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Stephen Mumford and Matthew Tugby, eds., *Metaphysics and Science*.
Oxford: Oxford University Press, 2013. ix + 244 pp.

Metaphysics of science, according to Stephen Mumford and Matthew Tugby, is "the metaphysical study of the aspects of reality, such as kindhood, lawhood, causal power, and causation, which impose order on the world and make our scientific disciplines possible . . . and also the study of the metaphysical relationship between the various scientific disciplines" (14). The editors explicitly rule out such studies as the metaphysics of space, for instance, as mere "specific metaphysical debates as they arise within specific scientific sub-disciplines" (6), such as physics in this case. The core of the metaphysics of science, as they insist, consists solely of those Kantian issues of extreme generality that concern the very possibility of science. The editors seem to suggest that the consideration of these points, as a truly *first* philosophy, prior to any scientific work, does not require any detailed competence in actual science. And they appear confident that work on kindhood, lawhood, and the relation among the sciences by the first philosopher will not suffer the embarrassing fate of Kant's a priori pronouncements on the metaphysics of space.¹ It is from the armchair, then, that "core" metaphysicians of science proceed to divine the fundamental order of things. Let us hope, for the sake of this first philosophy, that progress in science will never again force us to abandon our dear pretheoretic conceptions of causation, lawhood, and kindhood.

1. One cannot help but wonder for what convenient reason space and time, unlike causation and kinds, apparently play no role in "imposing order on the world."

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Not only does this conception of philosophy take us back to an era that had yet to enjoy the insights of the various revolutions in twentieth-century science, but the seemingly innocent word ‘impose’ in the editors’ characterization of metaphysics of science manages to exclude half the field. Humeans and non-Humeans agree that in a world without regularity, there could not be science, that is, there could be neither prediction nor explanation of natural phenomena. From this common ground, however, Mumford and Tugby leap to the further—and much stronger—claim that, therefore, the only legitimate concern for the metaphysician of science is what “imposes” this regularity. But to the Humean, the occurrent facts obtaining at our world are not *governed* by the laws—no laws *impose* this order—rather, we must read off the patterns and regularities from these basic facts. As we do this, our attempts to best systematize these facts may require a revision in our metaphysics of particulars, or it may have implications for our metaphysics of properties, or it may interact deeply with the metaphysics of space and time. But the Humean project grounds all this further structure in the patterns and regularities present in our actual world, rather than the other way around. Whether or not the Humean is right about this features among the most important debates in the metaphysics of science, as indeed also evidenced by some of the contributions; if Mumford and Tugby get their way, however, Humeans and their concerns are cordoned off *by definition*.

It is deplorable that the collection starts off with a disappointment for those who take science and Humeanism seriously. It is fortunate, however, that the editors’ outdated and unduly narrow characterization of metaphysics of science has no negative effects on the intrinsic quality of the other nine essays in the collection. I read most of them with enjoyment and gain, so let me briefly discuss them.

Part I collects three essays on laws of nature, by John T. Roberts, Jim Woodward, and Marc Lange. In his thought-provoking contribution, Roberts argues for the heterodox reversal of the explanatory direction between the counterfactual resilience of laws and the counterfactual reliability of legitimate measurement methods: the latter, Roberts contends, explains the former, rather than the other way around. In fact, his “measurability account of laws” conceptualizes laws of nature as just those “general truths that follow from the reliability of the legitimate measurement methods” (34). Roberts maintains that his approach to laws of nature is consistent with either a Humean or a non-Humean understanding of measurement, and can thus be used as an outline to a Humean or a non-Humean view of laws, although he admits that the combination with Humeanism is more natural. Woodward finds the methodological assumptions that he takes to constitute the Best Systems Analysis of laws such as the application of general criteria like simplicity and strength to an altogether non-modal evidential basis remote from the actual practice of science and hence unilluminating, irrelevant, and in fact misguided. Instead, scientific practice is steeped in causal and nomological assumptions that permeate its evidential

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basis with modal commitments and guide interventionist considerations and hypothesis testing. While straightforward Humean responses will blunt much of Woodward's point, he does raise an important challenge to the Humean project. Lange offers an essay on the grounds and role of the Lorentz transformations in physics. A convincing case can be made that these transformations possess a stronger form of necessity than the force laws they constrain. Lange's project is to articulate the modal metaphysics required to appreciate this intermediate necessity between the nomological one engendered by the dynamical force laws and a logical one. To this end, and to thus show how Lorentz transformations can be explained purely by the principle of relativity and the geometry of space-time, and can consequently be considered explanatorily prior to the dynamical laws they govern, Lange applies his own analysis of laws centered on subjunctive conditionals developed elsewhere. His refreshing analysis articulates lawhood in terms of (nonmaximal) stable sets of subnomic truths, such that "strata" of natural laws form a hierarchy of such stable sets determined by set inclusion, resulting in a hierarchy of ever more general laws.

Part 2 comprises two essays by Andreas Hüttemann and Jennifer McKittrick on dispositions and causation. Hüttemann offers a process theory of causation based on dispositions that he claims shows how physics accommodates at least a near relative of causation and solves what he considers the fundamental problem of causation, namely, the tension between a scientific image that portrays fundamental physics as being free of causation on the one hand, and a manifest image and the special sciences that are steeped in causal notions on the other. He argues that if we endow physical systems with dispositions, not only can we ground laws and causation, but we obtain the best explanation of compound systems and their parts. On this view, causes are seen as that which make a system deviate from its default behavior governed by the dispositions we ascribe to it. As causes are defined relative to a "causal field," and as causal fields are further characterized pragmatically, this analysis makes causation and its presence in physics an ultimately subjective matter, as Hüttemann readily admits. McKittrick contributes an essay addressing the nature of activation events of dispositions and their relation to the dispositions they activate. She is particularly concerned with how the "pandispositionalist" can or cannot avoid a vicious regress without conceding a basis of categorical properties; the regress, she argues, can be avoided only if the pandispositionalist accepts "constantly manifesting" dispositions that trigger the dormant dispositions. To my mind, this will at best secure a Pyrrhic victory for the pandispositionalist: these dispositions look awfully like categorical properties. As an exercise in purely analytic metaphysics, and although as such carefully argued, I found her essay rather stale. It remains disconnected from science and concerns as they arise in its philosophical reflection.

Natural kinds are the topic of part 3, which contains contributions by Helen Beebe, Emma Tobin, and L. A. Paul. Beebe starts out from the recognition that the special sciences in particular employ messy kind concepts that

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suffer from “intrataxonomic,” “intertaxonomic,” and “interparadigm crosscutting” and argues that there is nothing in Kripke-Putnam semantics that is incompatible with such crisscrossing. Contrary to popular belief, Kripke-Putnam semantics does not require a natural kind essentialism according to which natural kinds exist in the sense of the metaphysical realist but only a “shallow essentialism,” in terms she borrows from Paul, according to which claims involving essences are legitimate but do not entail that these essences are had in any absolute, mind- or theory-independent way. While I was not myself convinced that Kripke in particular would have thought his semantics separable from “deep” essentialism, I was intrigued by Beebe’s very sensible, though somewhat idiosyncratic, naturalistic take on how we ought to parse out the metaphysical commitments of Kripke-Putnam semantics. In her essay, Tobin argues that given a distinction between natural and nonnatural properties, we do not need to hypostatize natural kinds on top; in particular, we do not need an additional ontological distinction between natural properties and natural kinds. Although the argument is carefully worked out and the article well written, this reader could not get himself excited about an argument to a conclusion he found altogether unsurprising; but mind you, perhaps this was entirely due to Tobin’s convincing case for it. Paul considers Putnam’s model-theoretic argument, which allegedly saddles the semantic realist with radical indeterminacy of reference. She deems Lewis’s well-known response incomplete, while nevertheless accepting that he offers a constitutive account of determinate reference that generally succeeds in showing how an ideal theory can be false. The reason for this incompleteness stems from the possibility that there may exist a permutation of the natural properties of the world into itself that preserves maximal naturalness and satisfaction of the assertions of the theory. This is possible if there exist isomorphic models for the syntactically same theory. Since the world might have turned out to be sufficiently symmetric to permit the required permutation, Paul concludes that the determinacy of reference must remain a contingent matter. While her idea offers a neat test of how theories refer to the world they seek to describe and the metaphysical commitments that accompany them, I remain much less moved by the permutation worry than Paul. The existence of numerically distinct but isomorphic models entails commitments an opponent might eschew—particularly if he or she thought that the models and attendant notions of isomorphism and transmodel identity are not prior to, and independent of, the theory.

The fourth and last part contains but one paper—Jessica Wilson’s essay. It deals with emergence, and is thus also the only contribution concerned with the relation between sciences. Wilson’s concern is the “mutual bearing of non-linearity and metaphysical emergence” (201). To this end, she distinguishes between a strong and a weak form of emergence, where the latter is designed to capture a notion of emergence acceptable to the physicalist. Earlier forms of emergentism maintained—and were in fact strongly motivated by the belief—

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that nonlinear phenomena alone were sufficient for strong emergence and hence for a rejection of physicalism. As Wilson convincingly contends, this would commit the physicalist to an unnecessarily narrow position. So the paper attempts to identify the appropriate sense in which nonlinearity at a higher level is irreducible to a lower level. To this end, she invokes her earlier account of weak metaphysical emergence based on the notion of degrees of freedom of a physical system. The general idea is that if a composite, higher-level system does not have the full range of degrees of freedom one would expect from the degrees of freedom of the lower-level, composing entities, but is instead constrained, then we have a case of weak emergence. This account has the virtue of offering a criterion of emergence that articulates a form of ontological autonomy acceptable to the physicalist. While I found much stimulating material in Wilson's excellent paper, it must be noted that this sense of emergence is very weak indeed: in fact, pretty much all composite systems qualify!

Despite the fact that the only essay in the collection that addresses what the collection's title suggests, namely, the relation between science and metaphysics, is the underwhelming introduction, there is much food for thought in the remaining nine essays by the stellar group of contributors that the editors managed to assemble.

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Philip Pettit, *On the People's Terms: A Republican Theory and Model of Democracy*. Cambridge: Cambridge University Press, 2012. xii + 338 pp.

Are law and freedom inevitably in tension with each or reconcilable? It is this old question of political philosophy that Philip Pettit sets about to answer in his *On the People's Terms (OTPT)*. In this book, the author presents a theory of republican democracy based on freedom as nondomination (FND) as a core standard of legitimacy. In doing so, Pettit's book joins a movement in political theory that has been labeled as "republican revival." Generally, this revival is characterized by taking recourse to a particular strand in the history of political ideas in the attempt to get inspirations and conceptions that can help to develop a normatively convincing alternative to liberalism. The term *republicanism* covers a number of quite heterogeneous approaches ranging from neo-Aristotelian models focusing on an orientation toward a supposed common good and the civic