forthcoming in *dialectica*

Mumford, Stephen, and Rani Lill Anjum. 2011. *Getting Causes from Powers*. New York: Oxford University Press.

In her review of a recent collection on mental causation and ontology, Sara Bernstein observes that "Many advocates of more traditional approaches see the powers-based system as operating within its own philosophical universe and making little contact with the existing framework" (2013). Bernstein refrains from endorsing this general impression, but she does lament the apparent lack of contact between powers-based and mainstream metaphysicians, and suggests that the two camps would benefit from mutual engagement. *Getting Causes from Powers*, by Stephen Mumford and Rani Lill Anjum, is a highly creative and systematic treatment of causation from a powers-based perspective. It does little, however, to dispel the isolationist impression noted by Bernstein.

A useful heuristic for understanding Mumford and Anjum's account of causation is to begin with the stance of the standard bearer of neo-Humeanism, David Lewis, and on nearly every sub-issue, think about how one might take the opposite approach. For Lewis, (i) causation is reducible to patterns of counterfactual dependence between spatio-temporally distinct events (or absences), which are themselves reducible to global distributions of point-sized categorical properties (1973).[1] (ii) Dispositions and powers are also reducible to these same patterns of counterfactual dependence but play no direct role in his theories of causation (1997). (iii) Lewis is interested in the notion of *a* cause of an event, not *the* cause, nor the Millian "complete cause". (iv) According to Lewis, causation is transitive, (v) absences can be causes, and (vi) causation is something global, and thus not available to direct, local perception. (vii) Finally, Lewis famously modelled counterfactual, and thus causal, dependence with neuron diagrams.

On each of (i)-(vii), Mumford and Anjum stand opposed. (i) Causation, they say, is *not* a relation between distinct events (or absences) and causes do *not* precede their their effects. Rather, causation is a "process" in which cause and effect are temporally extended and simultaneous with one another, and in which cause "turns into" effect (107, 137). Though many kinds of entities can be

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[1] Lewis's views, particularly on absences, evolved, but in ways that are irrelevant to these contrast (2000, 2004).

"involved in" causal transactions it is only *causal powers*, not objects, states, events, or facts, "doing the work" (1).[2] Effects are brought about by "powers manifesting themselves" and, since all properties are powers, these manifestations are themselves powers, and thus, causation is just "the passing around of powers" (3, 7). (ii) Causal powers are irreducible to counterfactuals, and thus counterfactuals figure nowhere in the account of causation, except as a loose guide to the presence of powers (151). Since the notion of powers is itself causal, Mumford and Anjum do not claim to have a *reductive* account: the project of reducing the causal to the non-causal is, according to them, "a degenerating research programme" that should be abandoned (9). To continue with the anti-Lewis heuristic, (iii) Mumford and Anjum are uninterested in an account of what it is to be *a* cause, instead pursuing a theory of Millian *complete* causes (11). And finally, according to them, causation is (iv) *not* transitive, (v) absences *cannot* be causes, (vi) instances of causation are *local* and *can* be perceived, and (vii) neuron diagrams are misleading and inadequate to the task of modeling causation; they should be replaced with models using vectors to represent powers in a quality space (171, 148, 212, 22). For good measure, Mumford and Anjum take rhetorical aim at a pro-physics bias in metaphysics and they explicitly make room for "strong emergence" in their theory, both of which are not-so-subtle digs at Lewis's reductionist tendencies (17, 105, 215).

The single issue on which an "anti-Lewis" heuristic might lead one astray is the modal strength of the connection between cause and effect. Here Mumford and Anjum part company with some other dispositionalists (and with the rationalist tradition), arguing that causes, no matter how complete, never necessitate their effects, for one could always add an interferer and disrupt the effect: "... any causal process can be counteracted by other powers" (82, 166). Even here, however, they want to insist, against Humeans, that the connection between cause and effect is not *merely* contingent: it is *more* than contingent but *less* than necessary, the hallmark of what they call the "dispositional modality" (175). This dispositional modality, in turn, proves useful in characterizing not only causation, but also normativity and intentionality (186-189).

Among these heterodoxies about causation, the three most central, and striking, are that causes should be modeled with vectors, that causes do not precede their effects, and that causes do not necessitate their effects. In the remainder of this

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[2] Compare Paul (2000).

brief review I shall explore each in turn.

Neuron diagrams, Mumford and Anjum argue, implicitly carry Humean assumptions regarding the distinctness of causal relata, and they result from an attempt to answer the question of what a cause of an event is, rather than *the* Millean complete cause. They cite Pearl (2000) and Hitchcock (2006) as joining their complaint against neuron diagrams, but do not even mention Hitchock and Pearl's own increasingly sophisticated modeling choices, nor provide a rationale for why they are passed over in favor of vectors.[3]

Instead, working from a clean sheet, Mumford and Anjum suggest that we begin with a quality space, of any number of dimensions, where points in that quality space represent momentary (though not instantaneous) states of an object (or system) with respect to the quality or qualities represented, and we represent all of the powers relevant to that object's (or system's) changes with respect to the qualities involved, by vectors pointing in certain direction in the space, and with a length representative of their dispositional strength. The different causal powers involved combine to form a resultant vector, which inclines the object towards a certain motion in that quality space These vectors are not the vectors from math and physics: they have no familiar units; they do not necessarily sum, but often combine in non-linear, primitively emergent fashion; and finally, the resultant vectors are not definitionally tied to changes in the infinitesimal regions around them in the quality space.[4] (Recall also that all properties are powers, so a quality space is really a power space.) Thus, these are "vectors" only in that they have a strength and a direction.

In a simple case, e.g., striking a match, the quality space might be one dimensional: towards lighting in one direction and against lighting on the other. All of the powers conducive to lighting -- the powers of the match, the sandpaper, the force between them, the oxygen, are represented with vectors pointing towards the lighting side, with varying lengths depending on how strongly they tend towards lighting, and any powers in play that tell against lighting, e.g., dampness,

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[3] Representing the complexity of causal transactions is also behind, for instance Jonathan Schaffer's contrastive theory of causation (2005). For a sophisticated defense of neuron-based diagrams, and a critique of structural equations, see Hall (2007). None of the relevant literature on these issues is critically engaged by Mumford and Anjum.

[4] "Any [non-linear] function could be involved: multiplicative, inverse square, or far more complex" (99). Which function is used is a primitive matter, not of law, of which Mumford and Anjum are skeptical, but of the natures of the powers involved.

are represented as vectors that point in the opposite direction, towards not lighting. These vectors are combined -- though not necessarily summed -- to form a resultant, and if that resultant is over a certain threshold for lighting, then the match will light, if nothing else interferes. Even if the resultant is over the threshold for lighting, the lighting does not occur with *necessity*.

In more complex cases, rather than a threshold beyond which an effect occurs, the quality spaces may have a point representing an equilibrium, where the threshold for some effect is a distance from that equilibrium in the quality space. For instance, a plant may die as a result of a certain deviation in either direction from a given level of moisture.

Causes do not, according to Mumford and Anjum, precede their effects. In part, this is because they want to deny action at a temporal distance. But they note that causes could precede effects even if causation were *instantaneous*, and causes were temporally adjacent to their immediate effects (112).[5] What Mumford and Anjum want to argue is that causation is not only *instantaneous* (non-temporally-gappy) but also *simultaneous*. They do so by arguing that, "Causation comes in temporally extended wholes rather than as constructions from changeless discreta" (121). When some sugar is put into water, it starts dissolving without delay, precisely when the relevant powers come together: "The cause takes time to do its work, but the effect coincides with that time entirely" (124).

The simultaneity doctrine is difficult to grasp. The problem can be put in terms of a dichotomy. Either there can be change within a cause or there cannot. Vector diagrams suggest there cannot, for each set of vectors can only represent the state of a system, with respect to a given set of qualities, at one time. Change in a relevant quality would involve changing the lengths of the vectors involved in the diagram, i.e., it would require a vector animation, or a dimension in the diagram for time. Supposing there is no change built into causes, and effects are simultaneous with their causes, then the unfolding of a process is not itself causal: while there is causation *within* each moment, there is no causation *between* moments. Therefore, on this first horn, the resultant vector has nothing, causally, to do with following moments.

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[5] This prohibition rules out, for instance, Schaffer's cases of trumping preemption (2000).

On the other horn, if there *can* be relevant change within a cause, as suggested by some of the rhetoric, and their non-vector diagrams (123, 126) then, first of all, vector diagrams are terribly misleading, for they never represent causes, only states of causes at a time. Secondly, the glue holding together earlier and later states of a causal process turns out not to be causation, but rather, the *identity* of the process involved. For the cause itself extends over the entire change, and thus cannot causally explain the latter part in terms of the earlier parts. This is *not* actually a dispositionalist view, on which earlier and later moments of a process are dispositions manifesting themselves, but rather, what I call elsewhere "macro-Humeanism": processes come as temporal wholes, and what we call causation is an internal relation between earlier and later parts of an ontologically prior, temporally extended whole, which itself can be perfectly Humean (Cross, 2004; Handfield, 2008). In sum, whether or not causes are temporally extended, it is unclear how causes can both be simultaneous with their effects and also *causally* unfold over time.

Mumford and Anjum's claim that causes do not necessitate their effects is also difficult to grasp, especially when their claim is supposed to be compatible with determinism (74-76). The basis of their resistance to the necessitation of effects by causes is that all natural processes can be interfered with (186). Presumably all known physical processes are subject to interference. However, one wonders whether this feature should be built into the metaphysics of causation. The idea of an unstoppable power is not incoherent, and indeed is part of a longstanding theological tradition. Even supposing that all processes can be interrupted, one could always include all of the relevant powers involved in the cause and then also specify that no other powers are present, in which case it would seem the effect must result. Or rather, if the effect is still contingently related to the cause, then interference can be no part of the reason for that contingency. But according to Mumford and Anjum, to rule out interferers would be cheating:

> The lingering temptation in the idea of causal necessitation plausibly comes from … the thought that if only all interfering factors could be isolated and shielded off, then we would have exposed causal necessity. As argued above, however, this cannot possibly do the job hoped of it. Such shielding off only evades the test of necessity, and thus this strategy can never more than assume that a cause necessitates its effect. But such an assumption then starts to look highly implausible. Why does this approach seek to avoid the very test that could convince us of the

necessity of causation? (85)

Mumford and Anjum here simply beg the question against the necessitist. If a cause is thought to include a specification that no other factors are involved, then that cause cannot be interfered with. It is not clear why such a strategy would be "evading" the test for necessity rather than simply passing it.

There is an argument available to Mumford and Anjum that would make their case, and which would have made for a much shorter chapter on necessitation. As noted above, they argue that absences cannot be causes. Presumably any specification of non-interference or completeness would be an absence. Thus, a cause can never include such a specification. Together with the assumption that all processes are subject to interferences, this entails that no cause would ever necessitate its effect.

My review has been largely critical, but this is only because space is limited. Mumford and Anjum's book is brimming with innovation and insight, and it deserves a wide audience. To powers-based theorists, it will no doubt be lauded for its systematic development of a powers-based treatment of a wide range of issues in the metaphysics of causation. To mainstream metaphysicians, it risks being seen as an outlying curiosity. But I recommend the book to both groups, especially to those least inclined towards it, and who have the most to gain by taking up a perspective radically opposed to their own.

Troy Cross
Reed College
troy.cross@gmail.com

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