the cube's magnitude the bulk of the wooden cube. So, we should think that the referent of the relative pronoun, ὃ, is the cube's magnitude. The sentence thus can be read, "Indeed truly however much void the cube occupies, that is how much magnitude it has, which, even if [the magnitude is] hot or cold or heavy or light…"

Now, that the magnitude itself (rather than, say, the body) should be supposed hot or heavy or some other attribute may seem jarring to the Aristotelian interpreter. I return to this in a moment. Before doing so, it is worth laying out how Aristotle completes the ὃ clause. As we have seen, Aristotle maintains that if the μέγεθος is also hot or cold or heavy or light, it is nonetheless different in being from any such attributes. He then adds the contrasting qualification, καὶ εἰ μὴ χωριστόν, "even if it is not separable." There are two ostensible options for what the relata of the separability clause here are. On one reading, they are, "even if the magnitude is not separable from the attributes." On another reading, they are, "even if the magnitude is not separable from the cube." Also, there are two ways to understand "separable" (χωριστόν). On one reading, to say something is separable from something else is to say the first thing can be found existing without the second. On another reading, to say something is separable from something else is to say they are different in being, i.e., separable in account. On this latter reading, the ἕτερον τῷ εἶναι ("different in being") that preceded is equivalent to and just another way of articulating the 'separable' that follows. Taken together, the two different readings of the relata of the separability claim and the two different readings of separability itself yield four possibilities. They are as follows.

Option 1. "Even if it is not separable" means "even if the magnitude is not able to be found without the attributes." In this case, the whole relative clause in part makes the point that

while the magnitude is different in being from the attributes, it cannot be found without them. There is thus a contrast between these two different relations the magnitude bears to the attributes. This is a possible reading.

Option 2. "Even if it is not separable" means "even if the magnitude is not different in being from the attributes." This does not make sense, since it contradicts Aristotle's immediately preceding claim that the magnitude is different in being from the attributes.

Option 3. "Even if it is not separable" means "even if the magnitude is not different in being from the cube." In this case, the relative clause in part makes the point that while the magnitude is different in being from the attributes, it is not different in being from the cube. There is thus a contrast between the magnitude's difference in being in relation to the attributes and its sameness in being in relation to the cube. Of course, for Aristotle, the cube's magnitude *is* different in being from the cube. So, on this reading, Aristotle must be bracketing his own views and entertaining some other view.

Option 4. "Even if it is not separable" means "even if the magnitude is not able to able to be found without the cube." This is a possible reading. Indeed, presumably the reason for the inseparability in Option 1, i.e., the inability of the magnitude to exist without the attributes, is due to the inseparability in this option here, i.e., the inability to exist without the cube. Nevertheless, I will not pursue this option. When comparing Option 4 to Option 1, where both hold that the separability is an 'ability to exist without,' we should see that Option 1 gives a tighter reading of the relative clause. For in the relative clause so far Aristotle had been emphasizing the connection (or lack thereof) between the magnitude and the attributes. But Option 4 has Aristotle switch relata at the end of the clause and

emphasize the connection between the magnitude and the cube. On Option 1, the relata remain the same throughout.

Consider then just Options 1 and 3. In Option 3 Aristotle must be bracketing his own views, since Aristotle would deny that the cube and its magnitude are the same in being. He would think they differ in being and so are separable in account. Instead, Aristotle must be considering a view on which bodies and their magnitudes are the same in being. This is a pseudo-Platonic view of bodies. I am going to argue for Option 1, but it is worth first motivating Option 3 to see its appeal.

We know[109] that Aristotle has an interpretation of Plato on bodies that seems to go like this. The cube's body just *is* its magnitude. That magnitude then receives attributes like hardness and woodenness. So, while the magnitude is the same in being as the cube, it is different in being from the attributes. A virtue of Option 3 is that it can readily explain why Aristotle describes the magnitude in T4 as itself being hot or cold or heavy or light, since it is true according to this pseudo-Platonic view that the attributes can be predicated of the magnitude itself.

But it would be entirely surprising for Aristotle suddenly to have in mind Plato here. The arguments against void that preceded in *Physics* IV 8 did not target void as it is supposedly described by Plato, i.e., the matter and magnitude of bodies (εἶναι τὸ κενὸν τὴν τοῦ σώματος ὕλην at 214a13). For, as I showed in my Chapters 1 and 2, Aristotle swiftly rejects pseudo-Plato's account of what void is. That is, when Aristotle was getting clear in *Physics* IV 6-7 about what void is, if it exists, in order to ensure that he targets the right thing in the refutations that follow, he explicitly rejects the pseudo-Platonic account as relevant. This was because it gets what void is wrong, such that to target what pseudo-Plato has in mind by void does not amount to targeting

[109] We know this primarily from *Physics* IV 2, 209b6-16.

void. Now, the cube argument is meant to be an argument against the existence of void. It would make little sense for Aristotle suddenly to go back on his word here and target what pseudo-Plato had in mind. For then he would not be targeting void.

Moreover, the cube argument itself as it has unfolded so far shows that Aristotle cannot have in mind the pseudo-Platonic account of void. Recall, in T3 Aristotle considered what happens when a cube enters the void in contrast to what happens when it enters, say, water. Whereas the water will be displaced by the incoming wooden cube, the void will not. Instead, Aristotle wrote in T3, "But the equal extension, which was also previously in the void, will pass through the cube" (διὰ δὲ τοῦ κύβου τὸ ἴσον διάστημα διεληλυθέναι, ὅπερ ἦν καὶ πρότερον ἐν τῷ κενῷ). That is, the extension identified with the void will remain and pass through the incoming cube. And, Aristotle tells us, the extension that penetrates the cube was before merely in the void. Yet if according to the pseudo-Platonic view void just is the extension and matter of bodies, and if Aristotle is entertaining that view here, a contrast between the extension when it is penetrating the cube and the extension when it was merely in the void would make little sense. Since void according to the pseudo-Platonic account *just is* the extension or matter of bodies like the cube, there is no 'mere' void extension in contrast to the extension of bodies like the cube. It is clear, then, that Aristotle is not at this stage entertaining the pseudo-Platonic view.

The alternative, and the reading I wish to endorse, is Option 1. On this reading, the relative clause of T4 may be paraphrased as follows, "even if [the cube's magnitude] is hot or cold or heavy or light, nonetheless it is different in being from all those attributes, even if it cannot be found without them." One might object that Option 1, which eschews the pseudo-Platonic view, has Aristotle apparently supposing that attributes like hot and cold can belong to the cube's magnitude itself. Yet the magnitudes of bodies are not the proper bearers of properties like these on an

Aristotelian picture. Strictly speaking, they bear such properties κατὰ συμβεβηκός, i.e., incidentally. But, the objector emphasizes, Aristotle does not say in T4 that the magnitude is hot or cold κατὰ συμβεβηκός.

Yet we should respond by first noting that Aristotle also does not say in T4 that the magnitude is hot or cold καθ᾽ αὑτὸ, i.e., in itself or *per se*. That Aristotle writes neither κατὰ συμβεβηκός nor καθ᾽ αὑτὸ perhaps suggests that he is not seeking to make such metaphysically precise predications (that the magnitude is hot or cold in T4 is after all an "even if" (εἰ καὶ) supposition). Indeed, searches elsewhere in the corpus reveal Aristotle attributing actions and properties to magnitudes without mention of either κατὰ συμβεβηκός or καθ᾽ αὑτὸ, where those actions and properties are not strictly speaking done or borne by the magnitudes. Consider in *De Anima* II 12, 424a26, when Aristotle writes, "For while it is some magnitude that perceives (μέγεθος μὲν γὰρ ἄν τι εἴη τὸ αἰσθανόμενον), truly at least neither being perceptive nor perception is a magnitude; rather they are a certain proportion and power of it." Strictly speaking, what perceives is the body's sense-organ, not the magnitude of the sense-organ. Or again, consider *Met X*, 1052a26, when Aristotle is defining senses of 'one.' He writes, "Evidently if a thing has by nature a principle of movement that is of the first kind (i.e., local movement) and the first in that kind (i.e., circular movement), this is in the primary sense one magnitude." Again, is not strictly speaking true that the magnitude itself has by nature a principle of movement. Such a principle belongs rather to the ensouled thing which has a magnitude.

In both of the foregoing cases, Aristotle for dialectical reasons is eager to emphasize the fact that the subject in question is spatially extended, which is why he specifies magnitude as the subject, even though it is not strictly true that the magnitude is the proper subject. And here too in T4, Aristotle is eager to emphasize the cube's magnitude. As will became clear, the argument is

going to lead up to the indistinguishability of the cube's magnitude and the void. In the context of the dialectic then we can see why Aristotle would be eager to focus on the cube's magnitude at this point. Thus we should find that it is not so strange that he supposes that the magnitude is hot or cold, nor is it a problem that he does not explicitly flag that it should be so κατὰ συμβεβηκός.

It is therefore no problem for Option 1 that Aristotle claims the magnitude is hot or cold or heavy or light. Thus, to summarize, according to the reading I endorse, Aristotle claims that while the cube's magnitude may also be hot or cold or heavy or light, it is nevertheless different in being from those attributes, even if it cannot be found without them. Now, the claim that the cube's magnitude cannot be found without those attributes does not mean that the attributes can never change, i.e., it does not mean that the magnitude cannot be found existing without *those particular* attributes. The claim is only the perfectly Aristotelian one that the cube (and loosely speaking its magnitude too) must at a given time bear *some* attributes, whatever they may be.

So much, then, for the interpretive question presented by T4. The passage concludes with Aristotle adding the clarificatory point, "I mean the bulk of the wooden cube." This is meant to be a further specification of the subject of the relative clause. So, in speaking of the cube's magnitude that is different in being from the attributes yet is unable to be found without them, Aristotle means to speak of the cube's bulk (ὄγκος).

Before proceeding to the next passage, T5, which will take us through to the end of the cube argument, it is worth summing up all that we have heard so far. Aristotle tells us that while bodies displace other bodies, bodies do not displace void, which will remain when a body such as a wooden cube moves into it. Aristotle directs our attention to the cube's magnitude. He tells us at the start of T4 that the cube's magnitude will be equal in extent to the void the cube occupies. Note that Aristotle has not at this stage identified the magnitude itself and the void, rather he has only

identified the amount of the magnitude and the amount of the void. Aristotle then notes that even though the magnitude cannot be found without attributes, it is nonetheless different from those attributes in being. He reinforces that by the magnitude he means the bulk of the wooden cube.

Aristotle next in T5 will begin the transition from laying out and developing the scenario to posing a dilemma. T5 runs from 216b6 through to the end of the cube passage, at b20.[110]

> [T5] (b6) So, if it should even be separated from everything else and be neither heavy nor light, it will occupy an equal amount of void and will be in the same spot as the part of place and void equal to itself. (b9) How then would the body of the cube differ from the equal void and place? (b10) And if there are two such things, why should not any number also be in the same spot (ἐν τῷ αὐτῷ)? (b11) This then is one absurdity and impossibility. (b12) And further it is clear that even if it gives way the cube will have that which all the other bodies have also. (b13) So, if it does not differ from the place, why should we make the place of bodies beyond their own bulk, since the bulk is attribute-less? (b15) For nothing is added, if there is another such equal extension in this case. (b20) That then there is no separated void is clear from these considerations.
>
> (b6) ὥστ᾽ εἰ καὶ χωρισθείη τῶν ἄλλων πάντων καὶ μήτε βαρὺ μήτε κοῦφον εἴη, καθέξει τὸ ἴσον κενὸν καὶ ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ. (b9) τί οὖν διοίσει τὸ τοῦ κύβου σῶμα τοῦ ἴσου κενοῦ καὶ τόπου; (b10) καὶ εἰ δύο τοιαῦτα, διὰ τί οὐ καὶ ὁποσαοῦν ἐν τῷ αὐτῷ ἔσται; (b11) ἓν μὲν δὴ τοῦτο ἄτοπον καὶ ἀδύνατον. (b12) ἔτι δὲ φανερὸν ὅτι τοῦτο ὁ κύβος ἕξει καὶ μεθιστάμενος, ὃ καὶ τὰ ἄλλα σώματα πάντ᾽ ἔχει. (b13) ὥστ᾽ εἰ τοῦ τόπου μηδὲν διαφέρει, τί δεῖ ποιεῖν τόπον τοῖς σώμασι παρὰ τὸν ἑκάστου ὄγκον, εἰ ἀπαθὲς ὁ ὄγκος; (b15) οὐδὲν γὰρ συμβάλλεται, εἰ ἕτερον περὶ αὐτὸν ἴσον διάστημα τοιοῦτον εἴη. (b20) Ὅτι μὲν τοίνυν οὐκ ἔστι κεχωρισμένον κενόν, ἐκ τούτων ἐστὶ δῆλον.

According to the interpretation of T5 I am going to defend, Aristotle finishes laying out and developing the scenario in the first sentence of T5, b6-b9. Then, on the basis of facts of the scenario in b6-9 and what preceded, Aristotle in b9 poses a dilemma: either the cube's magnitude and the bit of void and place equal to it are (p) distinct or (not-p) not distinct. Because the dilemma lays out two alternatives that exhaust logical space, either p or not-p must be true. Aristotle takes each

[110] The text from 216b17-20 is bracketed by editors as a later addition. It is not included by the Greek commentators. Ross (592) hypothesizes that it was written in the margin of the archetype of GH. I do not include it here.

horn in turn. He addresses the first (p) from b10-b12, then addresses the second (not-p) from b12-b16. He finds in b10-b12 that p leads to an impossibility. So, not-p must be true. Yet Aristotle finds in b12-b16 that accepting not-p entails accepting an alternative account of place on which the place of a body is just the body's magnitude. Implicitly, then, because that account of place differs from the one required for the existence of void, Aristotle then concludes at b20 that there exists no (separated) void. This is to say, the starting circumstance of the scenario developed from the beginning of the cube passage, 216a28, through to the first sentence of T5, 216b6-9, namely, that void exists, is rejected by reductio. In what follows, I will offer an analysis of T5 and provide the grounds for this reconstruction.

The first sentence of T5 is already a challenge to interpret for several reasons, so it is worth spending a fair bit of time on it. First, I take the subject of the sentence to be the cube's bulk. This is likely the case at least because the bulk was what Aristotle specified in the sentence just preceding ("I mean the bulk of the wooden cube," at b6). the bulk, we recall, was identified with the cube's magnitude, which we were told in T4 was equal in extent to the amount of void the cube occupied. Aristotle now supposes in the antecedent of the εἰ sentence that the bulk, i.e., the magnitude, should be also separated from everything else (τῶν ἄλλων πάντων), such that it would be neither heavy or light (μήτε βαρὺ μήτε κοῦφον εἴη). I take the second καὶ in the antecedent to detail one result of the bulk's having been separated from everything else. Namely, it would be neither heavy nor light. It is a question both what sense of "separated" Aristotle means here as well as what the "everything else" is that the bulk is separated from. The sense of separability, I think, must be the first sense of the two possible senses I specified in my treatment of T4 above. That is, it is not the sense of separable by which we mean separable in account, i.e., different in being. It is rather the sense of separable by which we mean one thing is separable from another when it is

able to be found existing without the other. It must be this sense of separability because it would not follow from the other sense, separable in being, that the bulk is no longer heavy nor light. That is, if Aristotle were merely imagining that the bulk is different in being from this "everything else," it would not follow that the bulk would no longer be heavy or light. As T4 itself showed us, that something is different in being from another thing does not mean that that latter cannot be predicated of the former.

The sense of separability here must then be the other sense. That is, Aristotle is supposing in the antecedent of the εἰ sentence that begins T5 that the bulk or magnitude should be able to be found without "everything else" and so no longer be heavy or light. What is the "everything else" from which the bulk is supposed as separated here? I want to suggest it is all those enmattered, bodily features of the cube that would render it heavy or light. We can see why within Aristotle's own framework a thing's being separated in place from attributes would entail that the thing no longer *is* those attributes. Consider the locution Aristotle uses in his *Categories*, 'being in.' Some subject, e.g., Socrates, is pale precisely when the quality, pallor, is 'in' Socrates. Once pallor is no longer 'in' Socrates, he ceases to be pale. So too at the start of T5 above, when we imagine that the magnitude is separated in place from attributes, we imagine that the magnitude no longer is those attributes. In this way, the second καὶ in the antecedent gives us a result of the imagined separation before the καὶ. Of course, Aristotle does not think it is actually possible that the magnitude could be separated in place (i.e., found to exist without) any attributes, Aristotle does not consider it possible for magnitudes to exist independently of enmattered bodies. That the antecedent of the εἰ sentence here is *per impossibile*, contrary to the antecedent of the εἰ clause in T4, is suggested by the grammar itself. Whereas in T4 we are asked to suppose the bulk is (indicative, ἐστιν) hot or cold etc., here we are asked to suppose what *would* happen if the bulk

were separated (optative, χωρισθείη) such that it would be (optative, εἴη) no longer heavy or light. Aristotle is imagining that the magnitude and bulk of the cube is actually able to be found with any attributes. Why he should do so, and what the connection is between the *per impossibile* separability that begins T5 and the inseparability that we saw in T4, are both questions I will return to shortly. First, I must discuss the consequent of the εἰ sentence that begins T5.

So, upon supposing (εἰ) at the start of T5 that the bulk or magnitude of the cube is able to exist apart from all its enmattered features, such that it is neither heavy or light, Aristotle produces the consequent, "καθέξει τὸ ἴσον κενὸν καὶ ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ." Now, the subject of the consequent will be that of the antecedent, and so given my interpretation of the antecedent the subject here is also the bulk or magnitude. Before the first καὶ in the consequent, Aristotle tells us that the bulk καθέξει τὸ ἴσον κενὸν, that is, the bulk "will occupy an equal amount of void." The immediate interpretative question here is then 'equal *to what*'? Presumably, the thought is that the amount of void the bulk occupies is equal to itself. This is not exactly news. Indeed, we saw roughly this same claim at the start of T4: ἀλλὰ μὴν καὶ ὁ κύβος ἔχει τοσοῦτον μέγεθος ὅσον κατέχει τὸ κενόν. The key difference between the T4 claim and T5's καθέξει τὸ ἴσον κενὸν is that whereas in the T4 claim the subject of κατέχω was the cube, here the subject is the cube's bulk or magnitude. Otherwise, the claims say the same thing: the cube (in the one case) and the magnitude (in the other) will occupy an equal amount of void to the magnitude (in the one case) and to the magnitude, i.e., *itself,* (in the other). The difference between the claims, namely, the change in the subject of κατέχω from the cube to the bulk or magnitude, is licensed by the progressive shift in the scenario's focus from talk of the cube to talk of the bulk or magnitude itself, which *per impossibile* is now imagined as existing without those other features of the cube that make it enmattered.

Thus far I have only examined the first conjunct of the consequent at the start of T5: καθέξει τὸ ἴσον κενὸν, that is, the bulk or magnitude will occupy an amount of void equal to itself. The second conjunct of the consequent is also difficult, if not more so. The text tells us that the bulk or magnitude "ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ." There may be two different ways to read this claim, which diverge around how to understand the ἐν τῷ αὐτῷ. (My translation inevitably reveals my preference.) On one reading, the text offers no noun in the dative to go with ἐν τῷ αὐτῷ. On the other, it does, i.e., μέρει, such that the whole noun phrase, τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ is the noun phrase going with ἐν τῷ αὐτῷ.

The first reading produces the translation (which I give above): "it will be in the same spot as the part of place and void equal to itself." I add "spot" to the prepositional phrase ἐν τῷ αὐτῷ, though it is not present in the Greek. Note that on this first reading, the noun τῷ μέρει is what the subject is in the same spot *as*. That is to say, both the subject, in this case the bulk or magnitude, and the part (τῷ μέρει) are in the same spot (ἐν τῷ αὐτῷ). This works well in the Greek. Acceptable grammar can have it that the item that the subject is in the same spot as be given in the dative. So, we have the part (τῷ μέρει) in the dative as that which the subject, the bulk or magnitude, is in the same spot as. And we are told that this part which the bulk is in the same spot as is the part of the place and the void equal to 'itself' (τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ), where I take the 'itself' to which the part of place and void is equal to be the subject, i.e., the bulk or magnitude. So, the whole claim can be written like this '[the bulk] will be in the same spot as the part of the place and the void equal to itself [i.e., the bulk].' And the whole εἰ sentence that begins T5 can be written like this: "So, if it [i.e., the bulk] should even be separated from everything else and be neither heavy nor light, it [i.e., the bulk] will [still] occupy an equal amount of void and will be in the same spot as the part of place and void equal to itself [i.e., to the bulk]."

The second reading produces the translation: "it will be in the same part of place and void equal to itself." According to this reading, we do not have an 'as x' represented in the Greek following the 'in the same.' It is left unstated on this reading what the clause's subject is in the same part *as*. On this reading, perhaps what should be understood is that the bulk is in the same part as *the cube*. This reading would then have the second conjunct of the consequent be written as, "it [i.e., the bulk] will be in the same part [as the cube] of place and void equal to itself [i.e., the bulk]. In fact, this reading may take the καὶ between the first and second conjuncts as epexegetic. In this case, the reading would have the first conjunct, καθέξει τὸ ἴσον κενὸν, saying, "[the bulk] will occupy an equal amount of void [*to the cube*]." This is in contrast to how I read the first conjunct above, namely as saying, "[the bulk] will occupy an equal amount of void [*to itself*]," which is how the first reading took it. On the second reading currently under consideration, the second conjunct is meant to elaborate on the first. Both conjuncts together would go: "the bulk will occupy an equal amount of the void to the cube, that is to say (καὶ), the bulk will be in the same part as the cube of the void and place equal to itself." On this construal, the fact that the bulk will occupy an equal stretch of the void as the cube is then *spelled out* by the claim that it will be in the very same part of the void as the cube is. Both this reading and the first have challenges they must address. I will examine them shortly below.

First, briefly note that it is no worry (for either reading) that the bulk is said to be equal in amount to a mere *part* of place and void, rather than being equal in amount to place and void *simpliciter*. After all, when producing the cube argument Aristotle has in mind the so-called 'separated void'[111] that I considered at length in my Chapter 2. This entity, what Aristotle also calls 'separated place,' and which corresponds in part to the third candidate for place Aristotle

[111] That Aristotle has in mind the separated void is indicated by his conclusion following the cube argument, "That then there is no separated void is clear from these considerations" at 216b2-21.

rejects in his *Physics* IV 1-5, is the vast expanse across which all bodies move. It is then correct to say the cube's magnitude occupies a part of this place and void equal, namely, the part equal to itself. It is also true to say that *its* place is not the entire separated place, but merely the part of separated place equal in amount to itself. This distinction between separated place and a thing's own place (the part of the separated place equal to it) is something Aristotle would no doubt expect his listeners at this point to be acquainted with. There would have been no need to flag the distinction here.

Now, each reading has questions it must address. Recall, the first reading takes the consequent of the εἰ sentence to read: "It [i.e., the bulk] will [still] occupy an equal amount of void and will be *in the same spot as* the part of place and void equal to itself [i.e., to the bulk]" (ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ). This is in contrast to the second reading's use of τῷ μέρει as the noun going with ἐν τῷ αὐτῷ. Since the first reading lacks an explicit noun in the Greek, it is a burden on the first reading to explain the meaning of the mere prepositional phrase, "ἐν τῷ αὐτῷ" (which I translate neutrally as 'in the same spot') without a noun in the Greek. What is more, sense must be made of ἐν τῷ αὐτῷ in a way that does not refer to place, that is, ἐν τῷ αὐτῷ cannot mean 'in the same place.' After all, if it did mean 'in the same place,' the second conjunct would be claiming that the bulk and part of place and void will be in the same place. But this means that part of separated place, namely, the place of the magnitude, will itself be in the same *place* as the magnitude. And what could it possibly mean for the magnitude to share a place with its place? What defines the first 'place' in that sentence if not the second? This is then a challenge that the first reading must solve. I return to it shortly.

The second reading has two challenges. First, this reading is on shaky ground grammatically. For, were μέρει going with ἐν τῷ αὐτῷ, we would expect to see "ἐν τῷ αὐτῷ μέρει,"

rather than the duplication of the article that we in fact get in "ἐν τῷ αὐτῷ τῷ μέρει." There is no other instance in the Aristotelian corpus where the article of the noun is repeated before and after the adjective αὐτῷ in a prepositional ἐν phrase. There are also no allowances for the general possibility of such repetition in Smyth. In contrast, as I noted above, the first reading gives us what grammar would expect: when we have a locution 'in the same spot *as* x,' the 'x' may be given with its article, where both the noun, x, and the article are in the dative.[112]

Moreover, it is a fatal problem for the second reading that it has Aristotle making a point that does not make sense within the argument's development. While I have not yet turned to the next sentence, b9, it is worth simply glossing b9 as uncontroversially as possible here, so that the second reading of the εἰ clause can be dismissed before proceeding. After offering the εἰ sentence that begins T5, Aristotle at b9 makes the following inference: τί οὖν διοίσει τὸ τοῦ κύβου σῶμα τοῦ ἴσου κενοῦ καὶ τόπου; ("How then would the body of the cube differ from the equal void and place?"). Here, Aristotle questions how the cube's body (where 'body' is presumably understood to be the bulk or magnitude) should then differ from the bit of void and place equal in extent to it. Importantly, the possible indistinguishability of void and bulk raised in b9 is inferred (οὖν) from what preceded—presumably including the consequent of the εἰ sentence that immediately preceded. Yet the second reading of the εἰ sentence does not get us anywhere towards licensing such an inference. On the second reading, Aristotle finds that the bulk or magnitude is in the same part of place and void as the cube. But why should this fact, i.e., the fact that the cube and its bulk or magnitude share a part of the void, motivate a question about the inability to distinguish the

[112] One may counter that the second reading could appeal to apposition, such that it might be translated, "in the same, *namely*, the part" where τῷ μέρει is cashing out τῷ αὐτῷ. However, as will become clear from my discussion of ἐν τῷ αὐτῷ in what soon follows, ἐν τῷ αὐτῷ is a term of art Aristotle uses systematically. And in no other case of its use does he cash out τῷ αὐτῷ as τῷ μέρει. Further, given what we will see is the specific meaning of this locution, it would be strange if it were cashed out as 'same part.'

bulk or magnitude from the void? In contrast, the first reading prepares us for exactly this. According to the first reading, Aristotle finds that the magnitude or bulk is in the same spot as the part of the void equal to itself. We should see then that this second reading *does* motivate a question about the ability to distinguish the magnitude from the void. There is ample reason, then, to dismiss the second reading of the εἰ sentence that begins T5.

I promised however to discuss the challenge for the first reading, namely, to address what the prepositional phrase ἐν τῷ αὐτῷ can mean without any noun in the Greek, as the first reading has it. Thankfully, there has been very helpful discussion of this phrase, ἐν τῷ αὐτῷ, in recently secondary literature. The prepositional phrase without a corresponding noun is common in Aristotle and scholarly studies show that Aristotle uses it systematically. He uses it interchangeably with its counterpart, ἅμα.[113] I take the most convincing of these studies to be the recent report by Emily Katz (2022) on how to understand both ἐν τῷ αὐτῷ and ἅμα. In her account, Katz trains her fire on a view presented by Christian Pfeiffer (2017). The debate between Katz and Pfeiffer centers in part on how to understand Aristotle's account of contact in *Physics* V 3. Aristotle maintains there that two things are in contact (ἅπτεσθαι) if their extremes are ἅμα. Pfeiffer argues that ἅμα here should be understood as indicating that the extremes are in the same non-Aristotelian place or region. Emily Katz argues against this interpretation of ἅμα. She argues against Pfeiffer on two grounds. The first ground is a point of interpretation on the passage in question, *Physics* V 3, 226b21–3. The second concerns what Katz considers to be a fatal philosophical consequence of Pfeiffer's view. I consider the first ground now before proceeding to the second. In the passage in question, *Physics* V 3, 226b21–3, Aristotle distinguishes being together in place, being separate, and being in contact. The text reads:

[113] That these are treated as interchangeable will become readily clear by my discussion of examples in *Physics* IV 1-5 below.

> [T6] So then I say things are together in place [ἅμα κατὰ τόπον] when they are in one primary place [ἐν ἑνὶ τόπῳ ἐστὶ πρώτῳ]; apart when they are in different places; and in contact when their extremes are together [ἅμα].
>
> ἅμα μὲν οὖν λέγω ταῦτ' εἶναι κατὰ τόπον, ὅσα ἐν ἑνὶ τόπῳ ἐστὶ πρώτῳ, χωρὶς δὲ ὅσα ἐν ἑτέρῳ, ἅπτεσθαι δὲ ὧν τὰ ἄκρα ἅμα.

Pfeiffer takes both instances of ἅμα in T1 to correspond to a 'looser' and, Katz emphasizes, altogether different account of place from Aristotle's own. The sort of place in T1, Pfeiffer maintains, is akin to "region." He maintains this because, he says, it cannot be Aristotelian place at play in the description of contact, the second use of ἅμα in T1. For that would entail that things are in contact when their extremes are in the same Aristotelian place. But limits and boundaries do not have an Aristotelian place. So, he says, it must be non-Aristotelian place at play in the definition of contact, the second use of ἅμα in T1. And because, as Pfeiffer claims, it is non-Aristotelian place at play in second use of ἅμα, it is likely that the first use of ἅμα follows the second and so appeals to non-Aristotelian place as well. On his reading, the passage first says that things are together in place (ἅμα κατὰ τόπον) when they are in the same primary region, i.e., in the same primary non-Aristotelian place, and next that things are in contact (ἅπτεσθαι) when their extremities are ἅμα, in the same primary region, i.e., in the same non-Aristotelian place.

Pfeiffer's reading of *Physics* V 3, 226b21–3 is problematic, Katz notes, not only because it has Aristotle in the exposition of his own account of contact embracing a theory of place different from his own, but in fact, Katz maintains, Pfeiffer mistakes what is going on with the two uses of ἅμα in T1. She maintains that the first use of ἅμα, i.e., things are ἅμα κατὰ τόπον when they are 'in one primary place' (ἐν ἑνὶ τόπῳ πρώτῳ), should not be taken to follow the second case of ἅμα, that in the definition of contact, because, importantly she maintains, the second ἅμα is not related to place at all. Only the first use is explicitly related to place (it is explicitly ἅμα κατὰ τόπον that

is being described). Instead, the second case of ἅμα, that in the definition of contact, is an *unqualified* ἅμα. It is, she maintains, the core usage of ἅμα, in contrast to ἅμα κατὰ τόπον. Katz offers an account of this core usage of ἅμα in the definition of contact that makes no reference to place, but rather only to relative position. (I discuss her alternative shortly.) So, she maintains, because the second, core use, in the definition of contact makes no reference to place, there is no reason for thinking that some non-Aristotelian place is at play in the definition of contact. And since the occurrence of a non-Aristotelian place in the description of contact, the second case of ἅμα, was Pfeiffer's motivation for thinking that non-Aristotelian place must also occur in the first case of ἅμα, i.e., ἅμα κατὰ τόπον, there is no reason for thinking that a non-Aristotelian place is at play in the passage at all. Instead, Katz maintains, the place at play in the first use of ἅμα, i.e., ἅμα κατὰ τόπον, can perfectly well and indeed should be Aristotelian.

Katz then raises a second ground for rejecting Pfeiffer's interpretation of contact as appealing to a non-Aristotelian, region-like place. Not only does it fail as a reading of T1, but it runs into a fatal puzzle. Namely, it fails when we consider the specific case of lines in contact. Since the account has it that two things are in contact when their extremities are ἅμα, lines are in contact if a subset of their points are ἅμα. But if ἅμα just is 'to be in the same region,' as Pfeiffer maintains, then points must be in a region. This suggests that they have a kind of extension. But this is both absurd and non-Aristotelian, Katz maintains. Thus, Katz produces an alternative account of the unqualified ἅμα and what it means for the extremities to be ἅμα in the case of contact, which does not appeal to a non-Aristotelian, region-like place. Katz draws on Alexander's interpretation of T1 as well as the mathematical notion of 'fitting into' (ἐφαρμόζειν) to produce the following account of ἅμα:

> "For extremities to be 'together' [ἅμα] is for each of them to have the same position (θέσις) relative to one another—that is, for neither to be to the left of, to the right of, below, above, before or behind the other…. When two objects stand in this spatial relation, they are said to 'fit onto' one another (ἐφαρμόζειν)." (246)

On this alternative view of the core, unqualified ἅμα, the term is spatial insofar as it concerns relative position. However, it does not make reference to place—whether Aristotelian place or a region-like place. On Katz's alternative, two items are in contact if their boundaries share the same relative position, such that one is not above or below or to the right or left of the other. This interpretation prevails over Pfeiffer's not only in that it is a more accurate reading of *Physics* V 3, 226b21–3, but it is not acceptable to say that two points are ἅμα. Since this interpretation of the unqualified ἅμα also applies to in the same spot (ἐν ταὐτῷ or ἐν τῷ αὐτῷ,), to say two things are 'in the same spot' is just to say, 'in the same position relative to each other' (246).

We can consider examples from Aristotle's treatment of place in *Physics* IV 1-5 in order to see that Aristotle systematically deploys these concepts, ἐν τῷ αὐτῷ and ἅμα. Consider for instance when Aristotle is laying out conditions on an account of place at *Physics* IV 4, 211a31-35. Aristotle describes a body in place like this, "But when the thing is separate and in contact, it is primarily in the inner surface of the surroundings, and this surface is neither a part of what is in it nor yet greater than its extension, but equal to it. For the extremities of things in contact are in the same spot (ἐν γὰρ τῷ αὐτῷ τὰ ἔσχατα τῶν ἁπτομένων)." This last sentence is simply a regurgitation of the account of contact we already saw in *Physics* V 3—yet with 'ἅμα' there switched out for 'ἐν τῷ αὐτῷ' here. According to Aristotle's own account of place, for some placed body x, the inner extremities of the body that surrounds x is x's place. Those inner extremities are 'in the same spot' (ἐν τῷ αὐτῷ) as the extremities of x, and so also then, the place of x is in the same spot as the extremities of x.

These technical locutions, ἐν τῷ αὐτῷ and ἅμα, are not only reserved in *Physics* IV 1-5 for discussions of the extremities or boundaries of bodies. First, Aristotle extends his claim that the limits of a placed body and its place are together to the claim that the placed body itself is together with its place. He writes, "Further, place is together [ἅμα] with the thing, for boundaries are together with the bounded" (ἔτι ἅμα τῷ πράγματι ὁ τόπος· ἅμα γὰρ τῷ πεπερασμένῳ τὰ πέρατα at *Physics* IV 4, 212a29-30). Presumably, this is not quite as precise as saying that x's boundary is together with x's place. That x itself is together with its place is perhaps derivative from the fact that x's boundary is together with the place.

Further, throughout the discussion there are worries about two bodies being ἐν τῷ αὐτῷ or ἅμα. Aristotle makes it a condition on an account of place that the account not have two bodies be ἅμα. Early on in the discussion, Aristotle writes that a body's place cannot also be a body, if, as common opinion has it, place is meant to have an equal number of dimensions as the placed body. For then two bodies would be 'in the same spot.' He writes at *Physics* IV 1, 209a4-7, "Now, [place] has three dimensions, length, breadth, depth, the dimensions by which all body is bounded. But place cannot be body. For if it were, there would be two bodies in the same spot (ἀδύνατον δὲ σῶμα εἶναι τὸν τόπον ἐν ταὐτῷ γὰρ ἂν εἴη δύο σώματα)." After offering his own account of place (one on which a body's place has one dimension less than it), Aristotle congratulates his own account for not having two bodies be 'in the same spot' (ἐν τῷ αὐτῷ at *Physics* IV 5, 212b25).

Nor is it only extremities and bodies that Aristotle in *Physics* IV 1-5 imagines as being (or worries about being) ἐν τῷ αὐτῷ and ἅμα. In Aristotle's complex arguments against the third candidate for place (i.e., the candidate identified with place in void's 'place deprived of body'), which I treated in my Chapter 2, Aristotle alleges against this candidate that it would make multiple places be ἐν τῷ αὐτῷ and ἅμα, which he takes to be absurd. We will recall, according to this third

candidate, the place of a body x is the extension between the walls of the container containing x. In Aristotle's first argument against this third candidate, Aristotle finds that such a theory of place would lead to "an infinite number of places in the same spot" (ἐν τῷ αὐτῷ ἄπειροι ἂν ἦσαν τόποι at 211b21-22). For, if we imagine water in a jug, we could say that the whole water occupies potentially infinitely many inner extensions of the jug. This is easily visualized, as Aristotle does, by imagining the water being poured from the jug, with less and less water left in the jug, where that 'less and less' is infinitely divisible. And each less and less has an extension that is equal to it in the jug, which the whole water occupied before the pouring began. And because this theory of place does not have the resources to prioritize the extension equal to the whole water as the place of the whole water, rather than the potentially infinite number of smaller extensions the water also occupies, the theory is forced to say that the whole water occupies an infinite number of places. It is moreover forced to say that there are an infinite number of places 'in the same spot' (ἐν τῷ αὐτῷ). That is, if you look at say, the lower half of the jug, an infinite number of jug extensions higher than it fill it, each of which is a place for some bit of water greater than half. And there are infinitely many such greater-than-half bits of water, the infinite places of which are all present in the lower half of the jug. So, in the lower half of the jug, there are the infinite places of the more-than-half bits of water ἐν τῷ αὐτῷ, which is to say, on Katz's interpretation, infinite places having the same relative position.

Then, in a second argument against the third candidate, Aristotle imagines that as the jug moves, so too the extension between its inner walls moves, which serves as the place of the water. But to say that the place extension moves is to say place has changed place, and so "there will be a place of a place, and there will be many places together" (ὥστ᾽ ἔσται τοῦ τόπου τ᾽ ἄλλος τόπος, καὶ πολλοὶ τόποι ἅμα ἔσονται at 211b24-25). If you look at the place extension between the

walls of the jug, for instance, there will be another place sharing the same relative position, which is what enabled us to say the former place moved. And so there will be many places ἅμα, which Aristotle takes to be absurd. In this way, the possibility that more than one place may be ἐν τῷ αὐτῷ and ἅμα warrants the rejection of this third candidate for place. Why does Aristotle think that the existence of more than one place ἐν τῷ αὐτῷ or ἅμα is absurd? Presumably one criterion of an account of place is that a body have just one place. Yet, in the first argument, the whole water has an infinite number of places, and in the second, it has many (this is true only of for the whole water but any part of the water). Aristotle is not just rejecting otiose entities because they are otiose. These extra places actually *get in the way* of explanation. We cannot say where the water is, if there are an infinite or indeed even more than one possible answer to that question. In this way, the third candidate is rejected for having more than one place be ἐν τῷ αὐτῷ.

The foregoing discussion of ἐν τῷ αὐτῷ and ἅμα has served to show that Aristotle systematically and interchangeably uses these locutions, each of which he treats as a term of art. I presented Emily Katz's convincing arguments not to read these terms as meaning "in the same place" or "in the same extended region," but rather, "in the same relative position." With this, I now wish to return to the text of the cube argument.

We will recall, Aristotle had found in the consequent of the b6-9 εἰ sentence beginning T5 that the cube's bulk or magnitude will occupy an amount of the void equal to it and "will be in the same spot as the part of place and void equal to it" (ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ). On the interpretation of ἐν τῷ αὐτῷ and ἅμα that I have now outlined, this amounts to the claim that the bulk or magnitude will have the same relative position as the part of place and void equal to it. There is no worry about saying that a part of void and place has a relative position. After all, as we saw above, according to Aristotle's own account of place, place is 'in the

same spot' (ἐν τῷ αὐτῷ) as and 'together' (ἅμα) with the limits of the placed body and so undoubtedly has a relative position. There is precedent, then, for thinking that ἐν τῷ αὐτῷ and ἅμα can be predicated of places or parts of places.

So, at this point, i.e., by the end of the b6-9 sentence, Aristotle has established that the cube's magnitude will occupy an amount of void equal to itself and will have the same relative position as that part of place and void equal to it. On the basis of at least these two facts, Aristotle takes it to be a concern whether these two entities should differ at all. He thus poses the dilemma on partly this basis at b9: is the cube's magnitude distinct from that bit of void and place or not? Before proceeding to the dilemma at b9 and what follows, however, I promised that I would address how the b6-9 εἰ sentence that begins T5 relates to what came before in T4, as well as explain the connection between the antecedent and the consequent of the b6-9 εἰ sentence. I must also before proceeding address what exactly Aristotle is doing with all the talk of attributes (παθημάτα). So, then, recall T4 (below along with the first sentence of T5):

> [T4 with b6-9]: Indeed truly however much void the cube occupies, that is how much magnitude it has, which, even if hot or cold or heavy or light, is nonetheless different in being from all those attributes, even if it is not separable. I mean the bulk of the wooden cube. (b6) So, if it should even be separated from everything else and be neither heavy nor light, it will occupy an equal amount of void and will be in the same spot as the part of place and void equal to itself.
>
> ἀλλὰ μὴν καὶ ὁ κύβος ἔχει τοσοῦτον μέγεθος ὅσον κατέχει τὸ κενόν· ὃ εἰ καὶ θερμὸν ἢ ψυχρόν ἐστιν ἢ βαρὺ ἢ κοῦφον, οὐδὲν ἧττον ἕτερον τῷ εἶναι πάντων τῶν παθημάτων ἐστί, καὶ εἰ μὴ χωριστόν· λέγω δὲ τὸν ὄγκον τοῦ ξυλίνου κύβου. (b6) ὥστ᾽ εἰ καὶ χωρισθείη τῶν ἄλλων πάντων καὶ μήτε βαρὺ μήτε κοῦφον εἴη, καθέξει τὸ ἴσον κενὸν καὶ ἐν τῷ αὐτῷ ἔσται τῷ τοῦ τόπου καὶ τῷ τοῦ κενοῦ μέρει ἴσῳ αὐτῷ.

According to the interpretation of T4 that I defended above, in T4 Aristotle finds first that the cube's magnitude is equal in extent to the bit of void the cube occupies. Focusing then on the magnitude, he notes that even if it is hot or cold or heavy or light, it is different in being from those

attributes. He flags that the magnitude is different in being from the attributes "even if it is not separable," which I argued means, 'even if the magnitude is not separable in place from (i.e., able to be found without) those attributes.' So, T4 establishes that while the cube's magnitude is not separable in place from attributes, it is nevertheless different in being from them. And this magnitude, T4 tells us at its start, is equal in extent to the bit of void the cube occupies.

Now, T5 begins by supposing that the magnitude *is* separated in place from the attributes, contrary to T4: the εἰ sentence at b6-9 supposes what would happen εἰ καὶ χωρισθείη ("if it should even be separated"). That is, we are told to imagine that *per impossibile* the inseparability of T4 does not hold. If the magnitude is separated in place from those attributes, such that it is no longer heavy or light at all, the consequent of b6-9 tells us that the magnitude will occupy an equal bit of void to itself and share a relative position with that bit of void and place. Now, the content of the consequent was just as true before we imagined that the magnitude was separated in place from the attributes. That is, as the ὅσον… τοσοῦτον claim that begins T4 itself indicates, it was just as true in T4 that the cube's magnitude, which was different in being from the attributes but inseparable in place, occupied a bit of void equal to itself and shared a relative position with that bit of void and place. There is then an implicit 'still' to be understood at the start of the consequent of the b6-9 clause, such that it can be read, "if [the magnitude] should even be separated from everything else, it will [*still*] occupy…"

As I have noted, Aristotle would not affirm that it is possible for the bulk or magnitude to be found without any attributes, since magnitudes are not independent entities for Aristotle. They will invariably be found with attributes. We should think, then, that Aristotle wishes to show that even on a view according to which there are independent magnitudes, those magnitudes must occupy a bit of place and void. As with the inseparable magnitudes of T4, the independent

magnitudes will also be equal in extent to that bit of place and void they occupy and will share the same relative position as it. In other words, Aristotle is eager to emphasize that the fact that the magnitude will occupy a place is not simply a feature of his own metaphysics. Even for someone who insists that there can be independent magnitudes, those magnitudes will still occupy a place, will be equal to that bit of place and void they occupy, and will share a relative position with it.

The last thing I must address before proceeding to the dilemma is all the talk about attributes (παθημάτα). I want to suggest that Aristotle mobilizes the status of the cube's magnitude in relation to the attributes as a reason for doubting the difference between the magnitude and the bit of void and place it occupies. Recall, according to the reconstruction of the cube passage that I am developing, Aristotle will on the basis of the scenario with the cube's magnitude pose the dilemma: is the cube's magnitude distinct from the bit of void and place or not? He raises this dilemma in b9 upon finding both that the magnitude will be equal in extent to the bit of void and place it occupies and that it will have the same relative position. As I noted above, these two facts give reason for doubting whether the two entities, the magnitude on the one hand and the bit of void and place on the other, differ at all.

Yet it is not *just* these two facts that give reason to doubt whether the two entities differ. Looking ahead briefly, when Aristotle addresses in b12-16 what I am calling the second horn of the dilemma, not-p, i.e., that the two entities are not distinct, he appeals to the fact that the magnitude is ἀπαθὲς. Namely, he writes at b13-15, "So, if it does not differ from the place, why should we make the place of bodies beyond their own bulk, if the bulk is ἀπαθὲς?" Here, the fact that the bulk or magnitude is ἀπαθὲς is connected to the thought that the bulk or magnitude and the bit of void and place do not differ (presumably because the void and place extension too is ἀπαθὲς). At the very least, ἀπαθὲς must mean something like 'at some significant remove from

attributes.' We should think, then, that the fact that the cube's magnitude is at some significant remove from attributes like the void and place extension is a further reason, in addition to the first two I listed just above, for doubting whether the magnitude and the bit of void and place extension differ at all.

Aristotle's emphasis on the attributes in T4 and at the start of T5 is then most likely in service of motivating this indistinguishability and so is meant to show that the magnitude is at some significant remove from attributes. Of course, the supposition that begins T5, according to which the magnitude is imagined *per impossibile* as separate in place from attributes altogether, obviously has the magnitude at a far remove from attributes. Yet it is still the case that when the magnitude is *not* separated in place, as in T4, it can nevertheless be aptly described as at a remove from attributes. In my analysis of T4 above, I noted that strictly speaking the magnitude can be called at most hot or cold and heavy or light κατὰ συμβεβηκός. It is not the proper bearer of attributes and so is strictly speaking attribute-less. Indeed, I say 'at most κατὰ συμβεβηκός' since, when Aristotle describes the unseparated magnitude in T4, he does not simply come out and say that it *is* hot or cold and heavy or light. Rather, he says '"*even if*" (εἰ καὶ) the magnitude is hot or cold and heavy or light…,' suggesting that Aristotle is already reluctant to call it hot or cold—even κατὰ συμβεβηκός. After all, on Aristotle's picture, the magnitude and the attributes are alike hosted by the wooden cube. Both the magnitude and the attributes fall in non-substance categories, in the one case quantity and in the other quality. To say the magnitude is hot is like saying musicality is just because the musical man is just[114]—we say it at most incidentally. It is clear then that whether the magnitude is inseparable in place from attributes as in T4 or *per impossibile*

[114] Cf. Aristotle's discussion of the musical man at *Metaphysics* Delta 7.

separated in place from them as in T5, it is ἀπαθὲς, i.e., at some significant remove from attributes. I translate ἀπαθὲς as 'attribute-less.'

So, according to the interpretation I have defended so far, Aristotle has by the end of b9 established three facts about the cube's magnitude. Each of these facts gives reason for thinking that the magnitude is not distinct from the place and void extension: (1) the cube's magnitude is equal in extent to the bit of place and void it occupies, (2) they have the same relative position, and (3) they can both be taken to be at a significant remove from attributes.

2. The Dilemma of the Cube Argument

On the basis of these three facts, Aristotle will then raise a logically exhaustive dilemma that will carry him through to the end of the cube passage. I turn to the rest of the cube passage now, beginning with the dilemma at b9.

> [T5, b9-20 only] (b9) How then would the body of the cube differ from the equal void and place? (b10) And if there are two such things, why should any number not also be in the same spot (ἐν τῷ αὐτῷ)? (b11) This then is one absurdity and impossibility. (b12) But further it is clear that even if it gives way the cube will have that which all the other bodies have also. (b13) So, if it does not differ from the place, why should we make the place of bodies beyond their own bulk, if the bulk is attribute-less? (b15) For nothing is added, if there is another such equal extension in this case. (b20) That then there is no separated void is clear from these considerations.
>
> (b9) τί οὖν διοίσει τὸ τοῦ κύβου σῶμα τοῦ ἴσου κενοῦ καὶ τόπου; (b10) καὶ εἰ δύο τοιαῦτα, διὰ τί οὐ καὶ ὁποσαοῦν ἐν τῷ αὐτῷ ἔσται; (b11) ἓν μὲν δὴ τοῦτο ἄτοπον καὶ ἀδύνατον. (b12) ἔτι δὲ φανερὸν ὅτι τοῦτο ὁ κύβος ἕξει καὶ μεθιστάμενος, ὃ καὶ τὰ ἄλλα σώματα πάντ᾽ ἔχει. ὥστ᾽ εἰ τοῦ τόπου μηδὲν διαφέρει, τί δεῖ ποιεῖν τόπον τοῖς σώμασι παρὰ τὸν ἑκάστου ὄγκον, εἰ ἀπαθὲς ὁ ὄγκος; (b15) οὐδὲν γὰρ συμβάλλεται, εἰ ἕτερον περὶ αὐτὸν ἴσον διάστημα τοιοῦτον εἴη. (b20) Ὅτι μὲν τοίνυν οὐκ ἔστι κεχωρισμένον κενόν, ἐκ τούτων ἐστὶ δῆλον).

In b9 Aristotle questions: how will the body of the cube differ from the equal bit of void and place? (Presumably, 'body' here just refers to the magnitude or bulk, since otherwise b9 would not have developed out of the prior discussion about bulk or magnitude, which it clearly does, cf. οὖν at

b9). Aristotle's question in b9 amounts to the presentation of a dilemma that he will take up in what remains: either (p) the magnitude and the equal bit of void and place are distinct entities or (not-p) they are not distinct entities. The disjunctive proposition (either p or not-p) in the dilemma is logical truth. So, either p or not-p must be true. Aristotle takes each of these horns in turn in what remains. He addresses p, the claim that they are distinct entities, in b10-12, and addresses not-p, the claim that they are not distinct, in b12-15. Because p will lead to an absurdity, not-p must be true. But not-p will require rejecting the existence of void. The analysis I will offer now of the text at b9-16 will bear out this reconstruction.

In b10 Aristotle raises the conditional question: "And if there are two such things, why should any number not also be in the same spot?" (καὶ εἰ δύο τοιαῦτα, διὰ τί οὐ καὶ ὁποσαοῦν ἐν τῷ αὐτῷ ἔσται;). Note first that Aristotle is supposing (εἰ) that there are "two such things" (δύο τοιαῦτα). The referent of 'two such things' (δύο τοιαῦτα) must be something that came before b10's conditional supposition. As we know, in b9, Aristotle had questioned whether there is any difference between two entities, the bulk or magnitude, on the one hand, and the equal part of the void and place, on the other. Most likely, then, the two entities picked up by 'δύο τοιαῦτα' in the antecedent of b10 are just these: the bulk or magnitude, on the one hand, and the equal bit of void and place, on the other. So, on this reading, b10 can be understood as asking, 'and if there are indeed these two different entities, i.e., the bulk or magnitude and the equal bit of place and void…' Aristotle is clearly putting forward the first horn of the dilemma (p), that the bulk or magnitude and the equal bit of void and place are distinct.

Aristotle tells us that if we suppose p, i.e., there are these two different entities, a worry arises: why then should there not be any number in the same spot (διὰ τί οὐ καὶ ὁποσαοῦν ἐν τῷ αὐτῷ ἔσται;)? This consequence, that there should be any number in the same spot, is then ruled

in in b11 “one absurdity and impossibility.” Note that in the consequent Aristotle uses the locution, ἐν τῷ αὐτῷ, ‘in the same spot,’ which we saw before in b8. I have offered a lengthy analysis of ἐν τῷ αὐτῷ above. I understand it to mean ‘in the same relative position,’ such that the conditional question here at b10-11 can be read as, ‘if there are two such things, why should any number not also have the same relative position?’

It is not immediately clear what the circumstances of the worry are here. As the conditional structure of b10 suggests, the problem about any number of such things having the same relative position arises precisely in the case where p is supposed, i.e., that there exists both the cube’s magnitude and the bit of place and void equal to it. It is a key interpretative question, then, why the worry about ‘any number’ being ἐν τῷ αὐτῷ should follow from our admitting that there are these two entities. Unfortunately, Aristotle does not give us much to go on by way of grasping the worry in b10. On the interpretation I will present, Aristotle is running a similar argument to those he militated against the third candidate for place in *Physics* IV 4. They will be similar in that both arrive at the absurdity of otiose places by finding multiple places ἐν τῷ αὐτῷ. In order to build up to this interpretation, we can make the following points.

First, here in b10-12 we are presented with a worry that ‘any number may be ἐν τῷ αὐτῷ,’ which Aristotle treats as absurd. Second, as we saw above[115], when Aristotle argued against the third candidate for place in *Physics* IV 4, the central absurdity there was that the candidate would make more than one place be ἐν τῷ αὐτῷ. As I noted above, this was presumably absurd because it entailed otiose places. Further, we also know that one of the two entities admitted here in the antecedent of b10 is the equal bit of place or void. That is, one of the entities admitted is a place. Now, the other entity admitted is not a place. It is the cube’s magnitude or bulk. However, we

[115] Cf. my pages 147-48 above.

should remember that in laying out the scenario of the cube argument Aristotle had emphasized the similarity of that bulk or magnitude and the bit of place or void equal to it. Both are three-dimensionally extended entities equal in size, at some significant remove from attributes, and share the same relative position. This then raises the perfectly reasonable thought, if two distinct things like this can both exist ἐν τῷ αὐτῷ, what is there to prevent more things like this being ἐν τῷ αὐτῷ? Indeed, note the structure of Aristotle's question in the consequent of b10: "why should any number not (διὰ τί οὐ) also be in the same spot?" The "why not?" (διὰ τί οὐ) has the structure of "what is to prevent it?" So, the thought is that, if two similar entities can share a relative position, there is no reason why more cannot as well. This is commonsensical. If two, say, people can share the same relative position (they cannot), so can three and four and so on. Or if two gravitational waves can share the same relative position (presumably they can), so can three and four and so on. So too, as we have here, once we grant that two three-dimensionally extended magnitudes can share the same relative position, nothing prevents our saying that any number can as well

Why, though, is it such a problem—indeed an absurdity—that any number of three-dimensionally extended magnitudes should share the same relative position? Let us imagine briefly what such a picture may look like. Imagine a dice placed in the void. According to the account of place central to what void is, the third candidate for place, the place of the dice is the three-dimensional extension together with the dice. Now imagine that the dice is inside the hole of a donut. The donut hole will have a place, of course, and that place will be the extension that is together with the hole, i.e., the extension between the walls of the donut hole. So too, the entire donut will have a place, namely, the extension between the outer walls of the donut. And imagine also that the donut is in a box. The place of the box will then be the extension between its walls. This process can continue however long. Now look closely at the dice's own magnitude. In the

very same relative position (ἐν τῷ αὐτῷ) as the dice's magnitude will be not just the part of the void extension equal to it, but the equal part of the place of the donut hole, and the equal part of the place of the entire donut, and the equal part of the place of the donut box, and so on. Yet the place of some body x according to the third candidate for place is the extension equal to and ἐν τῷ αὐτῷ with the placed body. So, all those other extensions there with the dice could be its place. Indeed, they *are* all places of the dice. We have many otiose entities. It is then this, as in *Physics* IV 4, that is "one absurdity and impossibility" (b10-11).

Now, proponents of this account of place may object and insist that when specifying the place of the dice they do have a principled way of distinguishing between the bit of the whole void extension that is together with the dice and the bits of all the other extensions that are together with the dice. Namely, while the donut box and the donut (and the extensions belonging to them) move around, the whole, separated void extension is fixed! Yet should we simply change our example and choose additional extensions that are fixed as well, the problem returns. Say, imagine that the dice is somewhere in Paris, and so too somewhere in the GMT+2 time zone, and so too somewhere in the eastern hemisphere.[116] Together with the dice's extension is then the bit of the extension between the border of Paris, the bit of the extension between the boundaries of the GMT+2 time zone, and the bit of extension between the boundaries of the eastern hemisphere. Yet the extension of Paris, the extension of the GMT+2 time zone, and the extension of the eastern hemisphere are all fixed. So, the bits of those extensions that are together with the dice extension are each as eligible for being the place of the dice as the bit of the whole void extension together with the dice. There is no reason why, say, the bit of the extension between the boundaries of the GMT+2 time zone that is together with the dice should be any less the place of the dice than the bit of the whole

[116] I thank Benjamin Morison for this point about simply fixing in place the extensions we are considering.

void extension together with the dice. With many such eligible extensions, we are left with many otiose places for the dice. And as in the *Physics* IV 4 arguments, Aristotle takes otiose places to be absurd and impossible.

On my reading, then, the absurdity and impossibility of the first horn in b11 turns on the impossibility of more than one place being ἐν τῷ αὐτῷ. Because the place, which is just a three-dimensional magnitude on this theory, and the similar three-dimensional magnitude of the cube can both be ἐν τῷ αὐτῷ, there is nothing to prevent more places (which are just more three-dimensional magnitudes) from also being ἐν τῷ αὐτῷ. This argument is distinctively an argument targeting the third candidate for place. It is because according to the third candidate place is a three-dimensional extension that the bit of place and void is similar to the three-dimensional magnitude of the cube, such that once you admit two such entities are there, you can have however many there. And once you can have however many there, you can get however many places, and so get otiose places.

In this way, the first horn of the dilemma, on which we have p, the supposition that there are two distinct entities, finds that p leads to an impossibility. Because the dilemma is logically exhaustive, not-p must be true, the two entities are not distinct but the same. What follows in b12-16 is then Aristotle's treatment of this second horn.

Aristotle begins what follows at b12 like this: "But further it is clear that even if it gives way the cube will have that which all the other bodies have also" (ἔτι δὲ φανερὸν ὅτι τοῦτο ὁ κύβος ἕξει καὶ μεθιστάμενος, ὃ καὶ τὰ ἄλλα σώματα πάντ᾽ ἔχει). First, note that Aristotle is clearly beginning a new point, which is indicated by his use of ἔτι. I take the object of ἔχω and the referent of the relative article ὃ to be the magnitude. So, ἔχω here is not interchangeable κατέχω, the object of which would be the void or place. That ἔχω is not used interchangeably with κατέχω has been

clear throughout the cube argument. We saw the difference at the start of T4 above, 216b2-4: "Indeed truly however much void the cube occupies (κατέχει), that is how much magnitude it has (ἔχει)." That is, the cube has (ἔχει) magnitude and occupies (κατέχει) void. So too here at b12-13, what the cube will have (ἕξει), which (ὃ) all other bodies have (ἔχει) is a magnitude. We may think, then, that Aristotle is in b12-13 making a generalization from the cube to all other bodies. Namely, all bodies have magnitude. So even if the cube is displaced, what goes for the cube will go for any other body taking its place.

Then, on the basis of what likely includes this generalization, Aristotle in b13-15 raises the conditional question: "So, if it does not differ from the place, why should we make the place of bodies beyond their own bulk, since the bulk is attribute-less?" (ὥστ᾽ εἰ τοῦ τόπου μηδὲν διαφέρει, τί δεῖ ποιεῖν τόπον τοῖς σώμασι παρὰ τὸν ἑκάστου ὄγκον, εἰ ἀπαθὲς ὁ ὄγκος;). I take the subject of διαφέρει in the antecedent to be the magnitude, which was the object of ἔχω and the referent of the relevant pronoun ὃ in the sentence that preceded, b12-13. Thus, the question at b13-15 can be read as asking, "So, if the magnitude (which all bodies have, per b12-13) does not differ from the place, why make the place of bodies beyond their own bulk, since the bulk is attribute-less." This question has a conditional structure like that at b10-11. Namely, if (εἰ) there is no difference between the magnitude and place—or, presumably given what came before, specifically no difference between the magnitude and the bit of place and void that the magnitude occupies—then why should we call place something beyond the bulk of bodies?

Before considering the consequent and how it is licensed by what came before, first notice the parallel between the antecedent in the conditional question here at b13-15 and the antecedent in conditional question of the previous argument at b10-12. There, we were asked to suppose that there are 'two such things,' namely the magnitude and the place equal to it that is 'in the same

spot' (ἐν τῷ αὐτῷ) as it. Aristotle then showed that supposing two such things exist leads to an absurdity and impossibility. Here at b13-14, we are asked in contrast to suppose the contradictory claim: τοῦ τόπου μηδὲν διαφέρει, i.e., that there is no difference between the magnitude and the place. Clearly Aristotle is now addressing the second horn of the dilemma, not-p.

Upon supposing in the antecedent that there is no difference between the magnitude and the place it occupies, Aristotle writes, "why [then] should we make the place of bodies beyond their own bulk, since the bulk is attribute-less?" That is, Aristotle here questions why we should make (ποιεῖν) place—where this is to say, embrace an account of place on which place is—something beyond the body's magnitude. This is a general point about what account of place to endorse: we should not endorse an account of place where place is beyond bodies. The general point about an account of place I take it is licensed by two things: first, the generalizing claim in b12-13 that all bodies have magnitudes like the cube had magnitude, and so what went for the cube goes for all bodies, as well as the antecedent of b13-b14, the supposition (εἰ) of not-p, that there is no difference between these magnitudes and the bit of place and void they occupy. This is to say, the body's magnitude just *is* its place and void. In other words, if we grant that for any given body, not-p holds, i.e., the place of that body is no different from the body's own magnitude, then we must make certain conclusions about what an account of place would have to be (and not be). Namely, the account of place could not be the one required for the existence of void, on which the place is something beyond that magnitude or bulk. Rather, the account of place must be one on which the place of a body is its own magnitude. So, the consequence of this second horn, where not-p obtains and there is no difference between the body's magnitude and the place, is the rejection of the central account of place. Indeed, since the dilemma at b9 is logically exhaustive,

and p was shown to be absurd and impossible in b10-12, not-p must be true: the place of a body just is the body's magnitude. We are left with another account of place entirely.[117]

Aristotle drives home the now-superfluousness of the account of place required for void in the sentence at b15-16. He writes, "For nothing is added, if there is another such equal extension in this case" (οὐδὲν γὰρ συμβάλλεται, εἰ ἕτερον περὶ αὐτὸν ἴσον διάστημα τοιοῦτον εἴη.). That is, with the place of a body and the body's magnitude been identified, nothing is added by the postulation of *another* extension different from that of bodies. For that extension could not be place, since place is already identified with the magnitude of bodies. So, with place already having been 'taken,' so to speak, an additional extension would contribute nothing at all (οὐδὲν γὰρ συμβάλλεται).[118]

We have thus seen that the second horn, not-p, is problematic. The realization of not-p, i.e., the identification of the place and void extension with the cube's own magnitude (and so on generally for all other bodies) has required the rejection of the account of place central to void, on which place is an extension beyond bodies. Yet, I argued in my Chapters 1 and 2, what void is for

[117] As I noted in my fn. 106, Hussey takes b12-16 not the development of the second horn, not-p, but rather a new consideration outside the scope of the dilemma. He takes the dilemma to be articulated and wrapped up by b12. He presumably takes what I am calling the first horn, p, i.e., the supposition that they are distinct, to be dealt with at b10-12 (as I do). Yet he apparently takes the second horn to also have been addressed by that point. It is not clear where exactly it could have been addressed by that point, unless Hussey takes the question at b9, which I claim is the introduction of the dilemma itself, to be Aristotle's engagement with the first horn. Hussey (page 133) writes in his summary of the cube argument, "…(c) that therefore either the body's extension and the occupied void are identical, or (if not) there will be two coextensive extensions- in either case an impossibility (b6 - 12); (d) in any case, the void will be superfluous in the role of a place for the body, since the body's own extension will do just as well (bl2-16)." Yet it is precisely upon the supposition that the place and the magnitude are identical, i.e., the second horn, not-p, that the superfluousness of the void extension as place arises. Indeed, Aristotle's own language in b12-16 explicitly flags he is considering the second horn. Aristotle writes at b13, "So, if it does not differ from the place… (ὥστ᾽ εἰ τοῦ τόπου μηδὲν διαφέρει…)." Clearly, then, *pace* Hussey, Aristotle is here dealing with the second horn of the dilemma.

[118] Cf. Aristotle's claim when introducing the cube argument at 216a26-7 that void will be shown to be "fruitless" (κενόν). We see here that by the dilemma's second horn, the truth of which we must accept, place is the body's own magnitude. So, any additional void extension postulated at this point could not be place and would contribute nothing. It would be fruitless or explanatorily useless.

Aristotle *just is* place deprived of body according to that account of place. So, to reject that account of place is to reject the existence of void. Aristotle therefore concludes the cube argument at *Physics* IV 8, 216b20-21: "That then there is no separated void is clear from these considerations" (Ὅτι μὲν τοίνυν οὐκ ἔστι κεχωρισμένον κενόν, ἐκ τούτων ἐστὶ δῆλον).

In this way, the whole cube argument from 216a26–b20 is a *reductio ad absurdum* against the existence of void. It functions first by laying out a scenario in which void exists. In laying out the scenario Aristotle develops some consequences of the supposition that void exists. According to this scenario, three things must be true: (1) the magnitude of a body in the void will be equal in extent to the bit of void and place the magnitude occupies; (2) the body's magnitude will share the same relative position with that bit of void and place; and (3) both the body's magnitude and that bit of void and place will be attribute-less. On the basis of this scenario and the three facts, then, Aristotle poses an exhaustive logical dilemma. Either the magnitude is a distinct entity from the bit of void and place, or not. The dilemma forces us to accept that they are not distinct entities. The place of a body just is its own magnitude. Yet I argued in my Chapters 1 and 2 that void—if it exists—*just is* place deprived of body, where the account of place relevant in this quasi-definition is extension independent of the placed body. But a body's own magnitude is not independent of it. To deny then that there is such a place, and to make place instead something connected to the placed body, is to deny the existence of void (so understood). Yet since p was absurd, we must accept not-p. The cube argument therefore forces us to reject the existence of void.

Conclusion

1. Ground covered

I have offered an analysis of Aristotle's inquiry on void, *Physics* IV 6-9. I began in Chapter 1 by addressing two methodological questions. The first asked how Aristotle can say what a nonexistent thing is, as he apparently takes himself to at *Physics* IV 7, 214a16-17. What governs why any one answer is correct? The second question methodological asked how Aristotle could prove by demonstration the nonexistence of void, given that 'void' is an empty term, and Aristotle's logic employs only non-empty terms.

I found that Aristotle has a considered method for approaching nonexistence inquiries. This method is a counterpart of the method for approaching *existence* inquiries that he laid out in *Posterior Analytics* II 1-2. In the existence method there, Aristotle requires that when seeking to ultimately prove that something exists, the inquirer first get an initial grasp (*gnôsis*) that the thing exists. On the basis of that initial grasp, she finds an answer to what the thing in question is. That answer is then the middle term and explanation in a proof of its existence, upon which she then has full knowledge that it exists. The existence inquiry thus has a twofold route structure. The first route proceeds from the initial grasp that the thing exists to the answer to what it is. The second route is the proof of existence proceeding from that answer to the full knowledge of its existence. In this way the answer to what the thing is is the key nexus enabling the transition from the outbound to return routes of the *Posterior Analytics* II 1-2 method.

So too, I found, Aristotle's approach to nonexistence inquiries bears a twofold route structure, which centrally turns on the answer to what the thing is, if it exists. That is, the answer to what void is, if it exists, place or extension deprived of body, is achieved as the product of an outbound route, and it is what enables him to undertake the return route and argue against the

existence of the thing. For, when Aristotle argues that void does not exist in the return route, he targets *that* thing, place or extension deprived of body. Void does not exist precisely because place or extension deprived of body does not exist.

I found that there are important differences between the counterpart nonexistence inquiry and the existence inquiry. In the case of the nonexistence inquiry, instead of a grasp that the thing exists, Aristotle gets started with what people who talk about the thing say. He takes the dominant position about what void is (i.e., the position on which the majority of proponents and opponents of void's existence agree) to be authoritative over other positions on what void is, if it exists. He then refines that dominant position, making it serviceable for theoretical argument, and arrives at his answer to what void is, if it exists. Thus I inferred the general point: the correct answer to what a nonexistent thing is, if it exists, is according to Aristotle the answer that is consistent with the dominant view of what it is among the people who talk about it.

Moreover, unlike in the existence method of *Posterior Analytics,* it is not the case that the answer to what the thing is (if it exists) is the middle term in a demonstration of the return journey. Notwithstanding, I found that that answer is useful in a possible nonexistence demonstration. Namely, should Aristotle wish to demonstrate the nonexistence of void, his answer to what void is, if it exists, would offer two non-empty terms, 'extension' and 'deprived of body,' where he can demonstrate that the one fails to hold of the other. That is, he can demonstrate that being deprived of body holds of no extension, and since an extension deprived of body just was his answer to what void is, if it exists, Aristotle can demonstrate the nonexistence of void.

In my second chapter, I looked closely at Aristotle's answer to what void is, if it exists: place or extension deprived of body. I found that Aristotle retains a consistent account of void throughout his inquiry, despite targeting both a 'separated void' and 'inseparable voids.' How both

sorts of void are meant to be such places deprived of body while nevertheless differing in key ways was a question inadequately addressed in the scholarship. According to the interpretation I proposed, both are places deprived of body, where the relevant account of place is one according to which place is a three-dimensional extension independent of the body of which it is place. The point of difference lies at whether the extension in question is attached to bodies that move around or is the absolute extension within which all bodies move. The separated void is a fixed, universe-spanning extension. The inseparable void is, say, a pore's empty extension between its inner walls. It is attached to a body yet receptive of others. While the separated void is akin to an absolute Newtonian frame, the inseparable voids are akin to relative Newtonian frames.

In my third chapter I considered Aristotle's lengthy treatment of his predecessors. As I established in my first chapter, a key part of the 'outbound journey' of the void inquiry, i.e., the progression to an answer to what void is, if it exists, is laying out what those who have talked about void have said about it. In my third chapter I turned to that treatment, focusing on Aristotle's treatment of void's proponents. I examined Aristotle's initial laying out of their claims in support of void (*Physics* IV 6, 213b2-29) as well his response to their claims (*Physics* IV 7, 214a16-b11). In each of the claims of void's proponents, the proponents describe some physical phenomenon as requiring the existence of void. In Aristotle's responses to each, he offers an alternative explanation for the phenomenon, which does not appeal to void. I examined both Aristotle's presentation of their claims and his responses. Contrary to the orthodox scholarly interpretation of *Physics* IV 6, 213b2-29, I found that the claims Aristotle presents there were not atomist arguments for the existence of void. Rather, they were explanations for notoriously puzzling physical phenomena that appealed to the existence of void, which was presupposed. I argued that the reason Aristotle

does not outline any atomist arguments for the existence of void in his *Physics* IV 6-9 is likely because the atomists never gave any such arguments.

In my final chapter, I turned to the most interpretively challenging of Aristotle's arguments against the existence of void. This is the so-called 'cube argument' at *Physics* IV 8, 216a26–b20. I offered a reconstruction of the argument according to which the argument is a *reductio ad absurdum* against the existence of void. It functions first by laying out a scenario, the starting point of which is the supposition that void exists. In laying out the scenario Aristotle develops some consequences of this supposition. According to this scenario, three things must be true: (1) the magnitude of a body, say, a wooden cube, in the void will be equal in extent to the bit of void and place the magnitude occupies; (2) the body's magnitude will share a relative position with that bit of void and place; and (3) both the magnitude and that bit of void and place will be attribute-less.

On the basis of this scenario and the three facts, then, Aristotle poses an exhaustive logical dilemma. Either (p) the magnitude is a distinct entity from the bit of void and place, or (not-p) they are not distinct. Yet the supposition of p, that they are distinct entities, leads to an absurdity. Specifically, on the interpretation I offered, it would open up the possibility that the body in the void should have an indeterminate number of places. And Aristotle takes otiose places to be absurd. Because p is absurd, and p and not-p are contradictories, not-p must then be true. That is, the magnitude and the bit of void and place are not distinct. According to not-p, the place of a body just is its own magnitude. Yet, as I argued in my Chapters 1 and 2, what void is, if it exists, is place deprived of body, where the account of place in this quasi-definition is extension independent of the placed body. Because this just is what void is, if it exists, it follows that to deny that there is such a thing, i.e., such a place, is to deny the existence of void. I argued in my Chapter 1 that just as Aristotle's approach to existence inquiries in *Posterior Analytics* centers on achieving an answer

to what the item in question is, and then using that answer in the proof of existence, so too Aristotle's approach to nonexistence inquiries centers on achieving an answer to what the item in question is, if it exists, and then appealing to that answer in the nonexistence arguments that follow. For it is Aristotle's answer to what void is, if it exists, place deprived of body, that is targeted in the arguments of the return journey. The cube argument is just such a case of this. It works in part because Aristotle had already established what void is, if it exists: place deprived of body, understood according to a certain account of place. Because the cube argument shows the nonexistence of *that* thing, it shows the existence of void.

2. Implications and questions for further research

There are two possible projects emerging from this dissertation. I will say a bit about both here.

2.1 Aristotle and interpenetration of extension

While all Aristotelian interpreters agree that it is impossible for two bodies to interpenetrate, many have also maintained that it is impossible for two three-dimensional extensions to interpenetrate.[119] Indeed, some claim that the reason that it is impossible for bodies to interpenetrate is because it is impossible for two three-dimensional extension to interpenetrate. Most often, scholars who consider the interpenetration of three-dimensional extensions to be impossible take as the primary evidence for their view the 'cube argument' that I reconstructed in my Chapter 4. They interpret the argument such that it proceeds by showing that the void extension would *per impossibile* interpenetrate with the body's extension, and, because Aristotle takes such interpenetration to be impossible, showing that the void theorist is committed to this impossibility. Yet my analysis of the cube argument revealed there to be no such move at play. While it is indeed true that the bit of

[119] See for instance Pfeiffer (2016), Hussey (1983), and Inwood (1981).

void and place that the cube's magnitude occupies interpenetrates the magnitude, according to the reconstruction I presented, the fact of such interpenetration is not what Aristotle takes to be absurd.

Indeed, there is what I take to be overwhelming positive reason elsewhere for thinking that Aristotle does *not* take the interpenetration of extension to be impossible. After all, according to Aristotle's account of contact (*Physics* V 3, 226b21–3), entities are in contact when their limits interpenetrate. So, three-dimensional bodies are in contact when their two-dimensional surfaces interpenetrate. And two-dimensional surfaces are in contact when their one-dimensional edges interpenetrate. According to Aristotle's account of contact, then, we have one- and two-dimensional extensions interpenetrating. But there is no in principle reason why, while one- and two-dimensional extensions can interpenetrate, three-dimensional extensions cannot. So, given that I have shown that the primary evidence cited for the view that Aristotle thinks three-dimensional extensions cannot interpenetrate is not in fact evidence, and given this additional reason for thinking that that cannot be Aristotle's view, I reckon that the view can be rejected as Aristotelian. Instead, we should offer a different explanation for why bodies cannot interpenetrate ·(i.e., not one that appeals primarily to their being three-dimensional extensions). I suspect that we can follow Betegh (2016) in pointing to the status of bodies as 'full' or 'solid' (τὸ πλῆρες) and emphasizing the role that this status plays in their inability to interpenetrate.[120] I would hope to develop the foregoing in a future project.

2.2 Aristotle and the conservation of volume

A second project emerging from the dissertation concerns whether or not Aristotle subscribes to the conservation of volume. My analyses of Aristotle's responses to the claims of void's proponents at *Physics* IV 7, 214a16-b11, which I considered in my Chapter 3, are suggestive of

[120] Cf. my brief discussion in section 1.1.1 of my Chapter 3.

such a commitment—at least in some cases. By 'conservation of volume,' this is what I mean. The only way to increase a body's volume is to add matter to it, and, if matter is added, the volume must increase proportionally. So too, the only way to decrease a body's volume is for it to lose matter, and if matter is lost, the volume must decrease proportionally. Barring the addition or loss of matter, if the body expands in one dimension, it must contract in another. And vice versa, if the body contracts in one dimension, it must expand in another. Volume is conserved.

Indeed, I believe that Aristotle's treatment of all three of the void proponents' claims are suggestive of some such commitment. For instance, in his response to the void proponents' second claim that bodies are able to shrink because they retreat into internal voids, he claims that bodies shrink because they lose matter that had been inside. He does not consider the option that the body shrinks by getting denser, such that volume is not conserved. Granted, it is very possible that Aristotle does not mean to claim that loss of matter is the *only* explanation. That is to say, Aristotle's responses do not necessitate a commitment to conservation of volume. Yet is still worth noting that he does not suggest the alternative whereby volume would fail to be conserved. So too, in Aristotle's response to the void proponents' first claim that locomotion requires an empty space for the traveling body to enter, since two bodies cannot be in the same space, Aristotle proposes the explanation of mutual replacement—bodies getting out of each other's way. Yet Aristotle does not consider the alternative that the second body enter the space of the first and the first get denser with that addition of matter. In this way, Aristotle's responses in *Physics* IV 7, 214a16-b11 are suggestive of (though granted they do not necessitate) a commitment to the conservation of volume.

Yet elsewhere, including at *Physics* IV 9, 217a26-33, *GC* A5, 320b26-31, and 321a11-14, Aristotle seems to accept that genuine condensation and rarefaction can occur and that new

magnitude can come into being where there was less magnitude before. For instance, at *Physics* IV 9, 217a27-31, Aristotle writes, "For whenever air comes to be from water, the same matter becomes otherwise not by taking in anything (ὅταν γὰρ ἐξ ὕδατος ἀὴρ γένηται, ἡ αὐτὴ ὕλη οὐ προσλαβοῦσά τι ἄλλο ἐγένετο), but that which was potentially came to be in actuality, and again similarly water from air—sometimes into the small from the great, other times into the great from the small." Thus, for instance, when water becomes air, total size increases, presumably by virtue of genuine rarefaction. In fact, I would wish to suggest, in all cases where volume conservation does not obtain in Aristotle, what is being considered is specifically elemental change. That is, while volume fails to be conserved in elemental change, it is conserved in all other cases of change. This hypothesis is perhaps affirmed by Aristotle's *GC* B6 rejection of Empedocles's view that the elements do not transform into one another. Aristotle writes at 333a35-b1 that Empedocles's view that the elements do not transform into one another would have this consequence: "But then there would be no growth according to Empedocles except that in virtue of addition (ἀλλ᾽ ἢ κατὰ πρόσθεσιν)." That is, a world in which the elements do not mutually transform is a world in which increase in volume can only occur by addition. This suggests that the fact of increase in volume not by addition, i.e., a failure of volume conservation, is precisely owing to the fact elemental transformation. So much, then, for some of the hypotheses that have emerged as a consequence of this dissertation.

Bibliography

Algra, K. (1994). *Concepts of Space in Greek Thought*. Leiden: Brill.

Ackrill, J. L. (ed.) (1963). *Categories and de Interpretatione*. Oxford: Clarendon Press.

Baltussen, H. (2000). *Theophrastus Against the Presocratics and Plato: Peripatetic Dialectic in the 'De Sensibus*.' Philosophia Antiqua 86.

Barnes, J. (1969). "Aristotle's Theory of Demonstration," *Phronesis* 14(2):123-152.

Barnes, J. (ed) (1994). *Posterior Analytics*. 2nd ed. Oxford: Clarendon Press.

Barnes, J. (1982). *The Presocratic Philosophers*. Boston: Routledge & Kegan Paul.

Barnes, J. (1997). 'Roman Aristotle,' in *Philosophia Togata II*, eds. Jonathan Barnes and Miriam Griffin. Oxford: Clarendon Press.

Bernardete, J. (1993). "Real Definitions: Quine and Aristotle," *Philosophical Studies* 72(2/3):265-282.

Betegh, G. (2016). "Colocation." *Körper. Sôma und Corpus in der antiken Philosophie und Literatur,* eds. T Buccheim & D. Meißner. Felix Meiner Verlag.

Bolton, R. (1976). "Essentialism and Semantic Theory in Aristotle: Posterior Analytics, II, 7-10," *The Philosophical Review* 85(4):515-544.

Bolton, R. (2018). "The Search for Principles in Aristotle," in *Aristotle's Generation of Animals: A Critical Guide*, eds. Andrea Falcon, & David Lefebvre, Cambridge: Cambridge University Press.

Bostock, D. (2006). *Space, Time, Matter, and Form: Essays on Aristotle's Physics*. Oxford: Oxford University Press.

Bronstein, D. (2016). *Aristotle on Knowledge and Learning.* Oxford: Oxford University Press.

Burnyeat, M. (2001). *A Map of Metaphysics Zeta*. Pittsburgh: Mathesis.

Burnyeat, M. (1981). "Aristotle on Understanding Knowledge," in *Aristotle on Science: The Posterior Analytics,* ed. Enrico Berti, Padua: Editrice Antenore.

Carson, S. (2000). "Aristotle on Existential Import and Nonreferring Subjects," *Synthese* 124(3): 343-360.

Close, F., (2007). *Void*, Oxford: Oxford University Press.

Code, A. (2010). "An Aristotelian Puzzle about Definition: Metaphysics Z 12," in *Being, Nature, and Life in Aristotle: Essays in Honor of Allan Gotthelf*, eds. James Lennox and Robert Bolton. Cambridge: Cambridge University Press.

Code, A. (1985). "On the Origin of some Aristotelian Theses about Predication" in *How thing Are*, eds. James Bogen and James McGuire (eds.) Dordrecht, Holland: D. Reidel.

Code, A. (1986). "Aristotle: Essence and Accident" in Grandy, Richard E. & Richard Warner (eds.). *Philosophical Grounds of Rationality: Intentions, Categories, Ends*. Oxford: Oxford University Press.

Coope, U. (2012). "Aristotle on the Infinite," in *The Oxford Handbook of Aristotle*, ed. Christopher Shields, Oxford: Oxford University Press.

Cooper, J. (2016). "Aristotelian Infinites," *Oxford Studies in Ancient Philosophy* 51:161-206.

Corkum, P. (2018). "Empty Negations and Existential Import in Aristotle," *Apeiron*, 51(2):201-219.

Crivelli, P. (2001). "Empty Terms in Aristotle's Logic." *Proceedings of the Boston Area Colloquium of Ancient Philosophy* 17(1):237-284.

Crivelli. P. (2004). *Aristotle on Truth.* Cambridge: Cambridge University Press.

Charles, D. (2010). "Definition and Explanation in the *Posterior Analytics* and *Metaphysics*," in

Definition in Greek Philosophy, ed. David Charles. Oxford: Oxford University Press.
Charles, D. (2000). *Aristotle on Meaning and Essence*. Oxford: Oxford University Press.
Cheung, C. (2021). "Managing Food Storage in the Roman Empire." *Quaternary International*, 597:63-75.
Chiba, K. "Aristotle on Essence and Defining-Phrase in his Dialectic," in *Definition in Greek Philosophy*, ed. David Charles. Oxford: Oxford University Press.
DeMoss, D. and Daniel Devereux. (1988). "Essence, Existence, and Nominal Definition in Aristotle's Posterior Analytics II 8-10," *Phronesis*, 33(2):133-154.
Deslauries, M. (2007). *Aristotle on Definition.* Leiden: Brill.
Devereux, D. (2011). "Colloquium 5: Aristotle on the Form and Definition of a Human Being: Definitions and Their Parts in *Metaphysics* Z10 and 11," *Proceedings of the Boston Area Colloquium in Philosophy*, 26(1):167-210.
Devereux, D. (2018). Aristotle on the Essence of Happiness, in *Studies in Aristotle*, ed. Dominic K. O'Meara. Washington, D.C.: Catholic University of American Press.
Diels, H., and Walther Kranz (1959). *Die Fragmente der Vorsokratiker*. Berlin: Weidmann.
Falcon, A. (2019). "Definition, Explanation, and Scientific Method in Aristotle's *De Somno*," *Manuscrito* 42(4):516-543.
Frede, M. (1987). "Individuals in Aristotle," in *Essays in Ancient Philosophy*. Oxford: Oxford University Press.
Furley, D. (1987). *The Greek Cosmologists.* Cambridge: Cambridge University Press.
Gelber, J. (2015). "Aristotle on Essence and Habitat," *Oxford Studies in Ancient Philosophy* 48:267-294.
Gill, M. L. (2010). "Unity and Definition in Metaphysics H 6 and Z 12," in *Being, Nature, and Life in Aristotle: Essays in Honor of Allan Gotthelf*, eds. James Lennox and Robert Bolton. Cambridge: Cambridge University Press.
Goldin, O. (1996). *Explaining an Eclipse: Aristotle's Posterior Analytics 2.1-10.* Ann Arbor: The University of Michigan Press.
Gómez-Lobo, A. (2018). "Definitions in Aristotle's Posterior Analytics," in *Studies in Aristotle*, ed. Dominic K O'Meara. Washington, D.C.: Catholic University of American Press.
Gómez-Lobo, A. (1980). "The So-Called Question of Existence in Aristotle, an. Post. 2 1-2," *The Review of Metaphysics*, 34(1):71-89.
Gotthelf, A. (2012). *Teleology, First Principles, and Scientific Method in Aristotle's Biology*. Oxford: Oxford University Press.
Grant, E. (1981). *Much Ado About Nothing*, Cambridge: Cambridge University Press.
Halonen, I. and Jaakko Hintikka. (2000). "Aristotelian Explanations," *Studies in History and Philosophy of Science* 31(1):125-136.
Hankinson, R.J. (2012). "Colloquium 6: Commentary on Sedley," *Proceedings of the Boston Area Colloquium in Ancient Philosophy* 27:1, 202-209.
Heath, T. L. (ed.) (1897). *The Works of Archimedes*. London: Cambridge University Press.
Henry, D. (2021). "Essence and definition in Aristotle's *Parts of Animals*," *British Journal for the History of Philosophy* 29(5):763-783.
Hicks, R.D. (ed.) (1925). *Lives of Eminent Philosophers*. Cambridge: Harvard University Press.
Hintikka, J. (1966). "Aristotelian Infinity," *The Philosophical Review* 75(2):197-218.
Hussey, E. (ed.) (1983). *Aristotle's Physics, Books III and IV*. Oxford: Clarendon Press.
Inwood, B. (1981). "The Origin of Epicurus' Concept of Void," *Classical Philology*, 76(4):273-285.

Jhaveri, I. H., (1956). "The Concept of Ākāśa in Indian Philosophy," *Annals of the Bhandarkar Oriental Research Institute*, vol. 37(1/4):300-307.
Joachim, H. H. (1922). *Aristotle on Coming-to-be and Passing-away: a revised text with introduction and commentary*, Oxford: Clarendon Press.
Katz, E. (2022). "Contact and Continuity: What Happens at the Boundaries?" in *Oxford Studies in Ancient Philosophy* 60:239–270.
Kneale, W. and Martha Kneale. (1962). *The Development of Logic.* Oxford: Clarendon Press.
Kotwick, M. and Christian Pfeiffer. (2019). "How to Think the Infinite," *Mnemosyne* 72(1):24-52.
Laks, A. and Glenn W Most. (2016). *Early Greek Philosophy*, Volume IV: Western Greek Thinkers, Part 1. Cambridge: Harvard University Press.
Laks, A. and Glenn W Most. (2016). *Early Greek Philosophy*, Volume V: Western Greek Thinkers, Part 2. Cambridge: Harvard University Press.
Laks, A. and Glenn W Most. (2016). *Early Greek Philosophy*, Volume VII: Later Ionian and Thinkers, Part 2. Cambridge: Harvard University Press.
Lear, J. (1979). "Aristotelian Infinity." *Proceedings of the Aristotelian Society* 80(1):187-210.
Lennox, J. (2021). *Aristotle on Inquiry: Erotetic Frameworks and Domain-Specific Norms*. Cambridge: Cambridge University Press.
Lennox, J. (2010). "*Bios* and Explanatory Unity in Aristotle's Biology," in *Definition in Greek Philosophy*, ed. David Charles. Oxford: Oxford University Press.
Lorenz, H. (2014). "Understanding, Knowledge, and Inquiry in Aristotle," in *The Routledge Companion to Ancient Philosophy*, eds. Frisbee Sheffield and James Warren, New York: Routledge.
Lukasiewicz, J. (1951). *Aristotle's Syllogistic*. Oxford: Clarendon Press.
Martin, J. N. (2004). *Themes in Neoplatonic and Aristotelian Logic*. London: Routledge.
Massie, P. (2007). "The Actual Infinite as a Day or the Games." *Review of Metaphysics* 60(3):573-596.
Meister, S. (2021). "Aristotle on the Relation between Substance and Essence," *Ancient Philosophy*, 41:477-494.
Menn, S. (1995). Metaphysics, Dialectic and the Categories. *Revue de Métaphysique et de Morale* 100(3): 311-337.
Mignucci, M. (2007). "Aristotle on the Existential Import of Propositions," *Phronesis* 52(2):121-138.
Modrak, D. (2001). *Aristotle's Theory of Language and Meaning*. Cambridge: Cambridge University Press.
Modrak, D. (2010) "Nominal Definition in Aristotle," in *Definition in Greek Philosophy*, ed. David Charles. Oxford: Oxford University Press.
Morison, B. (2002). *On Location: Aristotle's Concept of Place.* Oxford: Oxford University Press.
Morison, B. (2011). "What as Aristotle's Concept of Logical Form? in *Episteme, etc. Essays in Honour of Jonathan Barnes*, eds. Benjamin Morison and Katerina Ierodiakonou. Oxford: Oxford University Press.
Nawar, T. (2015). Aristotelian Finitism, *Synthese* 192(8):2345-2360.
Patzig, G. (1968). *Aristotle's Theory of the Syllogism: A Logico-Philological Study of Book A of the Prior Analytics*, Dordrecht, Holland: D. Reidel.
Pellegrin, P. (2010). "Definition in Aristotle's *Posterior Analytics*," in *Being, Nature, and Life in Aristotle: Essays in Honor of Allan Gotthelf*, eds. James Lennox and Robert Bolton. Cambridge: Cambridge University Press.

Peramatzis, M. (2011). *Priority in Aristotle's Metaphysics.* Oxford: Oxford University Press.
Perkins, Phil. (2021). "The Etruscan *Pithos* Revolution," in *Making Cities: Economies of Production and Urbanization in Mediterranean Europe*, 1000-500 BC, eds. Margarita Gleba, Meatriz Marín Aguilera, and Bela Dimova. Cambridge: McDonald Institute.
Pfeiffer, C. (2016). "Aristotle on Being in the Same Place" *Körper. Sôma und Corpus in der Antiken Philosophie und Literatur*, eds. T Buccheim & D. Meißner. Felix Meiner Verlag.
Pfeiffer, C. (2017). Aristotle on Body, Oxford: Oxford University Press.
Philoponius, J. (1888). *Aristotelis Physicorum: Libros Quinque Posteriores Commentaria*, in Commentaria in Aristotelem Graeca. Volume XVII. Berolini.
Philoponus, J., and Pamela Huby. (2012). *Philoponus: On Aristotle's Physics 4. 6-9*, in *Ancient Commentators on Aristotle*, gen. ed. Richard Sorabji. London: Bloomsbury Academic.
Primavesi, O. (2012). "Second Thoughts on Some Presocratics, Metaphysics A 8, 989a18 990a32" in *Aristotle's Metaphysics Alpha: Symposium Aristotelicum*, eds. Carlos Steel and Oliver Primavesi, Oxford: Oxford University Press.
Read, S. (2015). "Aristotle and Lukasiewicz on Existential Import," *Journal of the American Philosophical Association* 1(3):535-544.
Rosen, J. (2021). "Aristotle's Actual Infinities," *Oxford Studies in Ancient Philosophy* 59:133-186.
Rosen, J. (2014). "Essence and End in Aristotle," *Oxford Studies in Ancient Philosophy* 46:73-108.
Ross, W. D. (ed.) (1949). *Aristotle's Prior and Posterior Analytics*. Oxford: Oxford University Press.
Ross, W. D. (ed.) (1936). *Aristotle's Physics*. Oxford: Oxford University Press.
Schiaparelli, A. (2011). "Epistemological Problems in Aristotle's Concept of Definition: *Topics* iv 4," *Ancient Philosophy* 31(1):127-143.
Sedley, D. (2012). "Colloquium 6: Aristotle on Place," *Proceedings of the Boston Area Colloquium in Ancient Philosophy* 27(1):183-201.
Sedley, D. (1982). "Two Conceptions of Vacuum," *Phronesis*, vol. 27(2):175-193.
Sedley, D. (2015). "Varieties of Definition," in *Theory and Practice in Aristotle's Natural Science*, ed. David Ebrey. Cambridge: Cambridge University Press.
Seuren, P. (2010). *The Logic of Language.* Oxford: Oxford University Press.
Simplicius. (1883). *Aristotelis Physicorum: Libros Quattuor Priores Commentaria*, in Commentaria in Aristotelem Graeca. Volume IX. Berolini.
Simplicius and J. O. Urmson. (2013). "Simplicius: On Aristotle on the Void" in *Ancient Commentators on Aristotle*, ed. Richard Sorabji. London: Bloomsbury Academic.
Simplicius and J. O. Urmson. (2014). "Simplicius: On Aristotle Physics 3" in *Ancient Commentators on Aristotle*, ed. Richard Sorabji. London: Bloomsbury Academic.
Sjoerd Hasper, P. (2013). "Leucippus and Democritus," in *The Routledge Companion to Ancient Philosophy*, eds. Frisbee Sheffield and James Warren, New York: Routledge.
Smiley, T. (1973). "What is a Syllogism?," *Journal of Philosophical Logic* 2(1):136-154.
Smiley, T. (1962). "Syllogism and Quantification," *The Journal of Symbolic Logic* 27(1):58-72.
Smith, R. (2002). "Aristotle's Logic," *Stanford Encyclopedia of Philosophy.*
Sorabji, R. (1988). *Matter, Space and Motion*, London: Duckworth.
Striker. G. (ed) (2009). *Prior Analytics Book 1: Translated with an Introduction and Commentary.* Oxford: Clarendon Press.
Strößner, C. (2020). "Existential Import, Aristotelian Logic, and its Generalizations," *Logica*

Universalis 14(1):69-102.
Tredennick, H. & Forster, E. S. (ed.) (1960). *Posterior Analytics, Topica*. Cambridge: Harvard University Press.
Thompson. M. (1953). "On Aristotle's Square of Opposition," *The Philosophical Review* 62:251-265
Vilkko, R. and Jaakko Hintikka. (2006). "Existence and Predication from Aristotle to Frege." *Philosophical and Phenomenological Research* LXXIII(2):359-377.
Wedin, M. V. (1990). "Negation and quantification in Aristotle," *History and Philosophy of Logic* 11(2):131-150.
Wedin, M. V. (1978). "Aristotle on the Existential Import of Singular Sentences," *Phronesis* 23(2):179-196.
Witt, C. (1989). *Substance and Essence in Aristotle: An Interpretation of Metaphysics VII-IX.* Ithaca: Cornell University Press.