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SCIENTIFIC COMPOSITION AND METAPHYSICAL GROUND

KENNETH AIZAWA AND CARL GILLETT

Reviewed by Michael Bertrand

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Kenneth Aizawa and Carl Gillett (*eds*)

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Scientific Composition and Metaphysical Ground is composed of ten essays concerning broadly compositional relations in science, and many of its contributors are familiar for having played significant roles in shaping our current understanding of these relations. Though ostensibly about level-connecting relations, this volume is an attempt to usher in a new paradigm governing work in the area. The old order featured a cluster of disparate groups working in isolation from each other and, too often, in isolation from the detailed investigations of the phenomena they aim to capture. The new order is characterized by deep engagement between these formerly isolated debates, as well as with the instances of scientific composition and compositional explanation that participants try to account for. Reflecting this aim, chapters are drawn from a workshop that took place in 2015 at Rutgers University, organized to encourage engagement between authors working in philosophy of science, philosophy of mind, and analytic metaphysics. Though the volume is very ambitious, many of its chapters offer useful first steps towards this engagement and, in its best moments, significant reflection concerning the foundations of particular frameworks.

Work on scientific composition has come from three camps. One neo-causal or new-mechanist strand descends from attempts to understand scientific explanations, drawn primarily from biology, that explain higher-level processes or entities in terms of the lower-level ones that make them up. For example, we might explain why the heart muscle beats as it does in terms of muscle fibres being stimulated by electrical impulses from the sinoatrial node. The driving idea of these neo-causal accounts is to repurpose tools developed for causation—for example, intervention and manipulation—in order to provide sufficient conditions for scientific composition. Another strand, the Grounding debate in analytic metaphysics, originates with concern for more general relationships between fundamental and non-fundamental features of the world. The primitive notion of metaphysical Ground serves as the level-connector (or genus of level-connecting relations) wherever these relations appear, including in science. Both of these strands share a common ancestor in early work on functionalism in the philosophy of mind. Neo-functionalism views form a third strand, which posits its own level-connecting relation in the form of realization relations holding between causally individuated entities. In the spirit of engagement, brief overviews of these positions, their similarities, and their differences are provided by the editors in their introduction.

Several essays in the volume take on the project of engagement directly by making explicit attempts to relate work on scientific composition (which is at least potentially distinct from material composition) with work on Grounding. The editors, Kenneth Aizawa and Carl Gillett, begin this task in their introduction, which provides a useful methodological roadmap charting the dialectical shift they hope to initiate. Aizawa and Gillett claim that different ways of understanding vertical relations, termed V-frameworks, often attempt to answer the same explanatory questions and offer at least partially overlapping relations in order to do so. It's because of this that engagement is so important. V-frameworks developed in isolation ignore their philosophical rivals. In light of this competition, a new methodological paradigm is suggested. By its lights, V-frameworks can only be justified if they can be shown to be superior to their rivals, wherever they might be found. The primary focus of these frameworks ought to be on the conception of vertical relations deployed in successful explanations, the idea being that successful explanations contain concepts that track the world.

Aizawa continues this work in his own chapter by offering up dimensioned realization, a tool developed by neo-functionalists, as a friendly addition to the toolboxes used by new mechanists and Grounding theorists. The dimensioned view of realization attempts to characterize the vertical relation that backs explanations of a property had by a whole in terms of the properties of its parts. These explanations are non-causal and make crucial appeals to properties (rather than processes or activities). As a result, they resist neo-causal treatments but can supplement them provided neo-causal theorists expand their ontology to include properties. Aizawa claims that these explanations have been largely overlooked by Grounding theorists as well. This is not true of all Grounding theorists; however, Aizawa's underlying point is a valuable one. If Grounding is to be extended to cover compositional explanations in science (and, I think, even if it isn't), Grounders need to accommodate or explain away familiar principles of good scientific explanation. In order to be illuminating, Grounding explanations of higher level properties ought to appeal to Grounds that are qualitatively distinct from the property being explained. This requires going beyond bare Grounding claims, a theme that also emerges in contributions by Jessica Wilson and Jonathan Schaffer. It also requires explicit consideration of explanatory goodness, something that has so far been missing from the metaphysical explanation literature.

Jens Harbecke's contribution continues the theme of direct engagement by comparing and contrasting the notion of mechanistic constitution, developed in neo-causal accounts, and material constitution, a fixture of the Grounding debate. Despite some similarities, mechanistic and material constitution are clearly different, most importantly because they lie in different ontologies. Material constitution presupposes an ontology featuring material objects, while mechanistic composition has its home in an ontology of space-time regions and mechanistic types (roughly, types of activities). Harbecke offers a friendly suggestion to fans of material constitution that might allow them to avoid problems often associated with it: adopt the mechanistic type ontology and endorse object eliminativism, the

view that objects are projections on mechanisms that persist over time. While I doubt that this suggestion will be welcomed by fans of material constitution (mechanistic types strike me as a dark ontological category), object eliminativism is a novel and interesting view that deserves consideration. It's an example of the fruits that engagement might provide.

Gillett's own chapter also belongs in the direct engagement category. In it, he argues that no existing framework adequately characterizes compositional explanations in science. This fault stems from the appropriational strategy the frameworks adopt, whereby old tools are repurposed to capture compositional explanation. As a remedy, Gillett offers a three-part strategy of engagement and sketches a properly engaged account in terms of working components and joint-filling roles: roughly, functional roles (that is, the neuron role or action potential role) filled by teams of lower-level components. I have some concerns about Gillett's engagement strategy. Its principal virtue is that it requires detailed investigation of the compositional explanations in science that these accounts are trying to explain. However, by requiring this investigation to come first, Gillett rules out by fiat accounts that proceed from the top down, developing their initial framework under which particular cases are then subsumed. Gillett's engagement also risks granting too much authority to scientists concerning the ontology and function of compositional explanations. Engaged views must be very careful to avoid building theories on the basis of unrepresentative examples. Nonetheless, it is undeniable that careful engagement with particular cases is urgently needed in existing accounts.

Rather than engaging directly with the frameworks of others, many of the standout essays in this collection offer interesting methodological reflections on and critiques of their home frameworks. L. R. Franklin-Hall's excellent chapter argues that the constraints imposed by new mechanist accounts do not successfully rule out unexplanatory mechanical models as intended. Three errors are diagnosed and every existing attempt fails to sufficiently avoid them. As a result, the mechanistic explanatory account is 'a story half-told'. Though not welcome news to the new mechanist, it is now clear what work remains to be done and what is required in order to do it successfully.

Also belonging to this group is the compelling debate between Jessica Wilson and Jonathan Schaffer, which is continued in back-to-back chapters. Schaffer offers a response to Wilson's earlier critique of Grounding (Wilson [2014]). His chapter distills a pair of lessons from Wilson's argument concerning how the Grounding debate should unfold. An account of Grounding needs to do more than just offer bare Grounding claims of the form 'x Grounds y'. It must also be capable of providing information about the character of the Grounding connection by making precise how this connection runs. In order to demonstrate that Grounding is helpful, we ought to embed it in a formalism that makes Grounding connections precise and outfits it with unified rules so as to reveal the illuminating generalizations it supports. Schaffer's main contention is that we can learn Wilson's lessons by embedding Grounding in the structural equation models that are familiar from the causation literature, an added benefit being that we have precisely the same evidence for a unified notion of Grounding as for a unified notion of causation.

Wilson's response identifies two arguments made in favour of positing Grounding relations over and above widely accepted small-g grounding notions like composition. The unity argument claims that Grounding unifies grounding relations and reveals those important features they have in common. The priority argument claims that Grounding is required in order to fix the direction of priority of small-g relations (that is, fix that wholes depend on their parts and not vice versa). Wilson has two primary aims: identify and dispute every premise of Schaffer's unity argument, and defend her priority-fixing notion of fundamentality in light of Schaffer's charge that it fails to learn the lessons of her earlier work. The debate between Wilson and Schaffer is interesting on its own terms, but is even more valuable to the Grounding literature for the implicit methodological reflection that it contains. Schaffer sees structural equations as the way forward for precisely illuminating the inter-level connections that Grounding forges. Wilson argues that formal unification in these terms is not clearly diagnostic of a unified phenomenon and that (in

line with work by Katherine Koslicki ([2015]) structural equations are not well suited to modelling some relations in the alleged genus of Grounding. This is a debate about the way in which future work on inter-level relations in metaphysics should proceed: Schaffer claims that Wilson's primitive notion of fundamentality is incapable of fixing the direction of priority (in at least some cases); Wilson appeals to standard metaphysical methodology in response, presuppositions of which she takes herself to be making explicit. I am uncertain that there is such a thing as standard metaphysical methodology. However, we should welcome this opportunity to clarify the methodological questions that Wilson has brought out into the open, particularly those concerning whether directions of priority must be fixed independently or whether we can build them in by hand.

The remaining chapters in the collection concern the particular applications of various V-frameworks to the formulation of physicalism. Derk Pereboom defends his earlier adoption of a fundamental 'made up of' relation in order to account for the relationship between the mental and the physical. The resulting view is anti-reductionist while retaining its physicalist character. Andrew Melnyk's chapter offers a compelling argument supporting caution toward Grounding-based formulations of physicalism. He argues that Grounding is not capable of doing the job that's required of it: it can't guarantee that Grounded entities are nothing over and above their narrowly physical Grounds. Furthermore, Grounding is dispensable: its work can be done by dimensioned realization, and it is not clearly physical in the way physicalism seems to require.

Alyssa Ney's excellent paper is in some ways a response to Melnyk's concerns. It defends a role for Grounding understood not as a sort of generative relation, but as a way of distinguishing between those propositions that describe the intrinsic nature of reality and those that, though true, do not. While some sentences fail to track reality's structure, they may nonetheless be true in virtue of having an explanatory basis in sentences that do. Finean Grounding is useful for accommodating a certain kind of non-sceptical anti-realism, can enfold canonical views in the metaphysics of mind, and can help to explain the relationship between fundamental physics and the special sciences. As a result, Ney carves out a distinct role for Grounding in the formulation of physicalism that is apparently immune to concerns like Melnyk's. Ney's application of the Finean view is both wonderfully clear and urgently needed. Fine's account looms large in the Grounding literature but is largely absent from debates about the formulation of physicalism.

In sum, this collection is a welcome addition to the literature on vertical relations in science and it sets the stage for a more engaged and methodologically sophisticated future. *Scientific Composition and Metaphysical Ground* is important reading for those working on vertical relations, whether in the philosophy of science, metaphysics, or philosophy of mind, and is likely to be useful in other areas of philosophy as well.

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