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## Molecule-for-Molecule Duplication

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RESUMEN

¿Es un *duplicado D*, idéntico molécula por molécula a otra entidad, siempre un duplicado perfecto? En concreto, ¿es D un ser consciente si lo es el original? Estas preguntas resumen una herramienta de diagnóstico usada por algunos metafísicos, y puesta al servicio de una forma de dualismo que supuestamente apoya una ciencia autónoma de la conciencia. En este artículo se argumenta que esta herramienta no sirve cuando se la usa como un ejercicio de experimento conceptual puro, con el fin de extraer datos o juicios de la intuición. El problema es que la intuición sólo puede presentar como “duplicado” aquello que ha sido puesto en el sujeto de la intuición por la experiencia u otros conocimientos (quizás a través de métodos dogmáticos). Sin embargo, en lugar de decepcionar las aspiraciones de una ciencia autónoma, el argumento de este artículo iluminará sus mejores apoyos metafísicos.

ABSTRACT

Is a molecule-for-molecule *duplicate D* of some entity always a perfect duplicate of it? And in particular: is D a being with consciousness if its original is? These questions summarize a certain diagnostic tool used by metaphysicians, and prominently used in service of a form of dualism that is supposed to support an autonomous science of consciousness. This essay argues that this diagnostic tool is inapt when the exercise is performed as a pure thought experiment, for the sake of eliciting data or judgment from intuition. The trouble is that intuition can render for a “duplicate” only what experience or other learning (perhaps via dogmatic methods) has instilled in the intuiiter. But rather than disappoint the aspirations of an autonomous science, the argument of this essay will instead illuminate its better metaphysical supports.

There is a diagnostic tool familiar to metaphysicians. It is a kind of thought experiment, designed to discern whether two features/characters /properties (or, more generally, classes of features/characters /properties) P and Q, must fall together by some sort of necessity. The thought experimenter seeks to ascertain whether it is possible to “make” (in some sense that will be discussed in further depth here) an entity that has the one — say P — but not the other. This familiar diagnostic is applied ubiquitously, but no-

where more earnestly or with more confidence in its results, than on the matter of physicalism, according to which everything is physical, or as contemporary philosophers sometimes put it, everything *supervenies* on the physical.

The thought experiment I will be discussing involves duplicating (through some imaginative process) an entity's P-characteristics, and determining whether in the process one has duplicated its Q-characteristics — for free, as it were. The entity generated in the process is often referred to as the *molecule-for-molecule duplicate*. I will therefore refer to this thought-experimental move as the *molecule-for-molecule (MFM) gambit*. The gambit is utilized prominently by David Chalmers in service of a dualism that would undergird the study of consciousness as an autonomous science.

I will be arguing that the MFM gambit fails in its diagnostic ambitions. That, in other words, it cannot play any theoretical role in making substantive discriminations. The whole trouble lies with the conception of duplication, and has nothing whatever to do with the character of the higher-order features — the purportedly non-physical features whose independence the gambit seeks to establish.

#### I. THE MFM GAMBIT

A prominent execution of the MFM gambit is performed by David Chalmers (1996), reviving Keith Campbell's (1970) conception of an "imitation man", elsewhere and more recently referred to as a "zombie".<sup>1</sup> Chalmers is a self-described dualist, concerned with preserving *qualia* as an arena of the non-physical. He is convinced that, in contemporary terms, not everything supervenes on the physical, and in particular not conscious phenomena such as *qualia*. To advance this thesis, he appeals to the possibility of a zombie, which, as he tells us, is a "molecule by molecule duplicate of a sentient creature" differing only by lacking all phenomenal consciousness — an exact physical and functional duplicate. Michael Tye offers the following characterization of the imitation man:

Whatever physical stimulus is applied, [my molecule by molecule duplicate] will process the stimulus in the same way as I do, and produce exactly the same behavioral responses. [...] Indeed, on the assumption that non-phenomenal psychological states are functional states (that is, states definable in terms of their role or function in mediating between stimuli and behavior), my zombie twin has just the same beliefs, thoughts, and desires as I do. [...] He differs from me only with respect to experience. For him, there is nothing it is like to stare at the waves or to sip wine [Tye (1995), pp. 22-3].

This “imitation” move, purportedly anti-reductionistic, involves asserting this thesis:

(Anti-R) A molecule-for-molecule duplicate of S, is a duplicate of S in all but H respects.

The move is supposed to prevent collapse into:

(R) A molecule-for-molecule duplicate of S, is a duplicate of S *simpliciter*,

by adopting instead

(MFM) A molecule-for-molecule duplicate of S, is a duplicate of S in all its physical aspects.

This is, after all, what molecule-for-molecule duplicates are supposed to be.

But there is a substantive problem with the analysis. If it turns out that duplicating S “molecule-for-molecule” doesn’t even duplicate its physical aspects—in other words, if MFM is strictly false—then the following might be true after all:

(T) A duplicate of S in all its physical aspects is a duplicate of S *simpliciter*.

If T is not ruled out, then physicalism, as such, is not ruled out. But the physicalism that would result is a less problematic one for the self-described dualist, because a physicalism of this sort would be one in which the so-called *higher* (H) strata are in no way inferior to — indeed, in no way different from — the so-called *lower*, physical strata. The higher-order maintains a full-blooded causal reality, but turns out to be physical like everything else. Such a physicalism can give Chalmers everything he needs, and indeed can put his project of studying consciousness on exactly the same footing as any other scientific enterprise—something that is unavailable if only (MFM) were true.

And so everything hangs on MFM’s truth, which has never been put under the microscope by metaphysicians, but which we shall examine here.

## II. MFM BROKEN DOWN

What is a molecule-for-molecule duplicate of S? The rhetoric of molecules suggests that an MFM duplicate is a duplicate of S in all microphysical aspects. And so the question becomes: is a duplicate of S in all microphysical aspects also a duplicate of S in all macro (albeit still merely physical) aspects?

This is no trivial matter, metaphysicians' intuitions notwithstanding. There are two major and fundamental points of concern. The first (and lesser) is that there is no clarity on the matter of whether at issue for duplication is micro aspects of S at one instant of time only, or micro aspects of S for an interval of time, possibly open-ended. I will put this (lesser) point to one side.

The second and more profound worry, having bearing on the first but of more consequence, is that there is no care in the use of the concept of duplication: what could duplication in this context amount to? Could it mean repeating the history of the universe (in micro and possibly also macro aspects) up until that point in time (after all, such a performance must perforce count as a duplication of S's micro aspects)? There can be no doubt that doing so would produce a duplicate of S, indeed a duplicate in absolutely all its aspects. But it has to be admitted that duplication in that way is in no way diagnostic of the issues at hand.

There is a great deal more to working out what a molecule-for-molecule duplicate could be like, and how it might be wrought. We will examine two roads to the explication of duplication. The first involves the standard philosophical exercise of intuition or imagination, and the second and more promising involves looking at duplication as a natural process governed by natural laws.

### III. EXERCISING THE MODAL IMAGINATION

The first and most familiar road to working out a clearer account of duplication is the idea of a philosophical thought experiment. We simply *imagine* a duplicate of S in its *current* micro aspects — where the work of imagining is confined to imagining micro aspects only — wrought as it were by a philosophical thought magic. And we ask: is this philosophical thought magic such that it must also duplicate all of S's physical aspects in the process of duplicating S's "molecules"? This, as Chalmers (2002) advocates, would be an exercise of the modal imagination in a way that "verifies" the truth of (MFM).

How reliable is our judgment as to whether (MFM) is verified by this process? This is without doubt among the most controversial philosophical issues of our time. The modal imagination is an unruly beast. Yours and mine are quite unlikely to behave the same way. Then what?

Fortunately, we do not have to rely on modal imagination alone. We also have science, and it has served us very well indeed. And so what does science tell us about duplication of physical states?

## IV. DUPLICATING THE PHYSICAL

For the sake of concreteness, I will consider the question of what it might take to duplicate a magnet. While the case is not as a matter of fact simple — and this is in any case the point I want to draw from the exercise, whatever example we choose — the reason for picking this one is that it involves uncontroversially physical characteristics.

Ferromagnetism is the phenomenon by which materials, such as iron, in an external magnetic field become magnetized and remain magnetized for a period after the material is no longer in the field. A substance that is susceptible to magnetization can be transformed into a magnet as follows. The process relies upon a property of magnetic materials known as *hysteresis*. When an external magnetic field is applied to a ferromagnetic substance, the item “absorbs” some of the external field: when the external field is removed, the magnet will retain some field — maintaining some of the structure that was imposed on it via the field: it has become magnetized. It has changed magnetic *phase*. This change in phase in a ferromagnetic material is sometimes referred to as *memory*, because it resembles the learning process with which we are each of us familiar as subjects. Ferromagnets are like entities that learn, in that the changes wrought in them, via “teaching” episodes, outlast the duration of the training process. In other words, teaching episodes result in the entity’s retaining (some of) the entrained condition even after the teaching device is removed and the external pre-training conditions are restored. This means that the phase condition is not strictly linearly dependent upon the external “standing” conditions, but depends also upon the substance’s “training history.”

What does it take to duplicate a magnetic phase — in effect, to build a magnet from scratch? To do it in real time we simply take a ferromagnetic substance through the “training regime” described above. We don’t do anything molecule-by-molecule. We never have. (It is a practical impossibility, whose truth suggests an impossibility of an even more stringent kind.) And the reasons are clear, as now we can explain directly.

Herbert Simon, in a decades-old treatment of the subject of reduction (Simon 1973), sought to formulate the idea that certain features of certain systems could not be captured correctly by analysis of their parts taken together with the concurrent interactions among them. His idea derives from his (engineering) concern with systems construction. The idea is that to build a complex system (as nature routinely does), one (like nature) proceeds in stages, with the result that at the end of each stage, what is constructed must possess a stable structure (so as to “hold still” whilst the next phase of operation is launched). Without these intervals or layers of stability, complexity (according to Simon) is unsustainable. This makes complex systems typically: (a) modu-

lar; (b) intersubstitutive in their parts; (c) qualitatively similar with a change to their parts or their number; and (d) stable under reaggregations of parts.

To build a complex system in real time, one typically has to put together the right parts, at the right time, in the right sequence of operations. Duplication takes time. (And this is why I brought out in initial discussion the question of what portion of the history of the universe is a candidate for duplication.) And so a “molecule-for-molecule” algorithm (however conceivable in the abstract — in principle, as philosophers say) is not a recipe for duplication, even of a physical system. And so it is worth wondering: what are we imagining when we are imagining a copy of the molecules of a complex system? Are we imagining a *macro* process that brings about the micro situation imagined? And if so, it might well be that to duplicate the micro one has to duplicate the macro, or at any rate some large portion of it, *first*. It might turn out that to duplicate a micro system for an imitation man, we would need to produce a phenomenology for it — because otherwise some of the micro we need to duplicate would not “hold still long enough” for us to duplicate the whole. And of course the exercise is then useless by way of a diagnostic for the truth of (MFM), much less of physicalism.

The molecule-by-molecule focus is akin to thinking that a painting consists of a pattern of colors. If we can duplicate the color pattern, we’ve duplicated all the “natural” properties of the painting, except for its history (and so perhaps not all its aesthetic properties, but let’s put that point aside for now). If we could, for instance, automate a means of analyzing colors on a canvas, down to as fine a grain as we insist, and subsequently devise and automate a way of conveying color to a new canvas according to this pattern, we will have duplicated the painting. But I can assure you this much is true: if the original is a watercolor, this system will not work unless care is taken to ensure that the process of laying down watercolor is sequenced properly. And the proper sequencing just might require the painter and her brush. And this would defeat the purpose of the exercise.

In summary, it looks as though duplicating a physical system requires at one and the same time bringing about both micro and (some) macro aspects. And if this is true of purely physical systems, might it not also be true of systems with so-called higher-order life? And if so, what is there to divide the physical as fundamental and the rest as in some way different, and so problematic?

#### IV. FAILED DIAGNOSTIC?

A critic of this line of argumentation might complain that duplication is not really the point. The point is similarity: Can there be an entity that is like the original in all microphysical details without also being like it in other re-

gards? There is no special role in this question for a process of ‘constructing’ a duplicate from an original. The question of whether something is constructible is at best a question regarding nomological possibility, not metaphysical possibility. And since everybody is prepared to concede the nomological impossibility of zombies, the “construction” line of argumentation has no bearing on the merits of the zombie diagnostic, as a diagnostic for metaphysical possibility.<sup>4</sup> Metaphysical possibility and nomological possibility are independent.

Now I am challenging just this independence thesis — something that the parties to the debate take for granted, and which (I’m contending) they ought not to do. How would the debate proceed if the parties could not take this independence thesis for granted? As I will be indicating — and this will be the take-home lesson of my paper — revoking broad title to the independence thesis will work against the dualists. But it need not work against the sort of science for which Chalmers seeks to lay foundations.

Why are those who support the metaphysical possibility of zombies prepared, nonetheless, to concede their nomological impossibility? Here is my answer: their judgments are erratic. Just as would be the judgments of someone who insists on the metaphysical possibility of a microphysical duplicate of my magnet without magnetic properties, whilst at the same time judging that it is nomologically impossible for something with the microphysics of a magnet to lack magnetic properties. For as a person’s judgments vis-à-vis magnetism come under the tutelage of science, their judgments on these matters tend to coalesce. So as someone who, under the tutelage of the considerations I’ve adduced above vis-à-vis magnetism, learns to judge the nomological impossibility of a microphysical duplicate of my magnet without magnetic properties, they would also judge that it is metaphysically impossible for something with the microphysics of a magnet to lack magnetic properties. (And they might well be of the opinion that neither set of properties is more fundamental or more privileged — more basic — as the supervenience thesis might insist.) This suggests that “purely metaphysical” judgment might, at least in some important cases, be a kind of abstraction, extension or even prediction from judgment about nomological possibility. And so lack of alignment between judgments of metaphysical possibility and nomological possibility is by no means indicative of their independence.

An intuition to the effect that no microphysical copy of my magnet fails to be a magnet, by someone who has never made a magnet or considered how this is done, is not a judgment that rests on nomological possibility. It is a purely “metaphysical” intuition — in the intended sense. When, by contrast, someone renders a tutored judgment on the matter, one is, ultimately, utilizing nomological knowledge for metaphysical uses — by reference to such things as genuine duplication. Such a judgment, as I argued above, might well be at odds with the “purely metaphysical” — meaning now, “untutored

by scientific knowledge”. The tutored judgment might be to the effect that a microphysical look-alike of the thing can fail to be a magnet — for example, if the look-alike does not also have a similar training history. (The tutored intellect will reflect that molecule orientations in the true magnet are in alignment while those of a fake are not; but the only way that one can achieve alignment of molecules is via a training history. So if one has to duplicate a history to get anything deserving of the label of a molecule-for-molecule duplicate of a true magnet — because for magnets molecule orientation matters — what is the nature of a molecule-for-molecule duplicate? A tutored intellect will realize that the answer is not simple.) And this is precisely my point: when a metaphysical judgment that rests on some scientific understanding of the origins of complex things conflicts with a purely metaphysical (meaning again “untutored by science”), we are apt to go with the former.

And so my reply to this critic affirms that construction of an entity is very much to the point, even on questions of the possibility of certain likenesses, because the two issues are not independent.

Now of course this reply to the imagined complaint would appear to bring us closer to argumentation to do with the nature of judgments regarding possibility, and in particular modal possibility. We did not manage to skirt that issue entirely. But notice this: the answer I have given to the complaint rests only on the point that metaphysical possibility cannot be assumed independent of nomological possibility.<sup>5</sup> If that simple point is conceded—as surely it must be—then questions about the modal imagination, and epistemology in general, need not take center stage. All the important work can be done by construing the points I’ve made about the way complex things hold together as quite general metaphysical points, abstracted from the specifics of magnetism or hysteresis or anything else: they are high-order, abstract “metaphysical” principles.

And so to summarize: the move I am challenging, when the duplication language is neutralized (when “molecule-for-molecule duplicate” is replaced by “microphysical imitation”) is this:

(N-Anti-R) A *microphysical imitation* of S, is an *imitation* of S in all but H respects.

The move is supposed to avert collapse into:

(N-S) A *microphysical imitation* of S, is an *imitation* of S simpliciter,

by adopting instead

(N-MFM) A *microphysical imitation* of S, is an *imitation* of S in all its physical attributes.

And the challenging thesis is (as I've argued):

(N-T) A *microphysical imitation* of S is an *imitation* of S simpliciter.

(N-T) is due to very high-order nomologico-metaphysical realities regarding how complex systems hold together (remember Simon's point). But (N-T) is just the "dreaded" (N-S) — which dualists take for granted they need to ward off. But as now we see, they don't.

One might read these considerations as illuminating the failure of a proposed diagnostic for physicalism. A second reading — the one I prefer — construes these remarks as vindicating the very truth of physicalism, but in such a way as preserves the dualists' face. On this latter reading, everything is indeed physical. But then, so is everything else!

But our considerations also suggest something about "metaphysical possibility" arguments. Our judgments in connection with these are very difficult to diagnose. While our judgments about the making of things are much more secure, and so the better to rely upon. Making things can be quite hard work. And study of the subject is empirical inquiry, that cannot be subject to philosophical fiat or subordination to the sort of philosophical thought experimentation that happens in the dark — for obvious reasons. To construct something out of building materials one has (almost always, perhaps invariably) to deal with the bulk features of matter. The facts on the ground are that one simply does not make things by putting molecules one at a time together, in some kind of point-by-point order. And this is not something that reveals itself in a thought experiment, in spite of being unrelentingly common-sensical.

#### V. AWAY WITH THE HIERARCHY

The thesis I've been displaying as (N-T) (*A microphysical imitation of S is an imitation of S simpliciter*) is neutral on the question of reduction. And so is compatible with a nonreductive reading. Nowadays, however, nonreductive physicalism, under formulations utilizing notions like supervenience or emergentism, is routinely and gratuitously posited as affirming a hierarchy of presumptive levels (rather than simply sets or categories) for organizing properties, phenomena or features of the world. Levels come with structure and an implicit organizing hierarchy. Why the hierarchy? One reason seems to be that hierarchy allows for the following forms of segregation, all putatively desirable: (1) segregation of scientific provinces or preserves; and (2) segregation of entities or quantities eligible to interact "causally" into different levels of the hierarchy (between-level relations are meant to be noncausal,

but may be one of the following three: realizational, determinational or “supervenience”-type relations).

My view is that this hierarchy is what is so offensive to Chalmers and others who wield the purported case of the imitation man in service of a science of the autonomous mental. Hierarchy stands in the way of the autonomy of that science. But (N-T) is neutral on hierarchy. And this further illuminates the arguments I have been making about the failed diagnostics of MFM.

The true question is: can nonreductive physicalism be formulated without hierarchy? The answer is Yes. I have done it elsewhere (Thalos, in progress). Here’s a sketch of the basic ideal, shorn of technicalities. It requires the notion of a *filter* (as contrasted with the implicitly hierarchical, but otherwise unanalyzed category of “level”): a filter is a network of interconnected and materially dependent quantities. Nonreductive physicalism (I prefer the term *materialism*) can then be defined as the confluence of three theses:

1 *Metaphysics*. The world comprises both dependent and independent quantities (properties, features), grouped by filters. Some of the filters are evolutionarily much older than others; study of the more recent filters is typically conducted by specialists outside the discipline of Physics proper; only empirical inquiry can identify the filters and then divide among the dependent and independent quantities within them.

2. *Nonreductive*: Not all independent quantities are the quintessentially microphysical quantities;<sup>6</sup> some of them lie outside the filter whose elements belong to the science of Physics. This is true, *not* as a matter of necessity, but only as a matter of fact.

3 *Materialism*: All independent quantities are nonetheless characteristics of spacetime and matter, or organizational characteristics of spacetime and matter.<sup>7</sup> This, by contrast with (2), is true as a matter of necessity.

And with this formulation of nonreductive physicalism, no diagnostic like MFM is either capable of, or necessary for, illuminating independent filters as the preserver of an autonomous science.

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## NOTES

<sup>1</sup> Tye (2006) argues that this is an impossibility — and a conceptual impossibility at that.

<sup>2</sup> A contemporary and more advanced treatment of the concept of control is contained in Thalos (2007).

<sup>3</sup> Wimsatt (1976) makes reference to many of these conditions as well, and W. Bechtel and Robert C. Richardson (1992) illustrates the ways in which scientific methodologies attain what they refer to as emergent phenomena utilizing these criteria.

<sup>4</sup> Suggested by Chalmers, personal communication.

<sup>5</sup> Shoemaker (1999) makes a similar though much stronger point: nomological necessity is a species of metaphysical necessity. I think that Chalmers (forthcoming) is right to reject that strong thesis. My own thesis is simply that there is some overlap between nomological and metaphysical necessity: some nomological necessities are instances of more general metaphysical principles.

<sup>6</sup> Indeed, I hold [Thalos (1999, 2002, 2006)] that the degrees of freedom in physics are not all micro.

<sup>7</sup> My own view is that fields are features of spacetime. But alternatively, one can take the view that fields are entities that emerge from the action of matter and the laws of physics. Nothing hangs on this issue, for purposes of defining nonreductive physicalism.

## REFERENCES

- BECHTEL, W. and RICHARDSON, R. C. (1992), "Emergent Phenomena and Complex Systems," in Anskar Beckerman, Hans Flohr and Jaegwon Kim (eds), *Emergence or Reduction*, New York, de Gruyter; pp. 257-88.
- CAMPBELL, K. (1970), *Body and Mind* Garden City, New York, Anchor Books.
- CHALMERS, D. (1996), *The Conscious Mind*, New York, Oxford University Press.
- (2002), "Does Conceivability Entail Possibility?" in T. Gendler and J. Hawthorne, eds., *Conceivability and Possibility*, Oxford University Press, pp. 145-200.
- (Forthcoming), *The Character of Consciousness*, Oxford, Oxford University Press.
- SHOEMAKER, S. (1999), "On David Chalmers' *The Conscious Mind*", *Philosophy and Phenomenological Research* 59, pp. 539-44.
- SIMON, H. (1973), "The organization of complex systems," in H. Pattee (ed.), *Hierarchy Theory: The Challenge of Complex Systems*. New York: Braziller; pp. 1-27.
- THALOS, M. (1999), "Degrees of Freedom: An Essay on Competitions between Micro and Macro in Mechanics", *Philosophy and Phenomenological Research*, 59, pp. 1-39.
- (2002), "Explanation is a Genus: On the Varieties of Scientific Explanation". *Synthese*, 130, pp. 317-354.
- (2006), "Nonreductive Physics," *Synthese*, 149, pp. 133-178.
- (2007), "Sources of Behavior: Toward a Naturalistic, Control Account of Agency," *Distributed Cognition and the Will*, Don Ross and David Spurrett (eds.), Harvard, MIT Press, pp. 123-67.
- (in progress), "Nonreductive Materialism Without Hierarchy".

TYE, M. (1995), *Ten Problems of Consciousness*, Harvard, MIT Press.

WIMSATT, W. (1976), "Forms of Aggregativity," in Donagan, Perovich and Wedin (eds.), *Human Nature and Natural Knowledge*, Dordrecht, Reidel; pp. 259-91.

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