

Semirealism *or* Neo-Aristotelianism?

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I.

Anjan Chakravartty and I are both scientific realists and yet we are separated by a great divide. He's a neo-Aristotelian, whereas I am a neo-Humean. *Prima facie*, this is not a divide that has anything to do with scientific realism itself. It's a divide within metaphysics—or the metaphysics of science, to be more precise. It might be thought that neo-Humeanism is anti-metaphysics altogether, but this is wrong. Metaphysics—that is, a view about the deep structure of reality and its fundamental constituents—is not optional. The only serious issue, I believe, is how deeply this view should be digging; how rich the conception of the fundamental structure of reality ought to be. Neo-Humeanism promotes a rather thin—or sparse—view of the fundamental structure of reality. In particular, it denies that the regularity there is in the world needs grounding in a metaphysically distinct (and typically deeper) layer of facts or entities, which are supposed to enforce the regularity there is in the world. But buying into the idea that the world is characterised by regular patterns of co-existence and succession of property-instances is metaphysics enough!

So the real issue between neo-Aristotelianism and neo-Humeanism is not: metaphysics or not-metaphysics. Rather, it is: how much of metaphysics ought we to buy into? I take it that this question is elliptical and needs supplementation: how much of metaphysics ought we to buy into *if we are to make sense of the world as this is described by science?* Others might disagree with the suggested supplementation. Fair enough! In my own view, metaphysics should be in the service of science and should be constrained by it. I trust this is something Chakravartty and I share. Our disagreement (and the real disagreement between neo-Aristotelianism and neo-Humeanism) concerns precisely the issue of whether the image of the world as painted by modern science does require or imply a neo-Aristotelian metaphysics. Concomitantly, the issue is how we decide (philosophically) what kind of metaphysical theory is required by science. Chakravartty is flexible. Rightly I think, he claims that science does not imply any specific metaphysical theory of the world. In this sense, science is consistent with both neo-Aristotelianism and neo-Humeanism. But, along with many others, he thinks that a neo-Aristotelian outlook *best suits* science. In other words, neo-Aristotelianism is supposed to win on the basis of an inference to the best explanation (IBE).

I am a friend of IBE (a card-carrying member of the club), but I fail to see how it can be used to favour neo-Aristotelianism over neo-Humeanism. In what follows, I will aim to do two things. The first is to explain why this failure is not idiosyncratic: it should be there even by Chakravartty's lights. The second thing I will try to do is raise some critical worries about Chakravartty's semirealism, especially in connection with the concept of a 'concrete structure' and the detection/auxiliary distinction. I will end with a dilemma: an exclusive disjunction encapsulated in the title of this essay.

II.

Neo-Aristotelianism is a cluster of views about a cluster of issues: causation, laws, properties, modality, essences, necessity and the like. It's hard to find a single unifying theme that underwrites all these views, but my best shot at it is this: there is irreducible power in the world and this is the reason why things in the world behave in certain (regular) ways and exhibit patterns of dependence among them. This is a slogan, of course, and it is unpacked in different and various ways. Chakravartty unpacks it by means of what he calls 'Dispositional Identity Thesis' (DIT):

A causal property can be identified as the property that it is in virtue of its relations to other properties. The conjunction of all causal laws thus specifies the natures of all causal properties (p.123).

And also:

DIT asserts that the identity of a causal property is wholly determined by certain dispositions for relations with other properties, or in other words, by the dispositions it confers for behaviour on the things that have it (p.134).

Laws, then, are summaries of the causal profiles of properties, and they are supposed to hold with metaphysical necessity¹ since "the relations between (...) properties could not be other than they are".

DIT advances a holistic account of the individuation of properties. What a property is cannot possibly be identified unless what all other properties to which it is related are has already been specified; that is, unless all other properties have already been identified. But since this tangle arises for *any* property whatever, it follows that no property can be identified unless some other properties have already been identified, and because of this, no property can be identified *simpliciter*. All we get, at best, is a web of causal profiles, but no other way to tell how the several parts of the web are related to (or flow from) certain properties. (Here is a comparison: if what it is for something to be gin is *wholly* identified via its relations to all cocktails it can be used for and if this happens from each and every other drink, then all we have is the set of all cocktails—a web of cocktail profiles!—and no other way to identify which individual drink goes into what cocktail.) The claim that the properties determine the laws becomes, then, non-explanatory because there is no way to identify the properties, which are supposed to fix the laws, except by first identifying the laws, that is the totality of relations into which properties enter. Chakravartty says: "Laws are composed of relations, the potential for which is determined by the identities of causal powers" (p.130). But since the identity of causal powers is holistic, it is laws (that is, networks of actual causal profiles) that determine the identity of properties and not the other way around.

Chakravartty is alive to this problem—or a variant thereof (see p.140). He makes three moves in reply. The first move is problematic. He says: "there is no contradiction in thinking that one can identify properties without giving exhaustive inventories [of their causal profile], and simultaneously believing that such inventories ultimately determine the identities of properties" (p.135). I am afraid there is a contradiction, unless we trade on ambiguity between identification and identity. If property P is determined by causal profile Q, and if Q' is part of Q, then no property can be (identified as) P unless it has Q' as part of its causal profile. Given this, Chakravartty must mean that we can epistemically identify (that is, get to know) a property P by some part of its causal profile Q', even if this part does not exhaust its causal profile Q. Indeed, Chakravartty goes on to add that we can measure and thus know the mass of an object. Even if we were to grant this, the hard problem would still be how to determine the identity of a property in a metaphysical sense of specifying how it is distinguished from any other property it is related to and not in the epistemic sense of finding a mark of its presence. This has not been answered yet. In any case, the shift from metaphysical identity to epistemic identification is not so innocuous. For—to use Chakravartty's example—we can

¹ Chakravartty (p. 130) is careful to note that the thesis that laws are metaphysically necessary is meant to imply that the laws of the actual world hold in all those possible worlds in which all and only the properties inhabiting the actual world exist.

use measurement to know (and hence epistemically identify) mass *precisely* because the identity of mass (the property we are measuring) is not determined in the holistic way implied by Chakravartty's DIT. If it were, its measurement would not be a measurement of *mass*, unless it were already known that what is measured is *mass*, that is unless it was known that the measured property satisfies the causal role of *mass* as this is specified by its relations to *all* other properties it is related to. The thing is that we can measure mass precisely because we can identify mass (metaphysically) independently of the network of relations it enters into, say as inertial mass. Chakravartty (pp.135-6) feels tempted to compare his first move with the one made by the advocates of categorical properties in favour of quiddities. But if this is the right comparison, Chakravartty shoots himself in the foot: presumably, the move towards a causal understanding of the identity of properties was motivated by an attempt to avoid the supposedly mysterious quiddities *qua* unknowable metaphysical identifiers of properties. Nothing much is gained by replacing them with a more mysterious holistic network of relations among properties, which is supposed to confer identity on properties, without in the end identifying any of them.

Perhaps in attempt to avoid the problems of the first move, Chakravartty makes a second move, which is common to all friends of powers—and which is no less problematic in my opinion. The (common) claim is that some powers are, ultimately, (epistemically) identified by the effects they have on us and our sensory modalities in particular. Chakravartty says: "Every case of warranted causal property attribution is facilitated by some properties that are known independently of a knowledge of their further effects. These latter property instances are the direct objects of our perceptions" (p.136). Clearly, some properties have effects on us. But this is no part of their identity and hence there would still be the problem of how to identify them *independently* of whatever effects they have on us. If the thought was that their effects on us were part of the identity of a property (a view which would not be totally unmotivated given the holistic way to identify properties associated with DIT), this thought would be in direct contradiction with Chakravartty's professed aim to put the neo-Aristotelian view in the service of scientific realism. The very idea of there being a way the mind-independent world is would be threatened.

There is a third move Chakravartty makes in an attempt to leave all epistemic issues behind and tackle the problem of identification of properties. He says:

On the dispositional view of properties, no specific relations need obtain in order for causal properties to have their identities. According to DIT, it is simply the potential for relations of various sorts that determines property identity. The identity of a causal property is determined by dispositions that, on the realist account, are genuine properties regardless of whether any particular manifestations come to pass. Thus, property identity does not depend on any particular relations obtaining. It is defined rather in terms of dispositions *for* relations (p.141).

I am not sure I understand how exactly the dispositions *for* relations are fixed independently of the actual relations properties enter into. But even if this is straightforward, the difficulty that ensues is that dispositions *for* relations which are not accompanied by any particular manifestations are consistent with *any* causal profile whatever, or with no causal profile at all, simply because the potential for relations might never be manifested. Far from determining laws, properties become mute.

III.

These are points of (substantive) detail. They have to do with the contours of the neo-Aristotelian view of nature and they might be dealt with provided enough ingenuity and creativity is shown on the part of neo-Aristotelians. The more central difficulty with Chakravartty's position is a deep internal tension in his attempt to save scientific realism from the sceptical onslaught and to marry it with neo-Aristotelianism. As we have seen, Chakravartty subscribes to the full panoply of neo-Aristotelianism. At the same time, he takes it that scientific realists should be committed only to the detection, as opposed to the auxiliary, properties of particulars. (More on this distinction section IV.) None of the extra stuff that Chakravartty finds in the world (*de re* necessities, ungrounded dispositions,

holistically individuated properties and the like) are detected or detectable. They are taken to be part of the baggage of scientific realism because they play a certain explanatory role, notably they are supposed to distinguish causal laws from merely accidental regularities. So: we are invited to accept a certain set of double standards—one for scientific theories, and another for metaphysics. While in the case of scientific theories, adopting the epistemic optimism associated with scientific realism requires causal contact with the world, thus denying epistemic optimism merely on the basis of the explanatory virtues of theories, in the case of the metaphysical foundations of scientific realism, epistemic optimism ends up being solely a function of explanatory virtues. Commitment to causal necessity, for instance, is based on the claim that it “serves an extremely important explanatory function” (viz., to explain the difference between laws and accidents), though it is not detectable. But then the road is open to think of causal necessity as an auxiliary feature, something there is no need to be committed to. To put the point somewhat provocatively, the neo-Aristotelian metaphysics of scientific realism ends up being an auxiliary system whose detection properties are Humean regularities and other metaphysically less fatty stuff.

The flip-side of this point is this. If, motivated by an attempt to secure the neo-Aristotelian foundations of scientific realism, we allow that there can be legitimate commitment to auxiliary, but explanatorily significant, entities—and not just to those that are detectable by the usual causal means—Chakravartty’s semirealism loses its distinctive flavour over standard renditions of scientific realism. This is supposed to come from its insistence on detectability as a criterion for epistemic commitment to unobservable entities. If undetectable entities end up being OK on the basis that they serve an explanatory role, then the fans of semirealism have to tell us why they are not in favour of the ether but they are in favour of causal necessity and the like.

It might be concluded that if one wants to be a neo-Aristotelian scientific realist, one had better *not* rest one’s epistemic attitude towards theories on a too demanding criterion—and in particular one that cannot be honoured by metaphysical theories. Alternatively, if one wants to be a neo-Aristotelian scientific realist with a clean conscience, one had better adopt a loose criterion towards unobservables and in particular one that allows both electrons and their ilk as well as *de re* necessities and their ilk.

Should, then, a realist adopt neo-Aristotelianism simply on the basis that it is the best explanation of, say, the neo-Humean account of the world? In broad outline, my own view comes to this. If we take IBE seriously, as we should, the answer to the above question should be positive. But, it can be contested that neo-Aristotelianism does indeed meet the best explanation test. One particularly acute problem is that all these denizens of the neo-Aristotelian world (powers, metaphysical necessities, dispositional essences and the like) are themselves unexplained explainers. Though everyone should accept some unexplained explainers, in this particular case, they are more purely understood than the Humean facts they are supposed to explain. Another problem is that it is not clear at all how all these heavy metaphysical commitments are related to current scientific theories. They are not borne out of current theories. Actually, no particular science, let alone particular scientific theory, can yield interesting general metaphysical conclusions, simply because each science has its own specific and particular subject matter whereas the object of metaphysics (at least as understood by many neo-Aristotelians) is very general and domain-independent: it is the fundamental deep structure (or building blocks) of reality as a whole, abstracting away from the its specific scientific descriptions. Accordingly, neo-Aristotelian scientific realists face a dilemma. They have to proceed top-down, that is to start from an *a priori* account of the possible fundamental structure of reality and then try to mould the actual world as described by the sciences into it. The price here is that there is a danger to neglect or overlook important differences that there are between sciences and/or scientific theories in the ways the world is described and in the commitments they imply. Alternatively, they have to proceed bottom-up, that is to start with individual sciences and/or theories and try to form a unified account of the actual deep structure of reality by generalisation and/or abstraction. The price here is that there is no guarantee that this general account can be had.

If semirealism is the best hope for scientific realists and if semirealism is seen as *requiring* commitment to a non-Humean metaphysical picture of the world, this might be reason enough to make scientific realism unattractive to all those who prefer barren metaphysical landscapes. Semirealism is so much metaphysically loaded that its very posture might be enough to give extra force to well-known empiricist arguments that tend to favour antirealism on the grounds it alone can deliver us from metaphysics. If, as it seems to be the case for Chakravartty, this rich metaphysical picture is an add-on to the selective epistemic commitments of semirealism (if scientific realists do not have to buy it, anyway), why not leaving it behind, thereby making scientific realism a more inclusive philosophical position?

Indeed, Chakravartty focuses on the empiricist critique of metaphysics (advanced recently by Bas van Fraassen) and contrasts van Fraassen's stance empiricism with what he calls 'the metaphysical stance' and which he takes it to be largely the stance of scientific realism. Given van Fraassen's own permissive conception of rationality, the metaphysical stance cannot be shown to be incoherent and hence it cannot be shown to be irrational. So, Chakravartty claims, the empiricist critique of metaphysics cannot win. It cannot block realism from incorporating a rich metaphysical outlook. This is all fine. But then again on Chakravartty's set-up, realism cannot win either. At best, there will be a tie between the empiricist stance and the metaphysical stance. If Chakravartty's critique of the empiricist stance is that it leads to a form of relativism (cf. p.25), it is hard to see how his own defence of the metaphysical stance avoids relativism—the very relativism that licenses the metaphysical foundations of semirealism.

IV.

The motivation for semirealism, *qua* an epistemic position, comes from the pessimistic induction on the history of science. This suggests that epistemic commitment should be restricted to those parts of theories that are more likely to resist future revisions. Semirealism adopts the epistemic optimism of entity realism (which is grounded on cases of experimental manipulation of unobservable entities), but adds that knowledge of causal interactions presupposes knowledge of causal properties of particulars and relations between them. Semirealism also adopts the epistemic optimism of structural realism (which is based on structural invariance in theory-change), but adds that the operative notion of structure should be concrete and not abstract.

Concrete causal structures consist of relations between first-order causal properties, which account for causal interactions—as we have already seen, Chakravartty claims that these causal properties are best seen as being powers, as having a dispositional identity, but this is by and large irrelevant to the development of the epistemic side of semirealism. Chakravartty promotes this understanding of structure in order, in the very end, to cut through the distinction between having knowledge of the structures and having knowledge of the intrinsic natures of things that make up the structure. He claims that knowledge of concrete causal structures contains 'unavoidably' knowledge of intrinsic natures of particulars, and vice versa. This is fine, I think, and it points to the right direction in the realism debate, since it tends to dampen the oscillation between entity realism and structural realism.

But, one may ask, isn't the very idea of a *concrete* structure an oxymoron? Structure, properly understood, is something abstract, shareable, multiply instantiated in concrete relational systems—otherwise, we cannot really talk about two structurally-identical concrete physical systems. A structure, constitutively, is something with slots, to be occupied by appropriate particulars. Now, there is a sense in which we can talk of structure as a certain spatial arrangement, or organization of parts into a whole—e.g., we can talk about the structure of the water molecule, or the structure of the DNA. But these are *types* and hence abstract as well. Concrete things, to be sure, instantiate certain abstract patterns or structures. It is in virtue of this, at least partly, that two distinct concrete water molecules are *water* molecules—they share structure (as well as the types of relata that instantiate the structure, that is, Hydrogen and Oxygen atoms). Chakravartty says: "An identity of concrete structures requires that the elements of the sets compared, α and β , as well as their respective relations, R and S , be of the same kind" (p.41). But then, part of what makes a concrete structure what it

is abstract: falling under a type of structure. Concrete structures—if there are such things—are diverse insofar as they are concrete (since their elements and relations are different) and identical insofar as they are abstract (that is, insofar as they share the same abstract structure). But how can the very same thing be both abstract *and* concrete? This is probably neo-Aristotelianism gone wild, since this view of concrete structures seems to require that concrete entities have abstract forms as their parts.

I am fully sympathetic with the rationale for introducing ‘concrete structures’. If concrete structures are “relations between first-order properties of things” (p.41), then the Newman objection evaporates. But, it evaporates precisely because the very idea of structure, which is presupposed by epistemic structural realism and is attacked by Newman, is reshaped. In the context of semirealism, relational systems (what concrete causal structures are meant to be) contain everything up to the very natures of particulars. As Chakravartty notes in a different place: “Concrete structures *do not* underdetermine particulars but merely their auxiliary properties. And thus, strictly speaking, different ontologies are *not* consistent with the same systems of concrete structures” (p.67). So there is no more leeway to tinker with the relations and objects that specify the relational system. Besides, precisely because the relational system (concrete structure) is determined (and individuated) by definite relations, there is no further issue of their re-interpretation; nor is it any longer possible to read these relations extensionally and to fiddle with their extensions. To put the point somewhat provocatively, since nothing is left out, structure is no longer distinguished from what it is a structure of; and what it is a structure of determines what structure it is. Relational systems (concrete structures) have no ‘slots’.

Be that as it may, Chakravartty’s key point is that the parts of theories to which realists should be epistemically committed are those parts that can be interpreted as referring to a certain class of properties of concrete causal structures (or systems or whatever), viz., the ‘detection’ properties. These are properties that are causally detectable and in whose presence realists should most reasonably believe on the basis of the scientists’ causal contact with the world. Detection properties are distinguished from auxiliary properties which are attributed to particulars by theories and in whose reality there is no reason to believe since they are not detected (though they might be detectable and become detected later on).

This distinction between detection properties and auxiliary properties is a central plank of semirealism. I am not sure, however, it is carefully delineated. It is clearly meant to be an epistemic distinction—one that is related to our state of knowledge, that is to what we already know by having causally interacted with. Chakravartty claims that “Detection properties are causal properties one has managed to detect; they are causally linked to the regular behaviours of our detectors. Auxiliary properties are any other putative properties attributed to particulars by theories” (p.47). This distinction, however, is moveable—some auxiliary properties may be ‘converted into detection properties’; others may be simply jettisoned.

So the distinction seems to be more pragmatic than epistemic. There is no epistemic mark of being auxiliary apart from the fact that there has not as yet been a causal detection of the property that is characterised as auxiliary. But causal detectability is always a matter of degree, unless a property is either causally isolated or inert. Detection can be more or less direct. Most properties are detectable by long causal chains of actions and interactions and there is no clear and sharp distinction between being detectable and being undetected (unless, as noted already, a property is already taken to be causally inert or isolated). Hence, barring these cases, we cannot really tell when a property is detectable (no matter how indirectly) and when it is auxiliary.

But then again, Chakravartty seems to intend to put a stronger gloss on the detection/auxiliary distinction. He claims of auxiliary properties that their ontological status “cannot be determined on the basis of our causal contact with the world” (p.64). This implies that auxiliary properties are acausal; and if we adopt a causal criterion of reality, then they are not real anyway. Their role, Chakravartty seems to think, is heuristic; they are “methodological catalysts” as he says. Though it is not clear to me what exactly this means, it seems to yield that the auxiliary/detection distinction is permanent and fixed. For if it is not,

auxiliary properties cannot be simply heuristic devices, since they may be detected after all as science progresses.

It transpires that Chakravartty needs a distinction like this in order to draw a line between those properties that are ‘carried over’ in theory-change (detection properties) and those that are not (auxiliary properties). This would create the required continuity in theory-change that could block the pessimistic induction. But if this is so, the distinction becomes rather ad hoc. It amounts to the claim that whatever content has been retained in theory change is what we call ‘detection content’ and whatever content was abandoned was ‘auxiliary content’. Indeed, Chakravartty oscillates between understanding the detection/auxiliary distinction as a distinction among properties and understanding it as a distinction within the content of a theory (see p. 48) and even between entities (see p. 49, where he talks about auxiliary posits).

The two key elements of semirealism—concrete causal structures and detection properties—are brought together when Chakravartty offers a practical way to demarcate the concrete causal structures associated with detection properties from those associated with auxiliary ones. This is what he calls a ‘minimal interpretation’ of the mathematical equations that make up a physical theory. Given that mathematical equations can be interpreted as describing concrete causal structures (or, equivalently, relations between causal properties), a minimal interpretation of them is one that interprets realistically only those parts of the equations that, in the context of a specific detection process, are indispensable in describing the (corresponding to that detection) concrete causal structures. There are two problems with this move. First, the minimal interpretation will not, in many cases, be enough to specify a causal structure because the causal/explanatory mechanism that explains/or grounds the causal structure will not be part of the minimal interpretation. At best, the minimal mathematical interpretation will capture phenomenological laws, like in the famous case of Fresnel’s equations. The second problem is this: if detection properties are specified *independently* of the theory, there is no need to interpret the theory minimally to get to them. If, however, they are specified in a theory-dependent way, this theory should be already interpreted *prior* to fixing the detection properties—and in all probability more than a minimal interpretation will be required to specify which properties are detection and which are auxiliaries.

What seems worth adding is that the very idea of detectability of properties as a criterion of epistemic commitment to them seems to be in direct conflict with the holistic individuation of properties recommended by Chakravartty’s causal structuralism. If properties have holistically specified conditions of individuation, then which property is actually detected? The tempting move would be to single out *some* of the effects of the property on us or some detectors as individuators—but this move, as we have seen, is bound to fail.

V.

Chakravartty’s fine book has aimed to make neo-Aristotelianism safe for scientific realism. At the same time, it has aimed to save scientific realism from the pessimistic induction, while avoiding the oscillation between entity realism and structural realism. My considered view is that the progress made in meeting the second aim unveiled the difficulties in meeting the first aim. The detection/auxiliary distinction, if successful, blocks the pessimistic induction and makes room for a view that accommodates both structures *and* entities (what Chakravartty calls ‘concrete structures’). The price however is an austere criterion of epistemic commitment, which puts a premium on causal detection and a penalty on merely explanatory virtues. This price becomes very steep when it comes to the defence of neo-Aristotelianism. For this, the premium and the penalty should be reversed. More precisely, the dilemma faced by neo-Aristotelian semirealism is this: either secure semirealism, but then become sceptical about a neo-Aristotelian metaphysics or secure a neo-Aristotelian metaphysics, but at the same time accept a lot more than semirealism recommends. Ergo: semirealism *or* neo-Aristotelianism?