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RESEARCH

Boyle's Reductive Occasionalism

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Was Robert Boyle an occasionalist? And if so, what kind of occasionalist was he? These questions have long troubled commentators, as Boyle's texts often seem to offer both endorsements of occasionalism and affirmations of bodies' causal powers. I argue that Boyle's position is best understood as *reductive* occasionalism, according to which (a) bodily powers are relations between bodies and God's action in the world, and (b) there is no causal efficacy in bodies that is not strictly identical to God's nomological causal efficacy.

Keywords: Robert Boyle; occasionalism; causation; God; laws of nature

Introduction

Was Robert Boyle an occasionalist with respect to causal relations between bodies? It might seem that this question should be easy to answer. After all, Boyle's extant *oeuvre* contains hundreds of pages that bear more or less directly on the causal order. But the matter is not so simple. Over the last several decades, a number of able scholars have taken up this question only to arrive at radically different conclusions. Indeed, since 1972, Boyle's position on body-body causation has been interpreted as "diluted occasionalist," (McGuire 1972) concurrentist, (Shanahan 1988) "nomic occasionalist," (Anstey 1999, 2000) and, most recently, as grounded in a reductive picture of powers that would later receive a more complete framing from Locke (Ott 2009).

The reason for this wide array of interpretive conclusions is no doubt the fact that many of Boyle's comments about causation seem to be strongly in tension with one another. For instance, in *A Free Inquiry into the Vulgarly Conceiv'd Notion of Nature*, Boyle writes that "it seems manifest enough, that whatsoever is done in the World, at least wherein the rational Soul intervenes not, is really effected by Corporeal Causes and Agents" (Boyle 2018: 465).[1] But in an unpublished fragment written within five years of *A Free Inquiry*, he declares that "material Agents…have really and properly no power to act, but only are Instruments acted and mov'd by the first cause" (Anstey 1999: 61). This is, by all appearances, something very close to a flat contradiction. Nevertheless, I think there is a solution to be had here. In this essay, I will marshal the relevant texts before considering several interpretive strategies aimed at making sense of them. I will then argue that Boyle is committed to what I will call 'reductive occasionalism,' according to which a) bodily powers are relations between bodies and God's action in the world and b) there is no causal efficacy in bodies that is not strictly identical to God's nomologically structured causal efficacy.

Before turning to the texts that generate the interpretive puzzle that concerns me here, it will be helpful to clarify what occasionalism says about causation. Steven Nadler has distilled the doctrine of occasionalism into the conjunction of a negative thesis and a positive thesis (Nadler 2005: 39):

Occasionalism
1) Natural objects—both minds and bodies—lack causal efficacy.
2) God alone is a true efficient cause.

[1] Unless otherwise noted, all Boyle citations are to Robert Boyle's *Works*. When not obvious from context, the particular work of Boyle's quoted from the *Works* will be mentioned in the citation.

I think Nadler's framing captures what scholars of modern philosophy most commonly have in mind when they refer to occasionalism. However, in this essay, I will be concerned only with Boyle's views on body-body causation. I will not be concerned with whether Boyle is committed to mind-body occasionalism (the doctrine that God is the real agent in apparent cases of minds acting on bodies) or body-mind occasionalism (the doctrine that God is the real agent in apparent cases of bodies acting on minds). One reason for this is simply that there is not enough space here to address the full range of Boyle's thought on causal powers. But there are other reasons as well. First, in perhaps the only text in which Boyle explicitly claims to be offering his assessment of occasionalism, he says that the view under consideration pertains to the "motions of bodies" rather than to causation more generally (Anstey 1999: 60). Second, Boyle states more or less unequivocally that there is real mind-body causation (Boyle 2018: 465 (*A Free Inquiry*)). Causal relations in which bodies affect minds pose very difficult interpretive questions, and I confess that I'm not sure how to answer them. So for my purposes here, I will adapt theses 1 and 2 as follows:

Body-Body Occasionalism
1*) Bodies have no causal efficacy.
2*) God alone is a true efficient cause of interactions between bodies.

1. The Textual Puzzle

Let's begin by considering some of the texts in which Boyle seems to endorse occasionalism. By far the clearest and most convincing evidence that Boyle was committed to body-body occasionalism is a brief, unpublished discussion from a notebook that Peter Anstey dates to the very late 1670s or (more likely) 1680s (1999: 58). In this short piece, Boyle takes up the question of occasionalism, which he calls "a new Paradox of some Cartesians, who will not allow that bodys can move one another, but thinke that of all Motions amongst things corporeal, *God* himself is the only proper and immediate cause" (quoted in Anstey 1999: 60).[2] Boyle undertakes to defend these Cartesians, and offers a number of arguments in support of body-body occasionalism. These include:

> *Argument from Parsimony*: "I consider that 'tis an acknowledged *Axiome* that *entia non sunt multiplicanda absque necessitate*; and therefore since the action of God is sufficient to all the motions that occur among bodys, 'tis needless and superfluous to have recourse to another cause." (Ibid.)
>
> *Argument from Unobservability of Causal Powers*: "It does not manifestly appear to us, that one body does really and truely move another, but only that upon a moved body's hitting another, there follows a motion in that body that is shocked or hitt against." (Ibid.)
>
> *Argument from Inconceivability*: "It may well be question'd, whither we can so much as *conceive*, how a body can communicate motion to another and loose it, its self." (Ibid.: 61)[3]
>
> *Argument from Piety*: "I think it may be considered, whether it be not more safe, as well as pious, in a doubtful case, to Attribute a power that must be lodg'd some where, rather to an omnipotent Spirit, than to senseless Matter, it being a less dangerous error to derogate from Bodys, than from God. (Ibid.)[4]

Boyle makes it clear that the upshot of these arguments is that "part(s) of matter…have no inherent motion and power to communicate it" (Ibid.). And since "motion (is) the great efficient in all the actions of one part of matter upon another," this means that parts of matter "have really and properly no power to act, but only are Instruments acted and mov'd by the first cause." (Ibid.).

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[2] It is not clear precisely which Cartesians Boyle has in mind here. Anstey notes that Boyle's correspondence with Henry Oldenburg contains substantial discussions of contemporary Cartesian doctrines, with Oldenburg often providing Boyle with updates on the debate. Furthermore, Oldenburg reviewed Cordemoy's *Dissertations Physiques sur le discernement du corps et de l'ame* in the September 1666 issue of the journal *Philosophical Transactions*, which Boyle read. These considerations provide some evidence that Boyle had some combination of Cordemoy and reports from Oldenburg in mind as he wrote this fragment. On occasionalism across the entire extent of Cartesian thought, see Nadler 2010. On Malebranche's occasionalism in particular, see Lee 2008.

[3] It's not exactly clear *why* this is inconceivable. Anstey suggests that perhaps Boyle is falling back on the Cartesian idea that motion is a modification of a substance; if a motion is indeed such a modification, then it might be difficult to understand how numerically the same mode could be first in one substance and then in another. However, this may not be what Boyle has in mind at all. Cf. Anstey 1999, 64.

[4] Something very like the argument from piety appears in Malebranche as well. He writes, "Some philosophers prefer to imagine a *nature* and certain *faculties* as the cause of the effects we call natural, than to render to God all the honor that is due his Power." Cf. "Elucidation Fifteen" in Malebranche (1992: 99).

At first blush, these texts may seem to make Boyle's position on body-body occasionalism clear. But there are two points that serve to mitigate (somewhat) the force of this fragment. First, Boyle suggests that his goal is merely to defend the plausibility of occasionalism and not to mount a case for its truth. He writes: "I shall … acquaint you with what came into my mind, as I was thinking what might, be said not to prove this opinion true, but to keep it from appearing absurd" (Ibid., 60). However, the arguments he offers are manifestly not mere defenses against absurdity, but rather forceful considerations in favor of occasionalism. It is certainly quite a stretch to suggest that Boyle's claim that it is hard to even understand how bodies might transfer motion to one another is meant only as a cautious suggestion that occasionalism might not be absurd.[5] Second, Boyle never published this fragment. But he did have it translated into Latin, no doubt for (at least limited) circulation among non-anglophone colleagues (Anstey 1999: 59). So although he may have been reluctant to put his defense of occasionalism before a general audience, he was sufficiently confident in it to make arrangements for other scholars to access it.

Nevertheless, we need to consider Boyle's published material in order to get a full and accurate sense of his attitude toward occasionalism. In a number of mature published works, especially *A Free Inquiry*, Boyle expresses support for a handful of positions that together suffice to commit him to body-body occasionalism, or at least something very much like it. Let's turn to these texts now.

Boyle writes in *The Origin of Formes and Qualities* that matter and motion are the only two "grand and most Catholick Principles of Bodies" and that all others are modes of these (Boyle 2018: 307). Furthermore, Boyle joins many other 17th century mechanists in denying that motion is inherent in matter. Indeed, Boyle claims in *A Free Inquiry* that the existence of motion must be attributed to God:

> I know, that God, who is an immaterial Spirit, ought to be acknowledg'd the Primary Cause of Motion in Matter, because (as we may justly with *Monsieur Des Cartes* infer,) Motion not belonging to Corporeal Substance, as such; Thus I must owe That to an Incorporeal One. (Ibid.: 554)

Boyle drives his point home again on the next page, declaring: "Motion does not belong to Matter in itself" (Ibid.: 555).

God, then, is the "primary cause" of motion in matter, which lacks real qualities and powers. Indeed, in a striking passage from *Some Considerations about the Reconcileableness of Reason and Religion*, Boyle makes it clear that both the laws of motion and the bodies whose movement they govern are radically dependent on God from moment to moment, and that he is perfectly free in his choice of what they will be:

> If we consider God as the Author of the Universe; and free Establisher of the Laws of Motion, whose general Concourse is necessary to the Conservation and Efficacy of every particular Physical Agent, we cannot but acknowledge that, by with-holding his Concourse or changing these Laws of Motion, which depend perfectly upon his Will, he may invalidate most, if not all the Axioms and Theorems of Natural Philosophy. (Ibid.: 251–252)

Indeed, even the quantity of motion depends entirely on God's free choice:

> And for the Rule … which asserts, *That there is always the same quantity of Motion in the World*; *every Body that moves another*, *loosing just as much of its own as it produces in the other*: the proof he [Descartes] offers, being drawn from the Immutability of God, seems very Metaphysical, and not very cogent to me; who fear that the Properties and Extent of the Divine Immutability, are not so well known to us Mortals, as to allow *Cartesius* to make it in our present case, an argument *à priori. And à posteriori I see not how the Rule will be* demonstrated: since, besides that it may be questioned whether 'tis agreeable to experience in divers instances that might be given of communicated Motions here below; I know not what experience we have of the Rules by which Motion is propagated in the Heavenly Regions of the World, among all the Bodies, that make up the Ætherial, (which is incomparably the greatest) part of the Universe. (Ibid.: 20 (*On the High Veneration*))

We have now seen that Boyle seems to commit himself to each of the following positions:

[5] Consequently, I cannot agree with Ott when he calls Boyle's remarks here a "mock defense" (2009: 138). Anstey agrees that Boyle's language in the fragment is stronger than would have been merited by a genuine attempt to do nothing more than rescue occasionalism from the charge of absurdity. See Anstey 1999, 76.

a) Material bodies are inert per se. God must add any motion they possess.
b) There are no real qualities in bodies that are distinct from the shape, size, and texture of bodies.
c) God directly arranges the parts of matter and freely establishes laws of motion to govern their motion.
d) God freely decides on the amount of motion to create among bodies.
e) Each of the following is radically dependent on God's "concourse" for its existence at every instant: 1) all bodies; 2) the quantity of motion; 3) the laws of motion.
f) God retains the power to alter the number of bodies, the quantity of motion, or the laws of motion at any time.

Given these apparent commitments, not to mention the explicitly pro-occasionalist fragment we considered earlier, it might seem strange that there should be any doubt at all that Boyle was a body-body occasionalist. The trouble is, though, that Boyle repeatedly states in print that bodies *do* have causal powers. Perhaps the most striking of such texts is the well-known Tubal Cain passage from *The Origin of Formes and Qualities:*

> We may consider then, that when *Tubal Cain*, or whoever else were the Smith, that Invented *Locks* and *Keyes*, had made his first Lock …[.] That was onely a Piece of Iron, contriv'd into such a Shape; and when afterwards he made a Key to that Lock, That also in it self Consider'd, was nothing but a Piece of Iron of such a Determinate Figure: but in Regard that these two Pieces of Iron might now be Applied to one another after a Certain manner, and that there was a Congruitie betwixt the Wards of the Lock and those of the Key, the Lock and the Key did each of them now Obtain a new Capacity and it became a Main part of the Notion and Description of a Lock, that it was capable of being made to Lock or Unlock by that other Piece of Iron we call a Key, and it was Lookd upon as a Peculiar Faculty and Power in the Key, that it was Fitted to Open and Shut the Lock. (Ibid.: 309–310)

In some sense, then, it is right to say of locks and keys that they have "capacities" or "powers" with respect to each other. And this would seem to be in direct tension with the claim, which is one of the two necessary conditions of body-body occasionalism, that bodies have no causal efficacy.

In *The Vulgarly Conceived Notion of Nature*, we find another endorsement of causal powers. Here, Boyle is distinguishing benign senses of 'nature' and 'natures' from the pernicious understanding of natures as "semi-deities" that stand between God and bodies and facilitate causal interactions between bodies:

> *Sometimes* we take *Nature* for an Aggregate of Powers belonging to a Body, especially a Living one; as, when Physicians say, that *Nature* is strong, or weak, or spent; …[.] And *sometimes* too, and that most commonly, we would express by the Word *Nature*, a Semi-deity, or other strange kind of Being, such as this Discourse examines the Notion of. (Ibid.: 453)[6]

It is clear here that "an aggregate of powers belonging to a body" is among the senses of 'nature' that Boyle judges acceptable.

Boyle, then, seems to be in something of a bind. For he has committed himself to propositions that jointly entail body-body occasionalism as well as to propositions that seem to entail the denial of body-body occasionalism. The interpretive task before us is thus to seek out a strategy for weaving these two disparate strands of thought into a single coherent thread. In the next two sections, I will discuss and then reject two attempts at resolving the problem before offering my own in the penultimate section.

2. Ott on Boyle's Powers

Walter Ott has provided a very thorough analysis of Boyle's understanding of material powers (Ott 2009: Ch. 17–18). Ott concludes that although Boyle's position on body-body causation remains less than totally clear, we can be fairly confident that Boyle is committed to a picture of body-body causation in which bodily causal powers do rather more, and God does rather less, than an occasionalist, or even a traditional concurrentist, would allow. According to Ott, "God and creatures seem to be genuine collaborators, with God doing one thing (creating, sustaining, and governing motion) and bodies another (deflecting and altering the course of that motion in accordance with their own properties)" (Ibid.: 157).

[6] Boyle has in mind entities like Ralph Cudworth's plastic natures. See Cudworth 1678.

Recall the Tubal Cain passage from *The Origin of Formes and Qualities*. We saw that in this passage, Boyle asserts that the metal of a lock and the metal of a key that opens it acquire powers with respect to one another when each is fashioned into the right shape. But consider how the passage continues after the portion discussed above: "and yet by these new Attributes there was not added any Real or Physical entity, either to the Lock, or to the Key, each of them remaining indeed nothing, but the same Piece of Iron, just so Shap'd as it was before" (Boyle 2018: 310). In this section of the passage, Boyle indicates that the active power of a key to operate a lock and the passive power of a lock to be operated on by a key are simply relations between the two bodies. And relations between bodies reduce fully to the mechanical properties of the bodies thereby related. Ott writes: "In this crucial passage, Boyle at one stroke disposes of the difficulties … others found in the ontology of powers. Like fatherhood, powers are relations" (Ott 2009: 143).

It seems, then, that to say that the key has a power to operate the lock is simply to say that when the metal of the key and the metal of the lock are spatially related in a particular way, a particular sort of mechanical event occurs. Remove either of the relata and the power no longer exists: ontologically, there is nothing to the power other than the corporeal properties of the bodies involved. So on this understanding of what Boyle is up to, it is right to say that the lock and key possess powers with respect to one another, but it is wrong to think that these powers amount ontologically to anything more than the magnitude, shape, and motion or rest of the relevant bodies.[7]

At first pass, it is tempting to understand this picture of powers as relations as attributing the capacity of a body (such as a lock) to relate causally to another body (such as a key) to features of those two bodies alone. But Ott rightly notes that Boyle's position is not so simple. For Boyle insists in the *Introduction to the History of Particular Qualities* that any particular power is embedded in a grand pattern of relations involving all of corporeal creation:

> Every distinct portion of Matter, whether it be a Corpuscle or a Primary Concretion, or a Body of the first, or of any other order of Mixts, is to be considered not as if it were placed *in vacuo*, nor as if it had Relation only to the neighbouring Bodies, but as *being plac'd in the Vniverse, constituted as it is*, amongst an Innumerable company of other Bodies, whereof some are near it, and others very remote, and some are great and some small, some particular and some Catholick Agents, and all of them governed as well by *The Vniversall fabrick of things*, as by, *the Laws of Motion* established by the Author of Nature in the World. (Boyle 2018: 275)

By Ott's lights, then, powers are relations between bodies that reduce entirely to the "catholic affections" shared by all bodies as such, namely size, shape, and motion and rest. Any particular power is one such relation ensconced in an enormously (perhaps infinitely) complex network of relations that involves all bodies.

Ott suggests that his understanding of Boyle's powers generates the following difficulty. As we saw in §1, Boyle is committed to a number of positions that are difficult to square with powers in bodies, however reductive they might be. For Boyle gives God such an expansive and direct role in the course of mechanical events that it is hard to see what is left for bodily powers to do. The amount of motion that exists, the way in which it is distributed among bodies, and the conditions under which certain bodies lose it and others acquire it, are all radically dependent from moment to moment on God's totally free activity. This would seem to mean that when the key moves inside the lock, the bodies that compose the lock move as they do because God is then creating an arrangement and quantity of motion among bodies that includes these particular movements. What could the reductive powers of the lock and key possibly be contributing here? Everything that needs to be done is already taken care of, indeed perfectly so, by God. And as Boyle opines in the fragment on occasionalism, *entia non sunt multiplicanda absque necessitate*.

[7] It is important to note that a consequence of this reduction of powers to relations between corporeal properties of bodies is that although property predications tend to adhere to a grammar that would suggest that they are one-place predicates (for example, 'the key has the power to unlock'), this is only surface grammar. A properly spelled-out grammar of power predication would make it clear that powers are actually (at least) two-place predicates. Furthermore, it is necessary to distinguish between the different sorts of qualities, both relational and non-relational, that a body can have, and to make it clear which ones come into the picture of powers as relations I'm sketching here. First, both complex bodies (bodies that are composed of corpuscles) and simple bodies (corpuscles) can stand in relations and possess non-relational properties. Among the relations of bodies, some are intrinsic (i.e. they obtain between corpuscles within a single body) and some are extrinsic (i.e. they obtain between bodies). Intrinsic relations are possible only in complex bodies, while extrinsic relations can have as relata any combination of simple bodies and complex bodies.

According to Ott, we can resolve this tension by understanding Boyle's picture of powers as one in which *both* the mechanical affections of bodies and God's activity must be in play in order for a body to have the power to alter another. He writes:

> When we focus on either relatum of the power relation, we will never find anything but intrinsic, non-relational properties. These are not enough to endow bodies with powers. But the further element that is required is not a further property of the body, beyond its mechanical affections. The extra element is the presence and continued transmission of motion. And this is what God does. (Ott 2009: 155)

I don't think that this answer will do. There can be no doubt that according to Boyle, God does indeed supply motion and ensure its continued transmission. But it is not the case that once God has supplied motion and guaranteed its transmission the key will interact with the lock as we expect in virtue of its mechanical affections and those of the lock. For as we have seen, God also freely determines, from moment to moment, the conditions under which motion is to be altered with respect to the lock and the key (and their respective parts). Ott says that with respect to body-body causation, "God (does) one thing (creating, sustaining, and governing motion) and bodies another (reflecting or altering the course of that motion in accordance with their own properties)" (Ibid.: 157). But this must be wrong, since Boyle's bodies "alter" the course of motion only in the sense that God freely makes it the case that distributions of motion change in particular ways when certain bodies come to be spatially related to certain other bodies in particular ways. There is simply nothing left for bodies to contribute. It thus seems that while we should agree with Ott that Boyle's powers are relations of *some* sort and that these relations don't require any properties in bodies beyond mechanical ones, we should reject Ott's claim that Boyle's powers are joint ventures between mechanical affections of bodies on the one hand and God's creation and conservation of motion on the other.

3. Nomic Occasionalism

So, what *should* we to say about Boyle's powers? As we have seen, God not only creates and conserves the total quantity of motion among bodies, but also freely ordains laws that determine the allotment of motion among various bodies. Boyle's mechanical affections relate to motion as they do only on account of God's freely promulgated laws of motion, so it is hard to see what mechanical affections could possibly contribute to causal powers. But could Boyle mean to claim that God creates and conserves both a quantity of motion and *laws* of motion, and that these laws themselves explain the transfer of motion among bodies? On this view, powers of bodies are relations between bodies and efficacious laws. Anstey defends such a reading, which he calls "nomic occasionalism." The nomic occasionalist reading is, I believe, nearly right, but not quite so. Moreover, the grounds on which it falls short suggest as a solution my own reductive occasionalist reading of Boyle on body-body interaction. In order to bear all of this out, it will be useful to reconstruct Anstey's position and then discuss it in some detail.

The nomic occasionalism that Anstey attributes to Boyle comprises four main claims. First, matter is causally efficacious, and it would be causally efficacious "even if God suspended or changed the laws of nature" (Anstey 2000: 171). This material causal efficacy is present in collisions between material objects, and it includes three distinct powers: "First there is the power to transmit motion, second the power to persevere in motion and third the power to change the determination of motion" (Ibid.: 162). According to Anstey, we may reasonably (though not certainly) surmise that material bodies possess the first and third of these powers on account of matter's impenetrability (Ibid.: 163).

Second, material causal interactions would not exhibit regular, orderly features without God's concurrence through the laws of nature: "No regularities are implied by the causal interaction of corpuscles colliding, for causal connections are not a species of law-like connection" (Ibid.: 172). Although causation would, on account of the three intrinsic material powers discussed above, exist even without God's imposition of the laws, that causation would be random and unpredictable. As Anstey puts the point, "chaos would result" (Ibid.: 164). This is because "while matter is causally efficacious in that it can transmit its motion in collisions, the nature of that transmission and the resultant motions are determined by the immanent activity of God" (Ibid.: 164).

Third, all natural causes require God's concurrence, not in the weak sense of passive agreement, but in the strong sense of direct cooperation. Anstey writes: "Boyle's notion of the concurrence of God in natural phenomena is one of immediate active involvement at the same location and time as the second cause and not one of detached consent" (Ibid.: 171). So, God must actively intervene in each material collision—at the

place and time of that collision—in order to impose on the matter and motion involved the laws of nature necessary to produce the causal regularity we observe in such collisions.

Fourth, and finally, Boyle's understanding of the laws of nature that God imposes on material interaction via his direct, active concurrence is strongly voluntarist. That is, God is in no way constrained by the nature of matter in issuing the laws of nature, and he could impose any other laws of nature according to his own judgment. According to Anstey, "Boyle denies any connection between the nature of matter and the laws of nature" (Ibid.: 163). There is no rational structure to material creation apart from that which God voluntarily imposes on it.

Anstey's nomic occasionalist reading of Boyle on material interaction is a powerful and plausible interpretation.[8] Nevertheless, I do not believe that it entirely succeeds. The trouble, I believe, lies not with the interpretive theses of strong voluntarism, direct divine participation in causation, or dependence of causal regularities on divinely created natural laws, but with the thesis that matter contributes causal power to causal interactions. The problem is that it is difficult to make sense of the idea that colliding bodies have the causal powers of transferring and determining movement while nonetheless determining nothing about where and how motion will be transferred and determined. As we earlier observed, Anstey attributes to Boyle the view that "while matter is causally efficacious in that it can transmit its motion in collisions, the nature of that transmission and the resultant motions are determined by the immanent activity of God" (Ibid.: 164). If God immanently determines both the nature of motion's transmission in collisions between bodies and the character of the motion that results from such collisions, it isn't clear what the causal efficacy of matter in collisions could amount to. For what is there to a causal power other than a capacity to transmit motion in some particular way with some particular dynamic results? A billiard ball, for instance, has the power to move another billiard ball across the table by striking it. Assuming the corpuscularian hypothesis, what could this power amount to but a capacity to transmit motion in a particular way, generating particular resultant motions? If, as seems to me correct, the answer is that this is all that such a causal power can be, and if we assume all that Anstey has attributed to Boyle concerning God's role in body-body interactions, how can we say that the balls themselves add causal efficacy that is not identical to God's immanent activity? Much as we observed with respect to Ott's interpretation, it would seem that God's action crowds material causal efficacy out of the frame.

Now, as we have already seen, Anstey interprets the causal efficacy of bodies as a kind of causal efficacy that does not imply any regularity of motion, and which would render chaos without God's intervention. So perhaps material bodies have causal efficacy only in the sense that when they move, something or other, but nothing in particular, will follow. But why should we count this as causal efficacy at all? If any set of material movements could follow any other set of material movements, what reason is there to say that there is chaotic and unstructured causal efficacy in play rather than chaos *simpliciter*? In short, it is not clear how, if God directly determines the nature of transmissions of motion between bodies as well as the properties of the resultant motion, bodies could possibly contribute causal efficacy of their own to collisions between bodies.

4. Reductive Occasionalism

Earlier, I agreed with Ott that powers are relations and that these relations do not saddle bodies with any properties other than their standard mechanical ones. The trouble with Ott's reading, I argued, is that Boyle gives God such a significant role in the causal order that there is nothing left for bodily powers to contribute to material causation. Consequently, it can't be right that God and bodily powers are engaged

[8] In *A Free Inquiry*, Boyle makes it clear that the concept 'law' cannot be properly and strictly applied to bodies:

> But to speak strictly, (as becomes Philosophers in so weighty a matter) to say that the *Nature* of this or that Body, is but *the Law of God prescrib'd to it*, is but an improper and figurative Expression. For … must freely observe, that, to speak properly, a *Law* being but a *Notional Rule of Acting according to the declar'd Will of a Superior*, 'tis plain, that nothing but an Intellectual Being can be properly capable of receiving and acting by a *Law.* For if it does not understand, it cannot know what the Will of the *Legislator* is; nor can it have any Intention to accomplish it, nor can it act with regard to it; or know, when it does, in Acting, either conform to it or deviate from it. (Boyle 2018: 457 (*A Free Inquiry*))

Nevertheless, I don't think Boyle means to deny that there are laws of motion. Rather, the point is that law talk has its primary home in juridical contexts that prominently feature intelligent agents receiving and acting on rules of conduct, so we must be conscious of the metaphor we invoke whenever we apply such language to material bodies. We must be sure to keep in mind that in whatever sense God authors laws that regulate the movement of bodies, he does not promulgate directives to them like he promulgates rules for behavior to us. And this is quite compatible with the nomic occasionalist reading.

in a joint causal venture to which each is a genuine contributor. This problem for Ott's interpretation led me to consider Anstey's nomic occasionalist reading. I argued that despite its many virtues, it fails to establish any role for causal powers inherent in material bodies, and that the reasons for this failure leave Boyle looking like a fairly complete occasionalist. These interpretive moves raise the question of this final section: How can we reconcile Boyle's occasionalism with his tendency to write about material bodies as though they do somehow possess causal powers? I believe that we can answer this question satisfactorily—and do so while retaining both Ott's notion of powers as relations and much of Anstey's nomic occasionalist reading—by demoting the ontological status of Boyle's powers below even the modest station they enjoy in Anstey's interpretation. Boyle's bodily powers, I contend, are relations between (1) bodies and (2) God's immediate direction of matter according to the laws of his choosing. I suggest that for some body A to have a power with respect to some other body B is for A to have a place in the structure of God's laws—which are identical to God's regular and systematic causal direction of matter—such that when A is located in some particular position relative to B, B moves in some particular way. The fact that this motion occurs when A and B are located relative to one another in this way is entirely explicable in terms of the amount of motion God causes to be in place among bodies and God's choice as to the conditions under which motion is to pass from body to body. This is a completely reductive understanding of powers; there is nothing about the efficacy of bodily powers that is not analyzable into the efficacy of God's nomological action. This view, which I am attributing to Boyle, is *reductive occasionalism*.

It will help to spell out the position I have in mind in a bit more detail. As the texts I reviewed at the outset show, God freely decides, from moment to moment, how much motion there will be among bodies and the conditions under which the allotment of motion between bodies will change. Suppose that God is currently willing an amount and order of motion such that when I turn my open water bottle upside down, its contents pour out. According to reductive occasionalism, this is all that it takes for the water to have an active power to leave the bottle and move toward the ground, and for the bottle to have a passive power to become bereft of its contents. What do these powers amount to? They amount to nothing more than relations to the divine activity whereby God makes it the case, according to his chosen nomological pattern, that the water falls out of the bottle. The same analysis applies to matter's power of impenetrability: The power of a corpuscle to resist penetration is a relation to the divine activity whereby God makes it the case, according to his chosen nomological pattern, that nothing penetrates that corpuscle.[9] According to reductive occasionalism, for a body B to have a power to Φ at t is nothing more than for God's nomological activity to entail that B Φs at t. Thus, each of the following is true:

a) Powers of bodies are relations;
b) Powers of bodies involve no properties of bodies other than normal mechanical ones;
c) Each power has at least three relata: the two (or more) bodies to be causally related and God's immanent nomological action;
d) God's action constitutes *the entire* efficacy of each power; no power has *any* efficacy that is not identical to the efficacy of God's activity.

Is reductive occasionalism really occasionalism? Let's look once more at the definition of body-body occasionalism I framed at the outset, which is a modified version of Nadler's definition of occasionalism more generally:

Body-Body Occasionalism
1*) Bodies have no causal efficacy.
2*) God alone is a true efficient cause of physical events.

On the reading of Boyle on causation I am proposing, this comes very close to being correct. But it is not quite correct, because as I understand him, Boyle's goal with respect to powers is to *reduce* them fully rather than to *eliminate* them completely. Here is how to modify this definition so that it is a match for reductive occasionalism.

[9] Thanks to an anonymous referee for pressing me to bring my interpretation to bear on matter's impenetrability.

Reductive Occasionalism

1**) Bodies have no causal efficacy *that is not identical to God's nomological causal efficacy.*

2*) God alone is a true efficient cause of physical events.[10]

Now that we have before us a blueprint of reductive occasionalism, it will be useful to consider some possible complications and objections. First, I have referred throughout this section to God's "nomological" action. I have done so in order to make clear that my reading does not replace laws of nature with God's action, but rather makes God's immanent, directive action constitutive of the laws of nature. Reductive occasionalism is, like the causal doctrine Anstey attributes to Boyle, a reading on which God directs causal interactions via laws of nature. The difference is that according to reductive occasionalism, there is no causal efficacy in bodies apart from the causal efficacy of God's action. And that action, as ordered according to regular patterns of God's choosing, constitutes the laws of nature. Thus, reductive occasionalism, like nomic occasionalism, is a nomological interpretation of occasionalism. But it is a different nomological interpretation, because it affords God an even more significant causal role than does nomic occasionalism.[11]

Second, although reductive occasionalism involves God heavily in the moment-to-moment work of causation, I do not mean to commit Boyle to the even stronger doctrine of continuous creation.[12] I am not aware of any texts in which Boyle affirms this position, or in which he suggests that corpuscles do not retain—without further help—their existence from moment to moment once God has created them. Moreover, as Anstey rightly notes (and as I have not contested), Boyle seems to think that corpuscles retain their motion once moved (Ibid.: 162). So, although Boyle accepts significant features of the occasionalist picture we find in continental figures like Malebranche, I do not mean to saddle him with the doctrine of continuous creation. I should note, though, that I see no reason why Boyle *couldn't* have endorsed continuous creation. But in point of fact, it appears that he never did so.

Third, if body-body causal powers are three-place relations among material objects and God's efficacious action in material creation, why shouldn't we say that the material objects involved are efficacious as well? The first thing to say is that there is a reductive sense in which they *do* possess causal efficacy: They possess causal efficacy that reduces entirely to God's causal efficacy. For instance, my cup really does have the power to spill its contents when dropped, but there is nothing to that power that does not reduce to God's causal power. Why say this? Because on the reading I am developing, corpuscles would not transfer motion but for God's direct, constant nomological intervention. God, by contrast, does not depend on material bodies at all, whether to order the transfer of motion among them or to do anything else.

This reply, however, suggests another objection: How is reductive body-body occasionalism distinct from classical body-body occasionalism? After all, both doctrines locate causal efficacy entirely in divine action. By way of an answer, we may helpfully compare the structure of the reading I am proposing to reductive theories in the philosophy of mind. Some such reductive theories are eliminativist. That is, they hold not just that beliefs, hopes, plans, and so forth reduce to brain states and activities, but that, as a consequence of this reduction, beliefs, hopes, plans and other entities that populate our "folk" psychological theories do not exist (see, for example, Churchland 1981). Other reductive theories of mind, however, are not eliminativist (see, for example, Jackson & Pettit 1990). According to non-eliminativist physicalism, beliefs, hopes, plans, and other folk psychological entities exist *even though* there is nothing mental that is not, at bottom, physical. Reductive occasionalism is a kind of non-eliminativist reductive theory about body-body causation vis-à-vis God's direct, efficacious, nomological action. In this case, of course, we are talking about causal powers rather than mental entities, and the problematic bit of ontology at hand is bodily causal efficacy rather than mental states. But the idea is similar: Boyle wants to retain bodily causal powers within a reductively theological picture of causal efficacy, just as some philosophers want to retain beliefs, hopes, and so forth within a reductively materialist picture of the mind.

[10] One interesting consequence of reductive occasionalism is nominalism about powers; there are no real power-kinds, only particular powers, which are particular relations between particular bundles of corpuscles and God's action on those (along with all the other) corpuscles. Because God (contingently) conducts his management of material creation in regular ways, nearly identical macroscopic bodies predictably relate to other such bodies in ways that manifest observable patterns amenable to experimental analysis. I thank Cathay Liu for pointing this out to me.

[11] Thanks to two anonymous referees for this journal for pressing me on each of the points that I discuss in the remainder of this section.

[12] Malebranche is perhaps the most famous proponent of this position. See Malebranche 1997: 115–116.

The most important reason to attribute this kind of non-eliminatively reductivist account of bodily causal powers to Boyle is straightforwardly textual. As I have argued in this paper, his texts make best sense if we read them as claiming both that bodies possess causal powers with respect to one another, and that all causal efficacy reduces to God's action. But this leaves unanswered the question of *why* Boyle opts for a non-eliminative version of occasionalism that leaves reductive bodily powers in place, albeit in a rather desiccated condition, rather than an eliminative version that does away with bodily powers entirely. I do not know of any text from Boyle that can provide direct assistance here. Nevertheless, it is reasonable to speculate that Boyle was loath to accept any causal doctrine that would render the physical and experimental hypotheses of the emerging natural sciences straightforwardly false. Although Boyle was willing to accept substantial autonomy for the speculative and experimental branches of philosophy, it is hard to imagine that Boyle would have considered it acceptable to hold that experimentation teaches us nothing, in any sense, about anything other than the will of God.[13]

Conclusion

There can be no doubt that it would be a stretch to say that reductive occasionalism is required by Boyle's texts. And although I think they certainly license it, there can be little doubt that they license other interpretations as well. However, it is clear that Boyle's understanding of God's activity does not allow bodies to have anything recognizably like independent causal efficacy. That is, some kind of occasionalism or near-occasionalism is required by the texts. But there can also be little doubt that Boyle does not mean to claim that there is no sense in which bodies move one another. I think that reductive occasionalism is the best strategy for resolving this tension. Nevertheless, if commentators on Boyle can come to agree merely on the presence of this apparent tension in Boyle's metaphysics and the need to resolve it, this will be an important step forward. For such an agreement would lead toward not only a clearer understanding of where Boyle's views on causation fit in relation to those of the other 17th century mechanists, but also toward a more adequate grip on how Boyle understood God's relationship to material creation.

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[13] On Boyle's treatments of the relationship between experimental and speculative philosophy, see Wojcik 1997.

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