

1/27/20

A Plea for Natural Philosophy

'A plea' in my title is obviously a nod to the great J. L. Austin and his plea for excuses (Austin [1956a]) -- a transparent ploy to align myself with my betters.¹ But apart from this trace of vanity, I hope the comparison might also help orient the project of this talk. So let me begin there.

Part of Austin's genius was the way he employed and juggled a number of different philosophical methods -- including the common sense embodied in his Plain Man² and a brand of therapeutic philosophy quite different from Wittgenstein's -- but he's most famously associated with, perhaps the leading figure of, the now much-maligned school of Ordinary Language Philosophy.³ Unlike some less discerning advocates of that approach, Austin was keen to emphasize that an examination of 'what we should say when' isn't appropriate in all cases:

¹ Just how much better is illustrated by how much more cleverly Austin crafted his own such nod: *Sense and Sensibilia* (Austin [1962]).

² Descendent of G. E. Moore, and Thomas Reid before him.

³ All three of Austin's methods are discussed in [2017].

Such a method ... is plainly preferable to investigate a field where ordinary language is rich and subtle, as it is in the pressing practical matter of *Excuses*, but certainly not in the matter of, say, *Time*. (Austin [1956a], p. 182)

In cases like *Time*, ordinary language 'has not been fed from the resources of the microscope and its successors' and 'our interests are more extensive or intellectual than the ordinary' (*ibid.*, p. 185).⁴

The point of his plea then is to recommend a particular topic -- *excuses* -- if one wishes to apply a particular method -- ordinary language analysis.

My plan here is to reverse the polarity of this line of thought: rather than starting with a method and recommending an appropriate topic, instead starting with a topic and recommending an appropriate method. To speak in vague and general terms, we might say that the topic in question is the world and our place in it. Admittedly, this rough characterization isn't much help; it's not immediately clear what it leaves out. For example, I take 'our place in it' to include the fact that humans engage in mathematics, so that asking what kind of discourse math is, what governs its practice, to what, if anything, it's answerable, would all count as part of the overall project.⁵ In what follows, I focus on particular subtopics that clearly fall within

⁴ Indeed, even in cases where attention to ordinary language is appropriate, 'modern scientists have been able, it seems to me, to reveal its inadequacy at numerous points, if only because they have had access to more comprehensive data and have studied them with more catholic and dispassionate interest than the ordinary man ... has had occasion to do' (Austin [1956a], p. 203).

⁵ There would be analogous questions for any human undertaking -- including ethics, theology, and astrology -- but answering them takes a different course for mathematics, because of its special role in our investigations of the world (see, e.g., [2011c]).

the scope of 'the world and our place in it'; toward the end, I indicate a few cherished items that may fall outside it. But first, I'd like to take up the other term in the relation, the proposed method, that is, 'natural philosophy'.

I. The method

The story begins in 17th century Europe. The historical literature on what's known as the Scientific Revolution is deep, subtle, and contentious, including an important debate over the extent to which there even was such a thing.⁶ However that may be, the 'natural philosophy' I have in mind arose in the early modern period in the wake of this purported change. The preceding Scholasticism, descended from Aristotle, comprised theology, morality, and alchemy, in addition to something then termed 'natural philosophy'. The basis for this last study was generalities of common knowledge⁷ -- for example, that the sun rises, that heavy bodies fall, that we perceive the features of ordinary objects -- and its goal was to understand them. Scholastics are sometimes ridiculed as positing 'dormitive virtue' to explain opium's tendency to put people to sleep, but their accounts typically have more moving parts. So, for example, I see

⁶ See, e.g., Shapin [1996], p. 1: 'There is no such thing as the Scientific Revolution, and this is a book about it', and Dear [2009], p. 2: 'For all that it was exaggerated and self-congratulatory, the [eighteenth century] idea that there was a fundamental difference between medieval learning and the new learning brought about by the recent "revolution" contains an important insight'. For an overview of the controversy, see Henry [2008], chapter 1.

⁷ See, e.g., Dear [2009], p. 5, Shapin [1996], pp. 81-82.

that an object has a certain sensible quality because that quality in the object alters the medium between the object and my eye, producing a 'species' in the medium that shares the form but not the matter of that quality; the species is then propagated through the medium, eventually reaching and being realized in my eye.⁸ This Scholastic natural philosophy is a contemplative discipline, proceeding from commonplaces (we see the properties of objects) by pure thought (since the object is distant from the eye, there must be some intervening medium,⁹ and so on).

The early moderns dramatically altered both aspects of this Scholastic account. First, the empirical input was no longer commonplace generalities, but individual observations -- not 'what happens in nature' but 'what actually *happened* in nature'.¹⁰ Great care was taken to collect these observations as broadly, methodically, and responsibly as possible, a process that eventually came to include deliberate experimentation. This initial phase is sometimes called

⁸ Cohen [1982] explores the sense in which the eye takes on the species. Pasnau [2017], chapter 4, points out that even when the eye or the mind 'takes on' the form of the perceived quality, the species is not itself perceived and can't be introspected even if we try (it's posited as a theoretical entity). The early modern's 'idea' plays a quite different (perhaps less plausible?) role as the object of perception.

⁹ Pasnau [2017], pp. 71-7hi2, especially note 1, traces the influence of this 'no action at a distance' line of thought in both the scholastics and the early moderns.

¹⁰ See Shapin [1996], pp. 85-90 (the quotations come from pp. 89-90), and Dear [2009], pp. 6-7. Shapin draws attention to 'the "cabinets of curiosities" then fashionable in gentlemanly circles throughout Europe. These cabinets eloquently testified to nature's particularity and startling variety. Stuffed with rarities and oddities, such cabinets were *accessible* proof that there were indeed more things in heaven and earth than were dreamed of in traditional philosophies' (p. 90).

'natural history', to distinguish it from the second undertaking -- theorizing about the causes of these phenomena -- sometimes termed 'natural philosophy', proper.¹¹

Of course the Scholastics had so theorized themselves, but in a second departure, the new school had more demanding standards. Rather than positing one species for each sensory quality -- flirting with the specter of dormitive virtue -- the explanatory basis was restricted: everything was to be explained in terms of tiny particles with a small range of features, at the beginning, of course, those of Corpuscular Mechanism (size, shape, motion, number, ...). As Bacon had counselled, this was no longer a project for the study; the new inquirer was to observe broadly, to experiment, to generalize, predict, and confirm.¹² In this way, the story goes, the old 'natural philosophy' was replaced by the new 'natural philosophy', and the new 'natural philosophy', the story continues, is what we now call 'science'. So, for example, we shouldn't be surprised, don't you know, that what we regard as one of history's most brilliant 'scientific' works, Newton's *Principia*, was sub-titled *Mathematical Principles of Natural Philosophy*.

¹¹ See Shapin [1996], p. 85.

¹² See, e.g., Gaukroger [2002]. This schematic telling suppresses various disagreements on fundamental points between individual early moderns, over certainty vs. fallibilism (see, e.g., Shapin [1996], pp. 101-103), over the role of experimentation (see, e.g., *ibid.*, pp. 82-4), over the nature of explanation (see, e.g., Gaukroger [2014], p. 20, on 'horizontal' vs. 'vertical' explanations (more on this distinction below)).

So far so good, but then one can hardly help wondering: where in this picture is what we now call 'philosophy'?¹³ The mystery deepens when we consider the canonical lists of 'natural philosophers' of this new sort: Galileo, Boyle, and Newton, of course, but Descartes was as central as Boyle to the development of Corpuscular Mechanism. For that matter, Descartes actively dissected eyes to observe the retinal image,¹⁴ traced nerves for his work on the physiology of distance perception,¹⁵ and propounded laws of motion.¹⁶ Even his quintessential 'philosophical' text (in our terms), the *Meditations*,¹⁷ was aimed at opening the way for his physics, as Descartes explained in his famous letter to Mersenne.¹⁸ So Descartes is typically included as well.

But now what about Locke? Praising 'Master-Builders' like Boyle, Huygens, and 'the incomparable Mr. Newton', he famously describes

¹³ Lüthy [2000], pp. 175-177, describes how the early moderns themselves debated terminological issues in the vicinity of 'natural philosophy'.

¹⁴ See *Optics*, Descartes [1632], pp. 91-93: 'the objects we look at do imprint very perfect images on the back of our eyes ... you will be ... certain of this if, taking the eye of a newly deceased man, or, for want of that, of an ox or some other large animal, you carefully cut through to the back the three membranes which enclose it ... Then, having covered it over with some white body thin enough to let the daylight pass through it, as for example with a piece of paper or with an eggshell ... place this eye ... in such a manner so that it has its front ... turned toward some location where there are various objects ... illuminated by the sun ... if you look at the white body ... you will see, not perhaps without admiration and pleasure, a picture which will represent in natural perspective all the objects ... outside it'.

¹⁵ In *Treatise of Man*, Descartes [1633].

¹⁶ In *Principles of Philosophy*, Descartes [1644].

¹⁷ Descartes [1641a].

¹⁸ Descartes [1641b], p. 173: 'I may tell you, between ourselves, that these six Meditations contain all the foundations of my physics ... I hope that readers will gradually get used to my principles, and recognize their truth, before they notice that they destroy the principles of Aristotle'.

himself as an 'Under-Labourer ... clearing the Ground a little, and removing some of the Rubbish' in service to these greats.¹⁹ Presumably what needs clearing away is Scholasticism (in concert with Descartes) and some Cartesianism (e.g., innate ideas), but despite his modesty, Locke's thinking goes considerably beyond this. His early work in medicine and physiology, his collaborations with Boyle, his study of seeds and principles of generation all fall under the broad umbrella of natural philosophy, often in its natural historical branch.²⁰ However he thinks of himself, the fact remains that he both helped formulate Corpuscular Mechanism and -- with admirable intellectual integrity -- brought attention to its points of tension: its apparent inability to explain object cohesion, contact forces, and ultimately Newton's gravitational force acting at a distance.²¹ He engaged directly with Newton on the nature of 'body' -- Newton's striking exploration of the notion²² apparently came to him in conversation with Locke²³ -- and evidence suggests that the third of Newton's famous

¹⁹ Locke [1689], 'Epistle to the Reader', pp. 9-10. Jacovides [2017], pp. 33-34, notes a remarkable parallel between Locke's 'under-labourer' remark and an earlier passage from Boyle, who describes himself as 'a drudge' and 'underbuilder' for his natural philosophical betters.

²⁰ Jacovides [2017] gives a comprehensive account of Locke's 'scientific' training and activities, and their interconnection with his 'philosophy'. See also Anstey [2011].

²¹ Locke's criticisms of Corpuscular Mechanism are documented in the influential Wilson [1979]. (Cf. footnote 26.)

²² In the much-discussed 'De gravitatione et aequipondio fluidorum' (Newton [1962], pp. 121-156).

²³ See Downing [2014], p. 105.

'Rules for the study of natural philosophy'²⁴ was influenced by Locke's argument for the inseparability of primary qualities.²⁵ Lisa Downing, astute analyst of the period, places Locke squarely in 'the historical transition from Boylean mechanism to Newtonianism'.²⁶

Easing into the 18th century, we find Berkeley, too, directly engaged with Newton, both in his cogent critique of the calculus²⁷ and in his innovative instrumentalist account of forces.²⁸ Most influential of all was his re-orientation of the theory of vision from optics to psychology in *New Theory of Vision*.²⁹ Just a few decades later, Reid makes his Newtonian method explicit:

The man who first discovered that cold freezes water, and that heat turns it into a vapour, proceeded on the same general principles, and in the same method, by which Newton discovered the law of gravitation and the properties of light. His *regulae philosophandi* are maxims of common sense, and are practised every day in common life; and he who philosophizes by other rules,

²⁴ Newton [1687], p. 795. Rule 3 appears in the second edition of 1713. (See footnote 67.)

²⁵ Locke [1689], II.8.9. See Jacovides [2017], pp. 89-91, and footnote 67 below.

²⁶ Downing [2014], p. 99. In the paper cited in footnote 21, Wilson takes Locke to suppose that God simply imbues objects with extra ('superadded') powers that don't spring from their corpuscular make-up, which conflicts with his assumption that all qualities of the object derive from that fundamental structure. Downing [1998] disagrees. Her Locke does believe that all qualities of the object derive from some fundamental features, but he takes his examples to show that these aren't exhausted by its corpuscular make-up: God doesn't tack on extras with no basis in the fundamental features; he's given objects a more complex array of such features than Corpuscular Mechanism allows. Since Locke also believes that the corpuscular account is only one fully intelligible to us -- because of its close connection with sense experience -- this is a deeply discouraging realization. I return to this theme below.

²⁷ In *The Analyst*, Berkeley [1734].

²⁸ In *De Motu*, Berkeley [1721]. See Downing [2005].

²⁹ Berkeley [1709].

either concerning the material system, or concerning the mind, mistakes his aim. (Reid [1764], I.1, p. 12)

True to his word, Reid's work on external world skepticism comes embedded in close empirical study of the physiology and psychology of vision and of the senses more broadly.³⁰

Perhaps a set of principles could be developed to disentangle what we call 'philosophy' or 'philosophers' in all this from what we call 'science' or 'scientists', but fair judgment suggests that to do so would be untrue to the spirit of the time. Margaret Wilson, who has done as much as anyone to illuminate the thought of this period, describes the 'the seventeenth-century framework' as one 'in which what we now regard as two distinct modes of intellectual activity were often seamlessly combined' (Wilson [1992], p. 481).³¹ This seamless combination is what I have in mind with the term Natural Philosophy: an empirical study, beginning with careful observation of phenomena

³⁰ Of course, Hume [1739] also set out to apply 'the experimental method of reasoning' -- with a clever analogy positioning himself as 'the Newton of the science of man' (Stroud [1977], p. 5) -- but the naturalistic credentials of his approach are undermined when he insists that 'the science of man is the only solid foundation for the other sciences' (ibid., introduction, paragraph 7), that it promises to change and improve them but not vice versa. See [2011b] for a comparison of Hume and Reid on method.

³¹ Others are less delicate: Lüthy [2000], p. 174, describes attempts to separate 'philosophy' from 'science' in the early modern period as 'a laughable farce' and quotes another historian, George Molland, as declaring 'for this period, to distinguish rigidly between philosophy and science would be grossly anachronistic'. Interpreters of Locke and Berkeley tend to agree. Speaking of Locke and Boyle, Winkler [1989], p. 255, characterizes some interpretations of the former as suggesting 'that scientists and philosophers operated within clearly defined spheres of authority ... But there was no such division of labour'. Speaking primarily of Berkeley, Atherton [1991], p. 67, writes: 'Berkeley was concerned with the debates that were prevalent and important to the physics of the time. ... both Locke and Berkeley ought to be seen as taking ... a more active role in the development of scientific theory than they are generally given credit for. ... they saw themselves as advancing considerations which would have the result of reshaping prevailing views of ongoing scientific endeavor'.

('natural history'), moving on to deliberate experimentation, theory formation and testing ('natural philosophy' in the stricter sense), always assessing and re-assessing its methods as it goes -- a mode of inquiry that makes no principled distinction between questions we tend to think of as 'scientific' and questions we tend to think of as 'philosophical'.³² This is the method I'm out to explore.

II. The topic

With this sense of the Natural Philosophical method, we're returned to the question of the relevant topic. Just now, Reid identified the suitable topics for his Natural Philosophical method as 'the material system' and 'the mind' -- not far from my own rough description, 'the world and our place in it'. It's worth noting that this characterization needn't involve any form of physicalism or materialism or reductionism. Reid, for example, was a confirmed dualist, but he was happy to engage in empirical study of the mental based on introspection³³ and the reports of others, either in ordinary life or as subjects in experimental conditions.³⁴ Notice also that

³² Readers of [2007] (or [2011c] or [2014]) or [2017] will recognize the Second Philosopher or the Plain Inquirer, respectively, viewed from yet another angle.

³³ Though he insisted that introspection is as fallible as any of our other faculties (see Reid [1785], I.6, pp. 59-64).

³⁴ See [2011b], especially footnote 38. Hatfield [1995], p. 188, locates an empirical approach to mental substance as a common feature of 18th century thought about the mind: 'if one believes that immaterial entities exist and that some of them inhabit human bodies, it makes good sense to seek to determine the powers and capacities of such substances empirically, by studying the manifestation of the mind in the behavior of others and in one's own experience of mental phenomena'.

this approach to psycho-physical laws represents a methodological shift: for the Corpuscular Mechanist, explanation is, as you might say, vertical -- the macro-qualities of an object are explained in terms of its microstructure -- but these are horizontal explanations -- some macro-qualities are explained in terms of others.³⁵ As Natural Philosophical method developed, in this and other ways, over the course of the early modern period, the work of Galileo, Boyle, and Newton clearly demonstrated its effectiveness for study of 'the material', and Locke, Berkeley, and Reid did the same for 'the mind', leading the way to empirical psychology.

This bird's-eye perspective certainly suggests that the Natural Philosophical method is well-suited to the topic, but I think we can trace the connection more effectively by narrowing to a familiar subtopic and engaging in a bit of compare-and-contrast with 'philosophy' as we think of it today. Among the many questions that can be and are posed about the world and our place in it, one of the most characteristically 'philosophical' (as we now use the term) concerns the relationship between the two: our knowledge of that

³⁵ I borrow the vivid terminology of vertical and horizontal explanations from Gaukroger [2014]. As Gaukroger and other have noted (see also Downing [2002], pp. 348-9), Boyle's actual explanations were horizontal, as were Locke's, given our ignorance of corpuscular structure (Jacovides [2017], pp. 80-81), but for both, these were second-best. Berkeley wasn't opposed to corpuscular theory (despite what his immaterialism might suggest, see Winkler [1989], pp. 238-275, Atherton [1991], Downing [2005]), but recognized no principled distinction between vertical and horizontal explanations; both are regularities or 'physical causes' (though the only true causal agents are minds) (see Winkler [1989], pp. 260-261). Despite his openness to corpuscular explanation, Berkeley was more closely aligned with Newton (Atherton [1991], p. 63; Downing [2005], p. 235). Gaukroger [2014] traces the path of horizontal explanation up through Newton.

world, that is, epistemology. As a way into this subject, I hope I may be forgiven a touch of autobiography ...

As an eager young math major, I was baffled by the question of mathematical knowledge and gradually stumbled unawares into philosophy. While gaining my feet, I naively assumed that the disciplinary specialization of epistemology would have something helpful to offer, but in fact, the main role it seemed to play was as a potential spoiler -- for example, when Benacerraf deployed the then-popular causal theory of knowledge to pose a stark challenge to many forms of mathematical realism.³⁶ At the time, I turned for help to empirical psychology instead,³⁷ but years later, when I strayed into meta-philosophy and adopted external world skepticism as a diagnostic instrument, it was this quintessentially epistemological challenge that led me back to its sources in Descartes and the early moderns. What struck me then -- and this is the point of this autobiographical digression -- was how fresh, how immediate these writings seemed! Unencumbered by centuries of philosophical theorizing, Descartes, Locke, Berkeley, and Reid addressed the problem of knowledge head-on, with breathtaking directness. Though what they were doing was undoubtedly epistemology, I couldn't imagine that any of these thinkers would much care about whether the agent in some intricately

³⁶ Benacerraf [1973].

³⁷ See [1990].

described situation should count as knowing -- their concerns were more raw and immediate than that.³⁸

With this puzzling apparent mismatch in the back of my mind, I was delighted to come across Robert Pasnau's fascinating history of epistemology, *After Certainty*.³⁹ Noting the contemporary impression that giving an account of knowledge has always been the main job of epistemology, he writes:

To be sure, there was Plato in the *Meno* and the *Theaetetus*, and the casual follower of philosophy's history might be forgiven for supposing that his example carried forward more or less continuously until the present day. [In fact,] from Aristotle to the Middle Ages and well beyond, philosophers took an interest in carefully circumscribing one or another particular kind of cognitive grasp of reality -- perception, imagination, assent, deduction, and so on -- but showed little interest in defining the broad category of knowledge. That English contains this very general word of positive cognitive appraisal did not strike philosophers, even those who worked in English, as calling for any special definitional inquiry. (Pasnau [2017], p. 2)⁴⁰

³⁸ At the time, analysis of the concept of knowledge was the leading goal of mainstream epistemology. More recently ([2017], pp. 205-206), I noted this mismatch between early modern and more contemporary epistemology in much the same terms and was rightly criticized for implying that contemporary epistemologists remain largely engaged in this same project, as in the heyday of Gettierology (e.g., in Williamson [2017]). Of course this isn't true -- see footnote 41.

³⁹ Pasnau [2017].

⁴⁰ In an extended note, Pasnau [2017], p. 141, is more pointed: 'The casual assumption that the Platonic definitional quest informs the whole history of philosophy is so rampant that it might seem unfair to single out individual scholars. ... The irresistibility of such "ever since the dawn of philosophy" claims attests to our vulnerability to a cognitive shortcut we might call the heuristic of historical continuity: our propensity to take data points scattered across an historical timeline and to fill in the gaps on the assumption that things have always been so. As vision fills in for the blind spot where the optic nerve meets the retina, so [does] our historical imagination fill in the inevitable gaps in our knowledge with an assumption of homogeneous continuity. In the present case, then, even if all we know is that Plato wanted a definition of knowledge and that philosophers today similarly seek such a thing, those two data points alone are enough to foster the conclusion that this quest must have continued uninterrupted over millennia about which we are wholly uninformed'.

Here Pasnau puts his finger on what had so impressed me in the early moderns: they weren't out to analyze a general concept of knowledge or to study a general state of knowing;⁴¹ their attention was on isolating and evaluating particular forms of 'cognitive grasp'. Their leading question wasn't 'what counts as (what is) knowledge?', but 'how do creatures like us manage to get reliable information about the world?'^{42, 43} This is just the question I once asked about mathematics -

⁴¹ I allude here to more recent developments in mainstream epistemology (recall footnote 38). In her [1994], Zagzabski argued that 'knowledge' can't be analyzed as the post-Gettier project supposed (i.e., by adding a condition to the justified-true-belief account); in his [2000], Williamson proposed that 'knowledge' be taken as primitive, that 'justification', 'belief', etc., be analyzed in terms of 'knowledge' rather than the other way 'round; and finally, in the wake of his [2007], Williamson turned his back on conceptual analysis entirely and simply theorized about knowledge itself ('To characterize knowledge as the most general factive state is not to engage in conceptual analysis ... It is simply to theorize about knowledge' (Williamson [2009], p. 290)). The project of conceptual analysis has by no means disappeared (see Ichikawa and Steup [2018] for a recent survey), but 'knowledge-first epistemology' is now a highly influential alternative. While this represents a sea-change in contemporary analytic epistemology, it hardly registers from the perspective of our 17th and 18th century Natural Philosophers: the topic is still 'knowledge', a level of generality that the early moderns didn't engage. (See also footnote 98.)

⁴² Here again Hume is an outlier, actually troubled by skeptical worries, unlike Galileo, Descartes, Boyle, Locke, Berkeley, or Reid. In contemporary terms, what I'm describing may sound like Quine's epistemology naturalized, but I would argue (have argued, see [2007], §I.6) that Quine -- for all his many virtues! -- goes seriously astray in a number of ways. See footnote 73 for one example.

⁴³ As it happens, this isn't Pasnau's assessment of the early modern epistemological project. He takes it to center on the notion of an epistemic ideal, with the leading question, not 'what counts as knowledge?', but 'what should we believe?' (Pasnau [2017], p. 8). My concern is that contemporary epistemologists could just as easily embrace this leading question, holding that the reason the 'what counts as knowledge?' is so important is that its answer tells us what we should believe. So I'm not convinced that Pasnau has correctly identified the early modern project and how it differs from the contemporary one. (Our disagreement here may spring from his identification of the Galileo-Newton mathematical method as the beginning of 'science' proper, so that Locke (and Berkeley and Reid, and maybe even Boyle) were doing something else (ibid., pp. 14-19). Important as the Galileo-Newton method was (see [2008] or [2011c], chapter 1), it wasn't the only method in use even in areas that now strike us as 'science', so I stand by the

- how do we manage to get reliable information about mathematics? -- the sort of question the contemporary epistemological literature hadn't helped me address!

When our early modern Natural Philosophers set out to address their version of the central question, they explore cognitive routes from basic perception -- distance information by sight, the significance color vision, the relations of vision and touch⁴⁴ -- to more theoretical matters -- the nature of explanation, the significance of force laws, general rules for Natural Philosophizing. Given the nature of their question, this piecemeal approach makes perfect sense: the way we gain reliable information about medium-sized objects by vision is unlikely to have much in common with the way we gain reliable information about molecular structure; to insist on a general answer would be to set aside the case-specific details that actually do the epistemic work. It's easy to see why the question of 'knowledge' in general just didn't arise.

From our contemporary point of view, we might try to separate the 'philosophical' from the 'scientific' strands in these inquiries, but these thinkers did not. Given that we now regard this as conflating questions of two disparate types, we should expect just what we find: contemporary epistemologists, as 'philosophers', are asking different

conclusion above that 'scientific' and 'philosophical' threads during this period can't be separated.)

⁴⁴ Reid [1764] considered our senses of smell, taste, and hearing as well.

questions. The puzzle then becomes: how did we get from there to here?⁴⁵

III. Two just-so stories

A likely thought is that this shift in focus in the theory of knowledge has something to do with the forces that gradually separated the two now-disparate practices over the intervening centuries. Perhaps there is an established historical account of this transition, but if so, I blush to admit it's unknown to me. There is, however, a story that philosophers sometimes tell themselves. Here it is, coming from Russell:

As soon as definite knowledge concerning any subject becomes possible, this subject ceases to be called philosophy, and becomes a separate science. The whole study of the heavens, which now belongs to astronomy, was once included in philosophy; Newton's great work was called 'the mathematical principles of natural philosophy'. Similarly, the study of the human mind, which was part of philosophy, has now been separated from philosophy and has become the science of psychology. Thus, to a

⁴⁵ Pasnau also answers this question differently than I'm about to do. For him, the key is Buridan's 14th century category of 'moral certainty': 'There is still another, weaker evidentness which suffices for acting well morally ... if someone, having seen and investigated all the attendant circumstances that one can investigate with diligence, judges in accord with the demands of such circumstances, then that judgment will be evident with an evidentness sufficient for acting well morally -- even if that judgment were false on account of invincible ignorance regarding some circumstance' (quoted by Pasnau [2017], p. 34). By the 17th century, Christianity had come to be classified as morally certain, and this turned the demarcation of moral certainty into a crucially pressing question: 'Epistemology now begins to consider where to draw the line between what is and is not sufficiently certain to warrant firm belief' (ibid., p. 43). Here again (see footnote 43), it seems to me that the seeker of moral certainty, like the contemporary theorist of knowledge, could take herself to be pursuing what Pasnau identifies as the early modern epistemological project: the question of moral certainty is important because these are the things we should believe. In other words, there doesn't seem to me to be enough distance between Pasnau's version of the early modern project and the contemporary project for the question of how we got from one to the other to arise.

great extent, the uncertainty of philosophy is more apparent than real: those questions which are already capable of definite answers are placed in the sciences, while those only to which, at present, no definite answer can be given, remain to form the residue that is called philosophy. (Russell [1912], p. 155)

Austin puts the sentiment in more colorful terms:

In the history of human inquiry, philosophy has the place of the initial central sun, seminal and tumultuous: from time to time it throws off some portion of itself to take station as a science, a planet, cool and well-regulated, progressing steadily towards a distant final state. This happened long ago at the birth of mathematics, and again at the birth of physics: only in the last century [Austin is writing in 1956] have we witnessed the same process once again, slow and at the time almost imperceptible, in the birth of the science of mathematical logic, through the joint labors of philosophers and mathematicians. Is it not possible that the next century may see the birth, through the joint efforts of philosophers, grammarians, and numerous other students of language, of a true and comprehensive *science of language*? Then we shall have rid ourselves of one more part of philosophy (there will still be plenty left) in the only way we ever can get rid of philosophy, by kicking it upstairs. (Austin [1956b], p. 232)

Austin is imagining the birth of linguistics, and indeed Chomsky's ground-breaking *Syntactic Structures*⁴⁶ appeared the year after this passage. For Russell and Austin, in the beginning there is philosophy, and the various sciences spin off from that source. Of course, in our terminology, what 'science' spins off from isn't 'philosophy' (in the contemporary sense), but Natural Philosophy in the sense we're pursuing here. I assume Russell and Austin would take this as a friendly amendment.

Appealing as it may be, I'm not sure this picture matches our case. Between them, Russell and Austin offer a range of examples: two that we've touched on already -- celestial mechanics and empirical

⁴⁶ Chomsky [1957].

psychology -- and two more recent -- mathematical logic and linguistics. In each of these cases, I think it's fair to say that some 'residue' has remained in philosophy: methodological questions about Newton's inferences, puzzles about sensations and the brain, unclarities about the nature of logical truth and linguistic meaning. As Austin says, 'there will still be plenty left'; indeed, the subsequent progress of the spun-off sciences tends to create new 'residues', like the puzzles of quantum mechanics.⁴⁷ The trouble with applying this picture to our present case is that the questions of contemporary epistemology, questions about the scope and nature of 'knowledge', don't look like this kind of residue. To take just one comparison, the question 'which are the logical particles?' was central in the 'pre-scientific' 'joint labors of philosophers and mathematicians' and remains as 'natural philosophical' residue when mathematical logic spins off into a 'science'. In contrast, contemporary questions about 'knowledge' weren't ones our early modern Natural Philosophers even felt the need to ask.

For cases like ours, I like to tell a different sort of just-so story. It begins with Hume's skepticism in the early 18th century. It's well-known that Hume occasioned Kant's awakening from his 'dogmatic slumbers'.⁴⁸ What's perhaps less well-known is that Hume had much the same effect on Reid, as expressed in this letter:

⁴⁷ In reality, those planets aren't as 'cool and well-regulated' as Austin implies.

⁴⁸ Kant [1783], 4:260: 'I freely admit that the remembrance of *David Hume* was the very thing that many years ago first interrupted my dogmatic slumber and

I have learned more from your writings ... than from all others put together. Your system appears to me not onely coherent in all its parts, but likeways justly deduced from principles commonly received among Philosophers: *Principles, which I never thought of calling into Question, untill the conclusions you draw from them in the treatise on Humane Nature made me suspect them.*

(Reid to Hume, in Reid [1764], p. 264, italics mine)

Though Kant and Reid were primarily motivated by different aspects of Hume's skepticism -- inductive and external world, respectively -- it's easy to imagine both of them flummoxed by section I.4.2 of the *Treatise*,⁴⁹ where Hume undertakes to locate the source of the idea of an external object.⁵⁰ That source, he argues, can't be either the senses or reason; in the end, he concludes that it's a 'mistake' of the imagination,⁵¹ and even this much only by a tortured argument of highly questionable cogency.⁵² Kant and Reid could be forgiven for concluding instead that the concept of an object -- clearly present in

gave a completely different direction to my researches in the field of speculative philosophy'.

⁴⁹ Hume [1739].

⁵⁰ Continued and distinct body, in Hume's terms.

⁵¹ See Hume [1739], I.4.2.35.

⁵² See, e.g., this excerpt from Stroud's extended analysis (Stroud [1977], pp. 103-104): 'Imagining or conceiving of X requires that one already have the idea of X; we cannot think of something of which we have no idea. In particular, therefore, we could not "imagine ... a change in the time without any *variation* or *interruption* of the object" unless we already had the idea of the invariableness or uninterruptedness of an object. But that is just the idea of identity for Hume. It follows that we could not perform that act of mind that is said to produce the idea of identity in us unless we already had the idea of identity to begin with. Hume seems to 'explain' our acquisition of the idea only on the assumption that we already have it, so he does not explain it at all. But without an explanation of the source of the idea of identity his explanation of the origin of the idea of continued and distinct existence cannot get off the ground. He would not have explained how we get into the conflict which the idea of continued existence is intended to resolve'. As if that weren't enough, Stroud continues, 'But even if he had, his account would still run into difficulties'.

the cognition (for Kant) or the perception (for Reid) -- must arise from some source that Hume overlooked. Their contrasting answers to this puzzle define their respective philosophies.

Reid recognizes that

If Nature had given us nothing more than impressions^[53] made upon the body, and sensations in our minds corresponding to them, we should in that case have been merely sentient, not percipient beings. We should never have been able to form the conception of any external object, far less a belief of its existence. (Reid [1764], VI.21, p. 176)

Lucky for us, Nature has formed our 'constitution' so that 'our perceptions ... correspond' to 'impressions on the organs, nerves, and brain' and 'vary in kind, and in degree, as they vary' (Reid [1785], II.2, p. 76); by these means 'the mind passes immediately from the sensation to ... conception and belief' in external objects (Reid [1764], VI.21, p. 177). On careful review, he laments that then-current accounts of the physiological processes from organ to nerve to brain, from Descartes to Hartley, are largely 'mere conjecture', but he clearly believes this is the kind of study that's needed -- it just has to be carried out in line with strictly Newtonian methods.⁵⁴ In the end, he's confident that our perceptual systems arose as 'necessary in order for our supplying the wants of nature, and avoiding the dangers to which we are constantly exposed', and that they are 'admirably fitted ... to this purpose' (Reid [1785], II.5, p.

⁵³ For Reid, 'impressions' are physiological: 'In perception, the object produces some change in the organ [of sense] ... the organ produces some change upon the nerve ... and ... the nerve produces some change in the brain. ... we give the name of an *impression* to those changes' (Reid [1785], II.2, pp. 75-76).

⁵⁴ See Reid [1785], II.3.

101). Of course, the good pastor Reid attributes this happy circumstance to the 'parental care and goodness' of his Maker (Reid [1764], VI.20, p. 170), but it would be entirely consistent with his Natural Philosophical approach to regard Darwin as a friendly and welcome amendment. In the same spirit, his response to Hume's external world skepticism rests on an empirical case against the Argument from Illusion and the theory of ideas, and a challenge to the underlying assumption that perception is less reliable than our other faculties (introspection, reason, memory).⁵⁵

In stark contrast, Kant takes a very different route: he invents an entirely new kind of inquiry, transcendental critique. This transcendental inquiry is defined in explicit contrast to the Natural Philosopher's empirical inquiry:⁵⁶ for example, transcendental psychology - 'explanation of the way in which concepts relate to their objects a priori' - is sharply distinguished from empirical psychology - 'how a concept is acquired from experience and reflection on it'. Just as we might expect, he locates the beginnings of empirical psychology in Locke:

Such a tracing of the first endeavors of our powers of cognition to ascend from individual perceptions to general concepts is

⁵⁵ See [2011b], [2017], pp. 92-109.

⁵⁶ This is what makes Kant the first First Philosopher (in the terminology of [2007]). I was slow to realize that if First Philosophy is understood on this Kantian model -- as a different sort of enterprise -- then Descartes doesn't qualify. (I made this mistake in [2007], I.1, though an inkling of the truth emerged here and there (e.g., p. 308). The light began to dawn in [2011a], pp. 124-125.) Though Descartes uses a priori methods, he does so as part of his investigation of the world, as a Natural Philosopher in the sense intended here. To put the point another way: Kant isn't out to correct Locke, he's engaged in a different activity; Descartes is out to change physics.

without doubt of great utility, and the famous Locke^[57] is to be thanked for having first opened the way for this. (Kant [1781/7], A85-6/B117-119)

Exemplary as this Natural Philosophical inquiry is, Kant sets it aside in favor of his new transcendental inquiry, presumably to be conducted with new, a priori methods.⁵⁸ The concept of an external object is then located transcendently, in the pure categories, in the structure of the discursive intellect, and not, as Reid would have it, in ordinary human psychology. The same transcendental move informs his response to Hume's inductive skepticism.

So by the end of the 18th century, there were two very different reactions to Hume on offer, one naturalistic, one transcendental. Kant being the philosophical genius that he was, bestriding the subject to this day, it's no surprise that his approach dominated. Various forms of neo- and post-Kantian idealism ensued, eventually provoking the anti-idealist reaction of Moore and Russell, the rise of conceptual analysis and analytic philosophy more broadly. At that point, the quest for an analysis of 'knowledge' naturally became a central undertaking of epistemology, which now often gives way to direct theorizing about 'knowledge' itself.⁵⁹ On this picture, then, what we call 'philosophy' separated itself from Natural Philosophy

⁵⁷ Kemp Smith's translation offers the charming but apparently inaccurate phrase 'the celebrated Locke'.

⁵⁸ Just what those methods are, how they work, and why they are reliable are all difficult questions to answer (see [2007], I.4).

⁵⁹ Recall footnote 41.

when Kant posited an explicitly separate inquiry with a priori methods.

This story reverses the Russell-Austin line: they have the sciences spinning off from Natural Philosophy; my story has philosophy breaking free from the same source. Though both are irresponsible just-so stories, mine seems a better fit for the question at hand: how did epistemology get from there to here? But once again, I think we can learn more by narrowing our focus still further, this time by looking more closely at the fine-grain of the early modern epistemological project, and in particular, at the role of the crucial distinction between primary and secondary qualities. This time, instead of asking how the current epistemological project took over from the early modern one, my thought is to ask what became of the leading questions of the early modern project as 'epistemology' came to focus on the nature of knowledge.

IV. Primary/secondary then

A distinction between qualities like size, shape, motion, and number,⁶⁰ on the one hand, and those like color, taste, odor, and sound, on the other, first appeared in familiar form in Galileo:

Upon conceiving a material or a corporeal substance, I immediately feel the need to conceive simultaneously that it is bounded and has this or that shape; that it is in this place or that at any given time; that it moves or stays still; that it does or does not touch another body; and that it is one, few, or many. I cannot separate it from these conditions by any stretch of my imagination. But that it must be either white or red, bitter or sweet, noisy or silent, of sweet or foul odor, my mind

⁶⁰ Different thinkers give slightly different lists, but these differences won't matter.

feels no compulsion to understand as necessary accompaniments. ... tastes, odors, colors, and so forth ... have their habituation only in the sensorium ... If the living creature were removed, all these qualities would be removed and annihilated. (Galileo [1623], p. 309)

To the dismay of those keen to separate the 'philosophers' from the 'scientists', here Galileo offers something like a conceptual analysis of what it is to be a substantial body. In the decades to come, as a distinction of this general sort became embedded in the rising Corpuscular Mechanism of Descartes and Boyle, Descartes's defense followed a conceptual route reminiscent of Galileo:

the nature of matter, or of body considered in general, consists not in its being something which is ... coloured, or affects the senses in any way, but simply in its being something which is extended in length, breadth and depth. (Descartes [1644], p. 224 (AT VIII A, p. 42)

Here in Galileo and Descartes, we see precursors to Locke and Newton in the tradition of analyzing what it is to be a 'body'.

Though perhaps not entirely immune to a priori considerations himself,⁶¹ Boyle most often strikes a different tone, taking empirical evidence as the deciding factor: Corpuscular Mechanism as a whole is 'to be either Confirmed, or Disproved by, the Historical Truths', where 'Historical Truths' are the fruits of natural history, in other words, observations.⁶² So, for example:

since [Corpuscular Mechanism] maintains that sensory qualities arise from the relations between bodies and our sense organs ... it predicts a sort of relativity that is in fact observed (e.g., water feels cold to one hand, and warm to another, depending on depending on the state of the hand). (Downing [2002], p. 346)

⁶¹ See Downing [2002], p. 346. I draw heavily on pp. 345-347 of Downing's paper for the rest of this paragraph.

⁶² For the quotation, see Downing [2011], p. 129.

Appropriately circumspect, Boyle takes this empirical case to be a work-in-progress, so far inconclusive, but he also appeals to the explanatory power of Corpuscular Mechanism, especially as compared to Aristotelean Scholasticism:

he expressed optimism that corpuscularianism would eventually accumulate explanatory success sufficient for it to merit the assent of reasonable people. (Downing [2002], p. 347)

Boyle also claims other theoretical virtues, including clarity and parsimony.

With these precursors in the background, the canonical treatment of the distinction, its sources and its defense, indeed the very terminology of 'primary' and 'secondary', comes in Locke's *Essay*, especially the famous section II.8. Locke dabbles with both a Galileo-Descartes-style conceptual derivation (see below) and a Boylean appeal to empirical predictions and explanatory power,⁶³ but setting aside how the distinction is supposed to be defended, I'd like to focus here on the question of its content: what is it that differentiates a primary quality from a secondary quality? This turns out to be a surprisingly difficult question to answer:

Careful readers of the *Essay* have noticed that Locke makes a number of puzzling claims about the nature of this distinction ... On occasion, the claims he makes appear to be flatly inconsistent. ... It is not surprising, then, that scholars are deeply divided over how best to interpret Locke's remarks ... it is tempting to see this lack of unanimity as revealing 'those unfortunate inconsistencies for which Locke's work is so famous' (Curley [1972], p. 440). It may be that scholars have fastened onto different strands in Locke's thought, strands that he simply

⁶³ E.g., Locke [1689], II.8.21: with the distinction, 'we may be able to give an Account, how the same Water, at the same time, may produce the *Idea* of Cold by one hand, and of Heat by the other'.

did not recognize as being mutually inconsistent. (Rickless [1997], pp. 297-298)⁶⁴

Fortunately, the problem of either knitting Locke's apparently conflicting claims together or convicting him of inconsistency isn't one we need to address here. For our purposes, it will be enough to isolate a few of Locke's most salient threads.⁶⁵

The obvious place to start is with the distinction already on the table: having primary qualities is part of what it is to be a body, while having secondary qualities is not. In Locke's version, primary qualities are 'such as ... the Mind finds inseparable from every particle of Matter' (Locke [1689], II.8.9). Whatever Galileo or Descartes might have had in mind with this sort conceptual criterion, we're now concerned with Locke, for whom all cognition begins with the senses:

Men have in their Minds several *Ideas*, such as are those expressed by the words, *Whiteness, Hardness, Sweetness, Thinking, Motion, Man, Elephant, Army, Drunkenness*, and others ... The Mind [is] white Paper ... without any *Ideas*; how comes it to be furnished? ... To this I answer, in one word, from *Experience*. (Locke [1689], II.1.1-2)

Among these ideas must be that of 'body'. In our experience, we isolate those properties 'such as Sense constantly finds in every particle of Matter' (ibid., II.8.9) -- like size, shape, motion or

⁶⁴ Though he sets out this temptation, Rickless [1997], p. 299, does not himself succumb: 'The purpose of this paper is to argue that II.8 of Locke's *Essay* is a unified, self-consistent whole, and that the appearance of inconsistency is due largely to misreadings and misunderstandings'. For two more samples of a vast literature, see Jacovides [2007] and Downing [2009].

⁶⁵ As will be obvious, this discussion draws heavily on Downing's reading, especially her [1998]. I depart from her, with considerable trepidation, in footnote 72.

rest -- then exclude any property that the mind can separate -- like color, fragrance, taste.⁶⁶ The result is what Locke calls the nominal essence of 'body', an essence constructed by us.

But Locke also recognizes real essences: 'the very being of any thing, whereby it is, what it is ... the ... Constitution of Things, whereon their ... qualities depend' (Locke [1689], III.3.15). According to Corpuscular Mechanism, the real essence is the corpuscular micro-structure, the features and arrangement of its tiny parts; these are responsible for all the properties of a body. Locke draws a crucial link between the nominal essence, drawn from ordinary experience, and Corpuscularism:

Take a grain of Wheat, divide it into two parts, each part still has *Solidity, Extension, Figure, and Mobility*; divide it again, and it retains still the same qualities; and so divide it on, till the parts become insensible, they must retain still each of them all those qualities. ... These I call the ... *primary Qualities* of Body, which I think we may observe to produce simple *Ideas* in us, viz., of *Solidity, Extension, Figure, Motion, or Rest, and Number*. (Locke [1689], II.8.9)⁶⁷

It may seem as if Locke is arguing that the qualities isolated by Corpuscular Mechanism -- size, shape, motion or rest, etc. -- comprise the real essence of body, but this seems unlikely given that (as we've

⁶⁶ Why doesn't color qualify as inseparable? Downing [1998], p. 403, footnote 46, suggests: 'I suspect that Locke agrees with Descartes that experience presents us with uncolored bodies'. (It would presumably be enough if we could conceive of a colorless body.) Of course, Berkeley would disagree.

⁶⁷ This extension of what's true of all observed objects to all objects is what may have influenced Newton's Rule 3 (Newton [1687], p. 795): 'Those qualities of bodies that cannot be [increased or diminished] and that belong to all bodies on which experiments can be made should be taken as qualities of all bodies universally.' Recall footnote 24.

seen) he was an early critic of Corpuscularianism and that he hedges his support in passages like this:

I have here instanced the corpuscularian Hypothesis, as that which is thought to go farthest in the intelligible Explication of the Qualities of Bodies; and I fear the Weakness of the humane Understanding is scarce able to substitute another. ... whichever Hypothesis be clearest and truest ... it is not my business to determine. (Locke [1689], IV.3.16)

Downing ([1998]) makes a compelling case that Locke means just what he says: in agreement with Boyle, he holds that Corpuscular Mechanism is uniquely intelligible, because of the direct connection it draws between the fundamental micro-qualities⁶⁸ and the qualities of ordinary experience -- the link described in the grain of wheat passage. Taking the real essence to be the nominal essence brings it within our epistemic reach. Corpuscular Mechanism may not be true, for all that, but if it isn't, the true alternative must necessarily be, to some degree, unintelligible to us.⁶⁹

In sum, then, the upshot of this first version of the distinction depends on whether or not we adopt the Corpuscular hypothesis. If we don't, primary qualities are special in that they are part of the nominal essence of 'body', the collection of qualities present in every body of ordinary experience and inseparable by the Mind. If we

⁶⁸ Given that a quality is a 'Power to produce [an] *Idea* in our mind' (Locke [1689], II.8.8) and that an individual corpuscle is 'less than to make it self singly be perceived by our Senses (ibid., II.8.9), Downing, [1998], pp. 390-391, points out that, strictly speaking, the size or shape of a corpuscle can't be a quality. Still, the features of an individual corpuscle do contribute to the aggregate corpuscular structure that produces an idea. In any case, Locke clearly intends that corpuscles and perceivable objects have, e.g., shape in the very same sense, so perhaps his usage here can be thought of as the sort of thing mathematicians happily shrug off as 'an abuse of notation'.

⁶⁹ Recall footnote 26.

do, primary qualities are special in the deeper sense of being present in the real essence, in what is it to be a body, in that from which an object's other qualities flow.

This brings us to the doorstep of a second version of the distinction, in terms of explanatory role. All of an object's qualities are to be explained in terms of ('flow from') the object's real essence. Primary qualities, then, are those included in the real essence -- shape, size, and so on (again assuming Corpuscular Mechanism) -- they are explanatorily basic, and secondary qualities are explained in their terms. As an epistemologist, Locke is particularly interested in explaining the object's ability to produce ideas in us:

The power to produce any *Idea* in our mind, I call *Quality* of the Subject wherein that power is. Thus a Snow-ball having the power to produce in us the *Ideas* of *White*, *Cold*, and *Round*, the Powers to produce those ideas in us, as they are in the Snow-ball, I call *Qualities*. (Locke [1689], II.8.8)

Why does the snowball look spherical and white? Because of the arrangement and qualities of the snowball's corpuscular parts. It looks spherical because of the way its corpuscles are arranged;⁷⁰ it looks white because of the qualities of the corpuscles at its surface.

But now there's a puzzle. What distinguishes the snowball's whiteness from its sphericalness? After all, both result directly from its corpuscular micro-structure. A first thought is that

⁷⁰ 'The way the corpuscles are arranged' is intended to refer to their overall geometric pattern (which is spherical), not a detailed accounting of where each and every corpuscle is located. Here I side with Putnam [1973], pp. 295-296, in thinking that the former is what explains my idea, not the latter. (His well-known example involves explaining why a square peg doesn't fit in a round hole.)

corpuscles, like the snowball, can be spherical, while they can't be white. But this seems too loose a connection: even if some of the corpuscles making up the snowball happen to be spherical, this isn't what gives the snowball the power to produce an idea of sphericity; that power of the snowball results, not just from the qualities of individual corpuscles, but from their arrangement in aggregate. The power of the snowball to produce an idea of whiteness also depends on the aggregate, but there is a key difference: the aggregate arrangement that produces the idea of sphericity is itself spherical, while an aggregate arrangement of corpuscular sizes, shapes, motions, etc., at the surface just amounts to a larger, more complicated size, shape, and motion.

This is where a third version of the distinction comes into play: primary qualities are special because their ideas resemble the powers that produces them and the ideas of secondary qualities do not.^{71,72} Of course the snowball example makes this look simpler than it is: the

⁷¹ Connecting this to another Lockean locution, though both primary and secondary qualities are powers, secondary qualities are 'mere powers' because they don't resemble. Notice, for the record, that even if color is identified with the surface micro-structure, that micro-structure wouldn't resemble the idea of color --so color ontology is irrelevant to the point.

⁷² Downing [1998], p. 388, footnote 15, seems prepared to accept a weaker notion of resemblance implicit in the 'first thought' in the previous paragraph: 'my idea of a cone would be resembling, even if no ultimate particles are cone-shaped, because the idea gives me an accurate conception of the sort of spatial properties which are had by those particles'. Reluctant as I am to depart from so keen an observer of Locke, it seems to me contrary to his spirit for our ideas to so uninformative: the idea of sphericity produced by the snowball would only tell me that there are shaped things out there. (The idea of whiteness produced by the snowball only allows me to distinguish it from other objects that don't produce an idea of whiteness. See Locke [1689], II.32.14.) If 'resemblance' operates instead at the level of aggregates of corpuscles, that idea tells me there's something spherical out there.

circular arrangement of a penny's corpuscles doesn't produce an idea of roundness when the penny is seen from an angle. It does, however, produce an idea of roundness at an angle, which is enough to distinguish it from the qualities of the corpuscles at its surface that produce an idea of copper-color.

Putting all this together, and assuming Corpuscular Mechanism, we have the beginnings of a Natural Philosophical answer to the early modern epistemological question: how do we manage to get reliable information about the world? The answer is that the world consists of corpuscles with primary qualities; these produce ideas in our minds; the ideas of primary qualities inform us of the primary qualities of the objects around us; the ideas of secondary qualities allow us to distinguish between objects, though without giving us direct information about them.⁷³ Formulating this answer involves an interplay between all three versions of the primary/secondary distinction: primary qualities are part of the real essence of 'body', secondary qualities are separable from body; primary qualities are explanatorily basic, secondary qualities are explained in terms of primary qualities; the ideas of primary qualities resemble the powers in the body that produce them, the ideas of secondary qualities resemble nothing in the body that produces them. Between them, the three interrelated distinctions touch on conceptual, metaphysical, and epistemic themes.

⁷³ If 'epistemology naturalized' is supposed to take place wholly within psychology, then this account doesn't qualify. Answering the early modern question requires an account of the world -- Corpuscular Mechanism -- as well as an account of the mind.

V. Primary/secondary now

Given this portrait of the early modern primary/secondary distinction and its role -- central to their Natural Philosophical epistemology -- let's now ask how primary and secondary qualities figure in today's marketplace of ideas. What topics in this vicinity capture the imagination, command the attention of the contemporary philosophical mainstream? I hardly count myself as finely attuned to such matters, but I think it's fair to say that sessions at disciplinary meetings, books and articles published, PhDs awarded, all suggest wide-spread concern with the nature of secondary qualities, particularly color, and more particularly, color ontology.⁷⁴ A first pass at the range of positions would include various forms of subjectivism -- color is in the head -- objectivism or physicalism -- color is in the object -- and relationalism or dispositionalism -- color is a relation between the object and the head, color is a disposition in the object to produce certain experiences in the head -- but philosophical ingenuity has moved the debate far beyond this crude beginning: for example, the opening chapter of Cohen's *The Red and the Real*⁷⁵ develops a taxonomy of (at least) seven general categories, each with two additional toggles, for a total (at least) twenty-eight possibilities!

⁷⁴ Cf., e.g., Cohen [2009], p. vii: 'A brief glance at recent philosophical journals, book catalogues, conference schedules, or graduate seminar offerings reveals that color has recently returned to its place at the center of philosophical inquiry'.

⁷⁵ Cohen [2009].

Of course the participants in this lively debate are well aware that the primary/secondary distinction traces back to the early modern period.⁷⁶ Unfortunately, those looking to the early moderns for inspiration are frustrated to find them fluctuating between quite different positions -- without apparent embarrassment! So, for example, Zed Adams, in his thought-provoking history of color concepts, lays out an array of possible positions and a string of quotations from Descartes, then remarks: 'If we ask ourselves which of these positions Descartes holds, the answer is that he seems to hold all of them -- which is obviously problematic' (Adams [2009], p. 91).⁷⁷ Similarly, Jacovides ([2017], p. 194) describes Locke's 'careless attitude' toward color ontology, and Downing ([2002], p. 344) remarks that 'Boyle does not seem overly concerned with this question'.

Wilson sums up this way:

Descartes, Boyle, Locke and other writers of the ... period could vacillate rather unselfconsciously among the views of, say, colors as dispositions or power to cause sensations, as the mechanistic structures in objects that accounted for the 'powers', or as the sensations themselves. Present-day philosophers may find it necessary to defend *one or the other* of these (or still different) positions, while conscientiously seeking to demonstrate the untenability of its rivals. (Wilson [1992], p. 477)

⁷⁶ E.g., Cohen [2009], p. 3, footnote 3, remarks that 'color physicalism has sometimes gone by alternative ... labels, including ... (adverting to the modern distinction among primary" and secondary qualities of matter) "primary quality theory of color"'.

⁷⁷ Adams [2009], pp. 84-92, gives a thorough account of commentators' efforts to distill a coherent view: 'Many have noted that Descartes appears to vacillate between different positions on the nature of color. The almost universal response ... has been to attempt to explain it away' (p. 91). See also Nolan [2011], pp. 81-82.

She traces the discrepancy here to what I think many would regard as its source: the contemporary embrace of 'more exacting standards of rigor than were characteristic of seventeenth-century treatments' (ibid.).

But there's something odd in all this. If we look back at the early modern epistemological story sketched a moment ago, a story with a starring role for the distinction between primary and secondary qualities, we can't help but notice it was easily told without taking any stand on the ontology of color or other secondary qualities. It involves primary qualities in the object producing ideas in us, some of which resemble features of the object and some of which don't. Nothing in this requires us to determine whether color *is* the qualities and arrangement of the corpuscles, the disposition to cause the idea, or the idea itself; all that matters is that the idea doesn't resemble the qualities and arrangement of the corpuscles. So maybe the reason Descartes, Locke, Boyle and others don't take a firm view on this matter isn't because they're sloppy or unrigorous, but because they don't care -- or better, maybe it isn't even a question that presented itself to them, in something like the way the nature of a general notion of 'knowledge' apparently didn't.

In fact, there are hints in the writings of some of our early modern Natural Philosophers that the question of color ontology isn't just without interest, but that it may even be ill-posed. As he works his way up from smell and taste to hearing and touch, Reid writes:

If it is asked, Whether the smell be in the rose, or in the Mind that feels it? The answer is obvious: That there are two different things signified by the smell of the rose; one of which is in the mind ... the other is truly and properly in the rose. ...

All the names we have for smells, tastes, sounds, and for the various degrees of heat and cold, have a like ambiguity ... They signify both a sensation, and a quality perceived by means of that sensation. (Reid [1785], II.16, p. 195)⁷⁸

This ambiguity in the terms leads to a conflict:

The vulgar say, That fire is hot, and snow cold, and sugar sweet; and that to deny this is a gross absurdity, and contradicts the testimony of our senses. The Philosopher says, That heat, and cold, and sweetness, are nothing but sensations in our minds; and it is absurd to conceive, that these sensations are in the fire, or in the snow, or in the sugar. (Ibid., II.17, p. 205)

If there's a real metaphysical fact of the matter to be settled here, either the Vulgar or the Philosopher must be wrong, but Reid believes 'this contradiction between the vulgar and the Philosopher is more apparent than real' (ibid.); it's what we would call merely verbal,

Owing to an abuse of language on the part of the Philosopher, and to indistinct notions on the part of the vulgar. (ibid.)

The Philosopher is abusing language because on the ordinary, ambiguous sense, the fire is hot; the Vulgar notion is indistinct, because his usage is ambiguous. Once each understands the sense in which their respective claims are meant, the disagreement vanishes.⁷⁹

And what about color? Here Reid surprises us:

Colour differs from other secondary qualities in this, that whereas the name of the quality [in the object] is sometimes given to the sensation which indicates it, and is occasioned by it, we never, so far as I can judge, give the name of colour to the sensation, but to the quality only. (Reid [1764], VI.4, p. 87)

⁷⁸ See also Reid [1764], II.8-9 and V.1.

⁷⁹ Reid [1785], II.17, p. 206: 'This speech of the Philosopher ... is meant by him in one sense; it is taken by the vulgar in another sense. In the sense in which they take it, it is indeed absurd, and so they take it to be. In the sense in which he means it, it is true; and the vulgar, as soon as they are made to understand that sense, will acknowledge it to be true'.

He speculates that this may be because

the appearances of the same colour are so various and changeable, according to the different modifications of the light, of the medium, and of the eye, that language could not afford names for them. (Ibid.)

Perhaps, he's suggesting, it's more efficient to use the word for the constant underlying quality in the object. But however that may be, Reid is clearly making an empirical claim about how color vocabulary is in fact used, just as he was with the other secondary qualities, not a metaphysical claim about what color really is.

In the context of Newton's more sophisticated account of color vision -- which includes light rays as potentially 'colored' alongside the object and the experience -- Howard Stein writes:

it seems to me a strange view of philosophy that holds that there is a single canonically "right" use of the word "color". (Stein [2004], p. 167, footnote 12)

Reid, at least, rejects this 'strange view'.⁸⁰ The causal story of the object, the light, the stimulations of the visual system, and the phenomenal experience can be described without any decision on which portion really is colored. In a similar key, Stein remarks:

The questions that arise about colors -- about, in ordinary parlance, 'the colors of things' (of the sky; of the sun; of the nocturnal and the diurnal moon; ...) -- can be discussed, in a way I have tried to exemplify in my earlier remarks, without any

⁸⁰ Immediately before the remark just quoted, Stein [2004], p. 167, footnote 12, notes that 'Newton distinguishes *various* senses of "color" -- "what colors are in the object, in the rays, and in the sensorium". These distinctions are - I should say *obviously* - clarifying'. It might appear that Stein is attributing a Reid-like position to Newton, but in fact, in the very passage Stein is quoting, Newton insists that 'the Rays to speak properly are not coloured', and that it's the sensations only that have 'the Forms of Colours' (Newton [1704], pp. 124-125). So Newton certainly appears to hold the 'strange view of philosophy'.

doctrine about the ontology of color; and such discussion -- I hope I have convinced you by those examples -- can genuinely satisfy the curiosity expressed by such questions -- again, without any need to take a stand, *one way or the other*, on the issue of whether colors are in some fundamental sense 'really in things'. (Ibid., pp. 155-156)

Given that our questions about why how color vision works and why the sky looks blue can all be answered without a stand on color ontology, the Natural Philosopher might well conclude that which element of the causal chain we regard as 'colored' is a linguistic matter, a matter of labelling, that the ontological question is asking for a fact of the matter where there is none.⁸¹

At the very least, then, these early modern natural philosophers weren't interested in the ontological question about color; at worse, they thought it ill-posed. This suggests that in terms of our just-so stories, the emergence of color ontology as a central theme, like that of the nature of 'knowledge', wasn't a Russell-Austin-style case of a Natural Philosophical matter left behind as 'science' spins off, but a Kant-started-it-style case of newly independent 'philosophy' posing a question of its own, to be settled by its own methods. This returns us to a more focused version of the question posed a while back: if these mainstream contemporary concerns are new, not the same as the early modern concerns, then what has happened to those earlier

⁸¹ Stein [2004], p. 156, doesn't draw this strong conclusion: 'I call this a "moderate" rejoinder because it does not claim to refute a theory of the ontology of color. [I take him to mean that it doesn't claim to show that the ontological question about color is ill-formed.] It does claim to refute the view that one such theory is *clearly prerequisite* to the understanding either of ordinary discourse or of our best current knowledge of color'.

concerns? In particular, as color ontology has taken center stage, what's become of the focal points of the early modern discussions of primary and secondary qualities?

VI. What's become of the early moderns' concerns?

Recall, once again, that the early modern epistemological story involved three versions of the primary/secondary distinction: primary qualities are part of the concept of 'body', secondary qualities are not; primary qualities are explanatorily basic, secondary qualities are not; our ideas of primary qualities resemble those qualities, our ideas of secondary qualities do not. When the distinction reaches its full development in Locke, the role of the conceptual distinction is to anchor the case for the unique intelligibility of Corpuscular Mechanism: the very properties that comprise our nominal essence of 'body' -- size, shape, motion, etc. -- also comprise its real essence, that is, the properties from which all the others flow, the explanatorily basic properties. The key components of the story, then, are two: intelligible explanatorily basic qualities, and ideas, some of which resemble and some of which don't. Let's take these up in turn.

As we've seen, Locke's hope that the uniquely intelligible primary qualities of Corpuscular Mechanism would explain all the properties of objects was under pressure even in the *Essay* from the cohesion of bodies and the workings of contact forces. As understanding has progressed, Locke's worries have been sustained; both these phenomena turn out to be beyond the reach of Mechanistic

thinking, both turn out to be electromagnetic phenomena. Here the explanatorily basic properties are the values of the electro-magnetic field -- qualities undreamt of in early modern thinking and entirely absent from the nominal essence generated from Locke's perceivable grain of wheat. Here, as elsewhere, the requirement of 'intelligibility' in Locke's sense necessarily falls away.⁸²

Today, we have the wild menagerie of particles detailed in the Standard Model, with properties like spin and color charge.⁸³ Some would take these particles as fundamental, and spin, color, and so on, as explanatorily basic; others seek to explain particles in terms of more fundamental quantum fields, whose values would then be explanatorily basic; still others would reduce both these to the mysterious strings of string theory. So this aspect of the early

⁸² See Wilson [1992], pp. 477-478, for reflections on this development. Stein [2004] traces the overthrow of Locke's intelligibility requirement to Newton's optics, in particular to his isolation of a specific number, the 'fit of easy reflection' (Newton [1704], p. 281), for each type of ray: Newton 'calls these "*original and connate properties*" of the rays; and the role of these properties in the ... understanding of light and vision that Newton develops is entirely analogous to the role that *should* be played, according to Locke, by *primary qualities*' (Stein [2004], p. 142). This may well be right, but I worry that some additional argumentation would be needed to show that the Corpuscular Mechanist couldn't reduce rays to aggregates of corpuscles and fits to features those aggregates enjoy due to the qualities and arrangement of those corpuscles (e.g., if the fit is a motion, the aggregate might have that fit due to the combined motions of its component corpuscles); if so, fits wouldn't be explanatorily basic, after all. In any case, for our purposes, it isn't important exactly when the intelligibility of explanatorily basic properties, their connection to sensory qualities, was first rejected, just that it was.

⁸³ Of course, color charge has nothing to do with color. See Feynman [1985], p. 136: 'The quarks have an additional type of polarization that is not related to geometry. The idiot physicists, unable to come up with any wonderful Greek words anymore, call this type of polarization by the unfortunate name of 'color', which has nothing to do with color in the normal sense'.

modern role for primary qualities -- marking the search for physical fundamentals -- is very much alive today.

A natural label for this contemporary study would be 'foundations of physics' -- for that matter, much of what our early moderns were up to could also be described in that way. Nowadays, when 'science' and 'philosophy' are regarded as distinct enterprises, it's worth noting that some contributors to this discussion are housed in philosophy departments and some in physics departments.⁸⁴ Those in philosophy departments would most often be regarded as philosophers of physics, but of a particular breed. Some philosophers of physics, some philosophers of science more generally, take their questions from mainstream philosophy -- say the problem of universals⁸⁵ -- and look to the physics to answer them; this is philosophy informed by physics. In contrast, those participating in what I'm here calling 'foundations of physics' take their questions from the physics, lending a hand with questions that arise -- like those above about the explanatory basicness of particles, field values, or strings -- within the 'science'. Philosophers of physics engaged in this project are sometimes challenged to explain why their work isn't just physics, isn't just 'science'; their rightful membership in the distinctive inquiry of 'philosophy' is sometimes questioned. Likewise, those

⁸⁴ See, e.g., the contributors to Saunders et al [2010].

⁸⁵ This example is drawn from chapter 3 of Maudlin [2007], a book devoted to addressing metaphysical questions by appeal to physics (as its title suggests).

theoretical physicists similarly engaged might be accused of straying from their own disciplinary norms. This is unsurprising, given that both groups are addressing questions of a piece with those of our early moderns, questions formulated in an arena where 'philosophy' and 'science' aren't separable. This is the Natural Philosophical residue left over after most of 'physics' spins off, Russell-Austin-style, into a distinct, well-regulated discipline.

So, if the worldly side of the early modern epistemic story, the side that counts primary qualities as explanatorily basic, lives on in the foundations of physics, what's become of the cognitive side, the relation between the world as so described and our cognition? The key notion here is resemblance: primary qualities are those whose ideas resemble them. As it happens, the most salient case -- perception of size, shape, and distance by sight -- has been central to theorizing about vision from the start. By the early modern period, Kepler's discovery of the retinal image had contributed to the rise of the theory of ideas⁸⁶ and with it the tendency to phrase the problem in its terms: how do we get accurate information about three-dimensional shape, size, and distance from a two-dimensional projection? Descartes, Berkeley, and Reid all discussed these matters in detail, often including experimental work, and (as noted) Berkeley especially had a profound influence on the discipline that eventually spun off, Russell-Austin-style, into contemporary vision science. Meanwhile, Newton was founding the study of color vision, showing how to predict

⁸⁶ See, e.g., Javokides [2017], chapter 7. See also [2017], pp. 124-136.

the color experience that would result from a given combination of rays.⁸⁷

In the centuries since, visual perception of the world's geometric features has turned out to be a complex and subtle business, involving intensive processing (e.g., stereopsis) and visual cues (e.g., the blueish cast of distant mountains).⁸⁸ Though space itself is locally Euclidean, our visual experience of it is neither perfect resemblance nor a two-dimensional projection: a long alleyway looks narrower in the distance, but it doesn't look like two converging lines on a plane, as a projection would; it's some kind of foreshortened three-dimensional space, whose structure is a lively topic of contemporary research.⁸⁹ The mechanics and physiology of color vision are comparatively well-understood.⁹⁰

So in this case the updated version of the early modern primary/secondary distinction would be the question: are worldly size, shape, distance, etc., registered differently from the workings of color vision? Phenomenally, the answer would seem to be 'yes' -- it's natural to think that our experiences of size, shape, and distance present themselves as geometric, while our color experiences bear no such resemblance to anything external -- but physiologically

⁸⁷ See Stein [2004], §6.

⁸⁸ See, e.g., Palmer [1999], chapters 5 and 7.

⁸⁹ See, e.g., Hatfield [2003a], Wagner [2006].

⁹⁰ Palmer [1999], p. 95: 'Certain aspects of color perception are among the best-understood topics in vision science, perhaps in all of cognitive science'.

both are simply encodings of certain features of the world. The question, then, is whether there's a principled difference between the way the system for spatial vision and the system for color vision register information.⁹¹ This is part of a larger inquiry into the mechanics of vision, what might be called 'the foundations of vision science'. Here once again we find a joint project of researchers from what are officially different forms of inquiry, this time, from departments of philosophy and of psychology or cognitive science.⁹² In other words, here, too, we find a residue left behind when a science spins off into independence -- this time vision science -- and practitioners who straddle disciplines, or maybe better, practitioners who pursue a single enterprise that's artificially segmented by our contemporary insistence that 'philosophy' and 'science' are distinct undertakings. Let's just call them Natural Philosophers and leave them be!

⁹¹ This question is even trickier than it seems because it requires a prior characterization of what information the visual system is out to encode. For example, if we take color vision to be encoding the reflectance distribution along an object's surface (its SRD), then the phenomenon of metamers (two SRDs that look the same) is a failure, but if we take the goal to be encoding, e.g., the location of ripe fruit against a leafy background, then metamers that don't effect this function (e.g., metamers that aren't present in the environment) are irrelevant (see Hatfield [1992]). A contemporary mainstream philosopher might be tempted to answer the characterization question simply -- the color vision system is out to encode color -- then stage the debate just mentioned (between SRDs or 'psychobiological properties' (Hatfield [2003b])) as a disagreement over color ontology. From the perspective being developed here, the underlying issue is a difficult evolutionary question: what purposes was the visual system designed to serve (in the terms of Marr [1982], a task analysis)? Masking this as a metaphysical question is at least a distraction, and at worst, the replacement of a real question with an ill-posed question that invites the application of inappropriate methods.

⁹² See, e.g., the contributors to Hatfield and Allred [2012].

VII. The plea

This brings us full circle, at last. We began with Austin, who recommended a certain topic -- excuses -- as well-suited to a given method -- ordinary language philosophizing. Reversing the order, I set out to recommend a certain method -- Natural Philosophizing -- as well-suited to a given topic -- the world and our place in it. To describe the method, I returned to the early moderns -- especially Descartes, Boyle, Locke, Newton, Berkeley, and Reid -- and called attention to their seamless integration of what we now call 'philosophy' and what we now call 'science'. Tracing history forward, the concerns of these Natural Philosophers survive in what we now consider as interdisciplinary inquiries, in the foundations of physics and of vision science. Once we recognize the phenomenon, it can be found in many other areas: in consciousness research,⁹³ in the foundations of mathematics,⁹⁴ in the theory of evolution,⁹⁵ and more. The fact is that pretty much any 'science' that's spun off from the Natural Philosophical core has left behind some Russell-Austin-style foundational residue.

So, where does this leave the questions that spun off instead as Kant-started-it, independent 'philosophical' questions? I've suggested that inquiry into the nature of 'knowledge' is such a

⁹³ See, e.g., Metzinger [2000].

⁹⁴ See, e.g., Koellner and Woodin's 'Exploring the frontiers of incompleteness' project at Harvard, 2011-2012: <http://logic.harvard.edu/colloquium.php>.

⁹⁵ See, e.g., Orzark and Sober [2001].

question. When the topic 'the world and our place in it' was introduced, I postponed consideration of what it leaves out; the nature of knowledge now presents itself as a potential example. It seems we could have a complete account of how, for example, the visual system registers information without touching the question of whether the agent 'knows' or 'sees that' in the presence of paper mache barns; presumably even a complete account of all the ways we gain reliable information wouldn't tell us whether 'knowing' is a factive purely mental state.⁹⁶ These contemporary epistemological questions appear to float free of what's going on in the world. To put the point another way: does the world contain a concept 'knowledge' to be analyzed⁹⁷ or a

⁹⁶ Cassam [2009], p. 27, describes a slight variant of Williamson's project that 'relies on armchair reflection rather than empirical science'.

⁹⁷ Austin mounted a case against concepts/meanings/universals that runs parallel to Quine's (see [2017], pp. 60-66). Psychologists speak of 'concepts', but insofar as this marks a serious theoretical posit, I doubt it can do the philosophical work required.

worldly item 'knowledge'^{98,99} to be studied or just a word 'knowledge' with an impressive array of subtle and effective ordinary language uses, a suitable topic for Austin's ordinary language philosophizing?¹⁰⁰ I suggest that what we've seen supports the third

⁹⁸ This includes both knowledge-first views stemming from Williamson (see footnote 41) and 'naturalistic' views like Kornblith's (see the following footnote). As an example from the first group, Cassam ([2009], p. 27) describes a Williamson-like view and remarks that it 'does not treat knowledge as a natural kind or as something to be studied by analyzing the concept of knowledge into more basic concepts. Instead [it] explains what it is to know A by identifying different means of coming to know it ... all one needs is an open-ended list of means of knowing that A.' Cf. Williamson [2000], p. 34: 'knowing that A is seeing or remembering or ... that A if the list is understood as open-ended' (quoted by Cassam [2009], p. 28). It's difficult to see how any of this can be done 'from the armchair' (see previous footnote); e.g., when Einstein and Perrin discovered means of coming to know that there are atoms, this was an empirical breakthrough. With no compunction about leaving the armchair, the Natural Philosopher might be forgiven for thinking that if 'know' is just the label for an open-ended list of ways of gaining information about the world, then the epistemologist's job is to study and assess the items on that list, from the senses to scientific confirmation.

⁹⁹ Kornblith [2002], p. 29, takes the opposite approach, holding that 'knowledge constitutes a legitimate scientific category. In a word, is a natural kind'. In particular, he argues that 'reliably generated true belief' is a collection of 'homeostatically clustered properties' and identifies this natural kind with 'knowledge'. One engaged in the contemporary epistemological debate might object to the last step: even if there is such a natural kind (see Roth [2003] for some doubts), on what grounds is it identified as 'knowledge' when 'there is a host of additional candidates, each corresponding to a different theory that was floated in response to the Gettier problem' (Goldman [2015]). Our early modern Natural Philosophers and their descendants would question the wisdom of lumping, e.g., reliably generated true visual beliefs with reliably generated true beliefs about molecular structure; as noted earlier, expecting an account at this level of generality blinds us to real work on how we get reliable information by vision, which is quite different from real work on how we get reliable information in physical chemistry. It's as if Kornblith wants to use the Natural Philosophical method, but is foiled by accepting the contemporary formulation of the leading epistemological question: 'It is worth pointing out that this conception of philosophy [i.e., his 'naturalism'] sits well with the practice of philosophy throughout most of its history. The great philosophers of the past were not narrowly trained specialists ... quite a number of them were able scientists in their own right' (Kornblith [2002], p. 176).

¹⁰⁰ This is what I take Austin to be doing in his well-known [1946], in implicit response to the skeptic. See [2017], pp. 65-66.

option. If this is right, then the contemporary philosopher's questions about knowledge, intended in some other sense, outstrip the target topic here: the world and our place in it.¹⁰¹

This conclusion runs parallel to our previous musings on the question of color ontology. It seems we could have a complete account of color vision -- from the micro-physics of the object to the behavior of light to the workings of the visual system -- and still not have an answer the central question of color ontology: what is color? Updating Reid, the contemporary psychologist Davida Teller writes:

Our goal is to unite three interestingly diverse kinds of entities: *Visual stimuli* (e.g., physical objects and their properties), *neural states* (the states of ensembles of neurons at many processing stages within the visual system), and *conscious perceptual states* (our visual perceptions of particular physical stimuli). ... As far as I can see, color realism is the view that of the vision scientist's three entities -- surface spectral reflectance, neural signals, perceived color -- one *is* color, and the other two are not. But if you ask a color scientist which of the three entities *is* color, she will answer that the question is ill-posed. We need all three concepts, and we need a conceptual framework and a terminology that makes it easy to separate the three, so that we can talk about the mappings among them. ... We care much more about our fundamental distinctions than we do about who owns the word *color*. ... The argument ... seems to me to collapse to an uninteresting terminological dispute. (Teller [2003], pp. 48-49)¹⁰²

¹⁰¹ I wonder if this is what Cassam [2009], p. 27, means when he says that knowledge, the target of his study, isn't a 'natural kind'.

¹⁰² Along the way, Teller also mentions usages like 'red light' and 'red cones'. See also, the psychologist Richard Warren [2003], p. 51: 'emphasis on reserving color terms for the inherent "physical" color of objects ... can make understanding color appearance more difficult ... Perhaps it is not necessary to choose between these views [preferring a] laissez-faire approach: Use the same term to describe both the stimulus and the sensory/perceptual response, and allow the context to make it clear which aspect is being considered'. The title used by another psychologist, Paul Whittle [2009], makes his point 'Why is this game still being played?': 'Why are we (particularly philosophers) still caught up in the problem of objectivity vs. subjectivity? ... We seem unable to let the problem rest.'

As Stein put it, why insist on a single 'right' use of the word? If something does determine the right use, then it, too, seems to fall outside the scope of our topic.

In general, then, Kant-started-it independent 'philosophical' questions float free of the early modern inquiry and its Natural Philosophical descendants: everything that needs explaining -- how we gain reliable information about the world, the functioning of color vision, the 'colors' of objects -- can be explained without answering them. This isn't to say that they're pseudo-questions; presumably they're part of a different inquiry with its own methods, just as Kant claimed.¹⁰³ But for those of us set on investigating the world and our place in it -- if that's your topic -- I stand by my recommendation: take counsel from the early moderns, stick with Reid's modest response to Hume, and adopt the seamless methods of the Natural Philosopher.¹⁰⁴

Penelope Maddy

Scientists are as divided in their opinions as philosophers, although in my experience their work is remarkably independent of their metaphysics, and when necessary they set up dual definitions' (p. 203). In the end, he makes a pitch for what I'm calling Natural Philosophy: 'It might be thought that these grumbles reflect a scientist's impatience with philosophy *per se*. Quite the opposite. ... The science of perception needs philosophy just now, and philosophy has much to offer. ... It has been my dawning awareness of these resources that has made me impatient with philosophy that seems to be playing old tunes with only minor variations' (p. 204).

¹⁰³ Though recall footnote 58.

¹⁰⁴ Thanks to Lisa Downing and Jeffrey Schatz for their helpful comments on earlier drafts. Neither should be assumed to second my more audacious conclusions.

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