BOOK REVIEW

Is really something wrong with microphysicalism?

Andreas Hüttemann: *What's Wrong With Microphysicalism?* Routledge, London, New York, 2004. 152 pages, Hardcover, ISBN 0-415-32794-6, EUR 93,90.

'Microphysicalism' is the doctrine that whole objects behave the way they do in virtue of the behaviour of their constituent parts. Among the different varieties of physicalism, microphysicalism is presumably still the predominant version with a long philosophical and scientific heritage. Andreas Hüttemann has written a blissfully short and concise monography in which he critically examines and challenges the validity of this view. The provocative title "*What's Wrong With Microphysicalism?*" already indicates that the author has some caveats, however, the focus turns out as remarkably different compared to the usual way of presenting the topic. Let me say from the outset that I very much like Hüttemann's exposition of the subject matter. And this is not only because of the pleasant brevity of the book (though this is of course a good reason, too). The book is pretty much up to the point and the author's line of argument is refreshingly straightforward and quite well to comprehend. In the following exposition, emphasis is put on the crucial chapters of the book, chapters 1, 3, 5, and 8 – those, which are a must for any interested reader.

Microphysicalists affirm to an ontological priority of the micro level. More precisely, and according to Hüttemann's introduction to the subject matter in the first chapter, this affirmation can be spelled out in at least three different ways:

1. Micro-determination: the thesis that the behaviour of the properties of compounds is determined by the behaviour of the properties of the parts or constituents,
2. Micro-government: the thesis that micro-level laws govern the system on the macro-level,
3. Micro-causation: the thesis that all causation is fundamental causation, i.e. the view that a micro-reduction to the bottom level is possible.

Hüttemann argues that the main reason, which makes microphysicalism such an attractive ontological view, is the success of *mirco-explanation*, hence, the idea that we can explain macro-properties on the basis of micro-properties. Therefore, a more detailed account of what micro-explanations consist in is in order, and this, after some general remarks on laws of nature in chapter 2, is what the author undertakes in the central chapter 3 of the book.

Hüttemann starts from a two-fold distinction. On the one hand we can either be interested in the *states* of a physical system, i.e. the values of the system's varying quantities at a particular time, or we can be interested in the *laws* that pertain to the system. This, the distinction between micro-explanations of states and laws, is the first

distinction to consider. We can, on the other hand, also be interested in explaining either a macro-property in terms of a micro-property or in explaining a compound in terms of its constituents. This is the second distinction. It is a distinction between explaining the relation between two properties (or kinds of behaviours) of one system as opposed to explaining the relation between parts and wholes. The first kind is the often considered case of explaining thermodynamic gas properties in terms of statistical mechanics, or of explaining mental properties like pain in terms of neurophysiological properties like C-fiber firing. This leads to the whole issue of Nagel reduction and property identities in terms of bridge principles, and also whether and which kinds of supervenience relations between macro and micro level properties hold. Hüttemann addresses to this distinction also in terms of a distinction between two variants of physicalism: identity-physicalism and part-whole physicalism which he seems to consider as micro-physicalism proper. In any case, it is micro-physicalism understood as part-whole physicalism which Hüttemann focuses on.

To sum up: we may altogether distinguish between four kinds of micro-explanation:

1. Micro-explanations concerning the lawful behaviour of a macro property in terms of a micro property of the same system,
2. Micro-explanations concerning a determinate macro state in terms of a micro state of the same system,
3. Micro-explanations concerning the lawful behaviour of a compound in terms of its parts,
4. Micro-explanations concerning the determinate compound state in terms of the state of its parts.

Consider Hüttemann's example of iron and its ferromagnetic property to explicate these distinctions: According to the first kind of micro-explanation or micro-explanation (1), the laws that characterise the magnetisation of a piece of iron, a macro-property, can be explained in terms of the laws of the Weiss-domains, a property of the iron micro-structure. It is furthermore possible to explain why a piece of iron is in a particular state of magnetisation because there is a determinate underlying state of the domain walls. This is the second kind of micro-explanation, micro-explanation (2), where the state of a system is explained in terms of another state of the same system. Next, we may consider the relation between the Weiss domain micro structure and the single iron atoms (as, for instance, in the Heisenberg-Ising model). This is micro-explanation (3), where the lawful behaviour of the compound is considered in terms of its parts as opposed to micro-explanation (4), where the determinate domain wall configuration, i.e. a determinate compound state, is explained in terms of the determinate atom interactions, i.e. the state of the parts.

It is an immediate and interesting consequence of Hüttemann's refined analysis that well-known cases of a failure of micro-explanation present themselves in a somewhat different light. It is a widely regarded fact that the case of entanglement in quantum mechanics provides a serious threat to part-whole-supervenience. In fact, according to quantum superposition the state properties of a compound quantum system do not supervene on the state properties of the parts, simply because the states of the parts, in

general, fail to possess determinate state values. Within Hüttemann's taxonomy, this is a *failure of micro-explanations (4)* pertaining the explanation of *states* of compound systems. But what about the *lawful behaviour* of the compound in terms of its parts? Do we have in quantum mechanics a failure of micro-explanations (3) as well? As Hüttemann points out, this is not the case - indeed (and perhaps astonishingly) neither in classical nor in quantum mechanics. The reason for this is that there is a clear recipe how the descriptions of the behaviour of the compound can be gained from the description of the parts. This recipe, according to Hüttemann, is essentially given by the particular *laws of composition*. In classical mechanics, for instance, in order to describe the lawful behaviour of two interacting systems, one has to build the direct sum of the phase spaces of the single systems. The full description of the dynamics is then given by a Hamilton function which is the sum of the kinetic single system Hamiltonians and the special interaction Hamiltonian. The same way of constructing the Hamiltonian holds in quantum mechanics, with the crucial difference, however, that unlike classical mechanics the law of composition now demands the Hamiltonian to act on the tensor product of the single system Hilbert spaces. Hence, the decisive difference between classical and quantum mechanics lies in the mathematical state space structure – the transition from phase spaces with Cartesian product structure to Hilbert spaces with tensor product structure. Nevertheless, in both cases we have a straightforward law of composition, from which, in turn, the lawful behaviour of the compound can be micro-explained from the laws of the parts.

So what is really at issue regarding microphysicalism? This is Hüttemann's question in chapter 4. He points out that a *mere identification* of macro and micro properties, for instance in terms of a psychophysical identity theory, would be, even if true, of almost no insightful philosophical consequences, since such an identification by itself doesn't tell us whether it is the micro parts of a compound system that do the relevant causal work or not. So it is part-whole physicalism that is really at stake rather than identity physicalism – in contrast to the major habit in debates about reductionism in the philosophy of mind! For this reason, Hüttemann exclusively focuses for the remainder of his book on micro-explanations (3). And he does that by taking up the three important readings of the microphysicalist thesis - micro-determination, micro-government, and micro-causation – in the subsequent chapters 5, 6 and 7.

Let us just focus on micro-determination, the thesis that the behaviour of the properties of compounds is determined by the behaviour of the properties of the parts, but not vice versa. It is important to note the asymmetry between macro and micro here. Ontologically speaking, this can be thought of as a hegemony of the micro-level. The micro-explanatory success can be made understandable by assuming an `explanatory realism', as Jaegwon Kim has dubbed it. Microphysicalists, sometimes perhaps tacitly, subscribe to the view that "*the direction of explanation recapitulates the direction of determination*" (Klee 1984, as quoted by Hüttemann, p. 71). Hence, in order to establish the microphysicalist view on the basis of micro-explanations (3), we have to single out an underlying determination relation from the micro to the macro level. It is now central to Hüttemann's line of argument that such a unidirectional determination

relation cannot be obtained. To show this, he draws on a well-known problem in connection with accounts of explanation in the philosophy of science. Since the days of Hempel it is a widely known fact that the DN-approach to explanation suffers, inter alia, from cases where there seems to be a symmetry between explanans and explanandum. For instance, in the ideal gas law, which states that the product of pressure and volume is proportional to temperature, the values of any two of the three state quantities determines the third one. So there is no unique and hegemonic but rather a mutual determination between the three quantities. Indeed, the determination relation seems to be seriously underdetermined.

This lesson takes over to part-whole descriptions. Take again the case of a two-particle system in physics (with no interactions). The Hamiltonian is $H = H_1 + H_2$. In the same sense as H_1 and H_2, the Hamiltonians of the parts, determine H, the Hamiltonian of the compound, H_1 is determined by H and H_2 due to $H_1 = H - H_2$. The same holds for H_2 and may of course be generalized to any n-particle Hamiltonian with the upshot that, as Hüttemann puts it (p. 81), "*we have an argument for the claim that parts and whole in physics determine each other mutually. The success of micro-explanation (3) does not only fail to provide evidence for micro-determination, it provides evidence for the falsity of micro-determination.*"

And this is exactly what is, according to Hüttemann, wrong with microphysicalism! After dismissing micro-government and micro-causation in basically the same manner as he dismissed micro-determination, Hüttemann ends up in his last chapter 8 with his own physicalist account which he dubs as "*pragmatic pluralism*". This view is suited to deal with the picture of a multilayered reality, where there is, on the one hand, no ontic hegemony of one of the layers, but which, on the other hand, is still physicalist in the sense that it sticks with an "*ontological unity of nature*". These two views are usually considered to exclude each other, but Hüttemann points out that this is only due to the usual microphysicalist prejudice. On his own view, parts and whole determine each other mutually, clearly without any hegemony, but nevertheless they *do* determine each other. This latter fact gives rise to a unitary ontological picture. It is a unity without fundamentalism. It may perhaps be established by our ongoing concerns to make our various conceptions of the world, on the various layers and from the perspectives of the various special sciences, more and more coherent.

So far Hüttemann's own philosophical story. It's time for me to mention at least one of my major concerns with his provocative and stimulating way of arguing. The failure of micro-determination, as the author has pointed out, is mainly due to the fact that we cannot set up a unique determination relation in nature. And here is exactly where my qualms lie. It is a well-known counter-objection already to the symmetry-objection of explanans and explanandum in the DN-approach of explanation that causality is the most plausible candidate to establish the desperately needed asymmetry. Whether this suits with the logic of the DN-schema is of no concern here, but it should bother Hüttemann. In fact, he addresses the issue ever so briefly on pages 82 to 85, but ends up with the conclusion that causality plays no role in our part-whole descriptions. This, I think, is

wrong. It is perhaps not only for the sake of brevity that Hüttemann discusses the case of an n-particle system "*in the absence of interactions*" (p. 79). Strictly speaking, the case of $H = H_1 + H_2 + \ldots + H_n$ with mere kinetic Hamiltonians H_i is a non-starter, for there are no non-interacting, truly isolated subsystems in the world (how should we ever observe them?). As Hüttemann rightly points out in chapter 3 (p. 34-35), "*…a compound system's behaviour is micro-explainable if it is - at least in principle - possible to deduce (to explain) the behaviour of the compound on the basis of*

1) *general laws concerning the behaviour of the components considered in isolation*
2) *general laws of composition and*
3) *general laws of interaction.*"

His core anti-micro-determinist argument is then based on (2), the logic of the laws of composition only. But what about (3)? One must keep in mind that the exposition of laws of composition is a purely formal business. Whether two systems really mould into a compound, is, however, based on real physical processes, i.e. on interactions. To be sure, the whole separation of (1), (2) and (3) doesn't reflect reality, for there aren't components in isolation, hence (1) and (2) are idealizations, and (3) cannot be separated from them.

To illustrate this, take the case of quantum entanglement. It is not sufficient to form the tensor product space out of the single system state spaces in order to have entangled states of the whole, what one needs is a real interaction taking place between the two systems. This holds in classical physics as well. It is a peculiarity of quantum mechanics that this entanglement, once set up, cannot be reversed. This is in a sense the whole fuzz about the measurement problem. Even if the measurement interaction between system and apparatus turns down, the correlations between the two, formerly separated subsystems persist and cannot be destroyed by some unitary process (decoherence, therefore, only works "FAPP" – for all practical purposes). But be it as it may in quantum mechanics, the general lesson is that no argument about an ontological determination relation can be gained from considering laws of composition (2) alone. I maintain that it is the particular causal interaction process which takes place in forming wholes out of the parts that should be considered as the sought determination relation. And since the distinction between (1), (2) and (3) is an idealization only, the interaction (3) cannot be omitted from any refined micro-explanation of the behaviour of parts and wholes. Interaction is a crucial part of composition.

A second objection must also be raised – an objection Hüttemann doesn't even mention. Consider a wall made out of ten bricks. For Hüttemann the description of the wall just given and the description of one particular brick made out of the whole wall minus the remaining nine bricks are, ontologically speaking, on a par. However, while the former introduces only one lower level kind – bricks -, the second description introduces two – walls and bricks. Hence, Occam's razor cuts in favour of the first, microphysical description. In fact, I believe that this argument from ontological parsimony is the one which, at least tacitely, guides most of our intuitions. Of course Occam's principle might be wrong and one has to argue for its plausibility. As a principle which simplifies our

explanations and therefore contributes to their success, however, it stays unchallenged. In any case, I would have liked to hear a bit more about the two objections in Hüttemann's discussion.

But setting my own critical concerns aside, I like to finish this review with a resumption of one of my introductory remarks: I, nevertheless, very much like Hüttemann's exposition of the subject matter. "*What's Wrong With Microphysicalism?*" is a fresh and certainly original contribution to central issues in contemporary philosophy of science, philosophy of mind and metaphysics. Whether it is already the last word to the complex issue of microphysicalism or not, the reader must find out by herself.

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