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Levi on the reality of dispositions

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[p. 313]

Isaac Levi is more interested in inquiry and how it progresses than he is in metaphysics.

Questions concerning the role of disposition predicates in inquiry are more central to him than those concerning the nature and reality of dispositions. It has not stopped him from giving me and others very useful metaphysical advice. Currently, where empirical metaphysics is in vogue, there is every reason to see if the two forms of philosophical interest might interlock substantially.

Levi has stimulating ideas indeed on the two forms of philosophical interest, and has recently summarised them in the slogan: "The reality of dispositions is a work in progress" (Levi 2003, p. 152). We can learn much about what kinds of dispositions are acceptable in the world from tracing and comparing the histories of successful and less successful disposition predicates in scientific inquiry.

Levi explores one route along which dispositions become real. His idea is that the introduction of dispositions facilitates covering law explanation by increasing the number of laws. The successful disposition predicate eventually becomes integrated in scientific theory, much like an ordinary theoretical term, whereas the unsuccessful does not. My impression is that Levi thinks that this is the only way a disposition can become real. To evaluate this claim an alternative course suggested by Jon Elster is introduced. I then try to bring out the differences between Levi's and Elster's views on dispositions, partly by suggesting that they resemble two aspects of full explanations discussed by Wesley Salmon. But more about that below.

1. Levi on stopgap explanations and their integration

Introductions of dispositions in science are correlated with explanatory attempts. As Levi states, a disposition predicate is often introduced in order to cover an otherwise unexplainable gap.

Take two species of fish vulnerable to [p. 314] predation by pike, such as tench and crucian carp. The crucian carp changes its body morphology in a special way when predators are around. It starts to grow "vertically" instead of "horizontally", i.e. it becomes deeper bodied. The body-depth index changes so dramatically that earlier biologists thought the two morphs were different species. Within weeks the change is visible to the careful observer. But tench do not change in this way nor do most other fish we know of. Why? Since the two species exist in the same environments, a promising start is to assume that there is an intrinsic difference between crucian carp and tench. We assume that crucian carp have a special kind of built-in growth mechanism or disposition. In the presence of pike this mechanism is somehow activated and the fish becomes deeper bodied. A suitable disposition predicate matching this mechanism is the notion of a predator-induced "morphological defense", as in Brönmark and Miner (1992).

Let us focus on what kind of explanation the disposition predicate provides. Levi calls it "stopgap" explanation, and if I read him correctly this means both of the following two things. The stopgap explanation is preliminary, i.e. by using it we commit ourselves to the idea that it eventually needs more work. The stopgap explanation is also of covering law type. One of Levi's examples concerns coin tossing. We know that some coins have the ability to land on edge when tossed. Therefore, whether or not all coins land heads or tails when tossed near the surface of the earth, the fact that a coin was tossed together with this regularity are not explanatory of the fact that it landed heads or tails. There is thus a gap in our explanatory powers and in order to close it a disposition is introduced. We start to distinguish between coins with the surefire disposition to land heads or tails if tossed and other coins. Explanation is possible again by using the covering law:

$$(x)(t)\{x \text{ has the surefire disposition to land heads or tails if tossed at } t \supset [x \text{ is tossed at } t \supset x \text{ lands heads or tails at } t (+\Delta t)^i]\}$$

Besides being a covering law this formulation is a postulate that characterises the dispositional predicate. Disregarding problems concerning determinism in ecology, a similar postulate can accompany the predator-induced "morphological defense":

$$(x)(t)\{x \text{ has a predator-induced morphological defense at } t \supset [x \text{ is exposed to a pike at } t \supset x \text{ becomes deeper bodied at } t (+\Delta t)]\}$$

[p. 315] According to Levi this constitutes a first, but only a first step needed for accepting the reality of the disposition.

(L1) *Levi program in progress, step 1:*

A disposition predicate providing a stopgap explanation is introduced

To understand Levi's view it is instructive to compare the disposition predicate in (L1) with *ceteris paribus* clauses in laws and regularities like "*ceteris paribus*, all mammals give birth to live young". The two have much the same function. Primarily, both fit the explanation into the covering law model of explanation: "They are place-holders for unspecified standing conditions in purely general laws", say Levi and Morgenbesser (1964/1978, p. 400). But there are also differences. Even if *ceteris paribus* clauses occur in many and widely different laws they are not assumed to be identical across contexts. Applying a disposition predicate in more laws than one involves a commitment, if revision takes place, to replace the disposition predicate by the same specification of standing conditions in each of the laws in which the disposition predicate appears (unless of course one loses faith in the predicate and comes to the conclusion that it was in fact disjunctive). Another notable difference is that while a *ceteris paribus* clause remains silent as to the location of the unspecified standing conditions, a disposition predicate locates these conditions in the object. That, at least, is granted by Levi and Morgenbesser: "[I]f we are told that fragile objects break when tapped lightly, we assume that if we are to improve or replace the generalization we should investigate the micro-

structure of fragile objects" (ibid, pp. 401--402). This is certainly true of many good examples.

By using the disposition predicate predator-induced "morphological defense", Brönmark and Miner accordingly locate some unspecified conditions to crucian carp, and why not to their micro-structure? Nothing similar is implied when we say that, *ceteris paribus*, all mammals give birth to live young. What must be kept equal here might be external factors.

Let us now continue with the subsequent steps of the Levi program, for it is clear that we cannot rest content with having taken the first step. That kind of disposition will not do in the longer run. "In that setting, explanation by disposition becomes suspect in the way that explaining the responses of those who imbibe opium by appealing to its dormitive virtue is" (Levi 2003, p. 139).

Each point of inquiry from L1 and onwards belongs to one of three stages with respect to what more we claim to have filled in about the disposition. Since this is easiest to understand in connection with what is often called the basis of the disposition, I first follow Levi and Morgenbesser (1964/1978, p. 403) [p. 316] in distinguishing between, on the one hand, the innocent or *problem-raising* situation after the first step (L1) where no basis is known to exist and no claims that there is one have been made and, on the other, later *problem-solving* situations where legitimate bases have been found. In between lies Ryle's *mystery-raising* stages where no basis is known to exist, although claims that there is one are being made. Problem-solving stages are mystery-solving, too, so the idea of progress we are looking for can be pictured as a development from problem-raising or mystery-raising to problem-solving and mystery-solving.

In Levi (2003) the micro-basis idea is downplayed. He now claims more generally that giving up one's expectation of progress after L1, and saying that this is the best we can achieve, transforms something that was initially problem-raising to the level of being mystery-raising. Mystery raising occurs in all situations where inquirers have not integrated the disposition

predicates into an explanatorily adequate theory, and yet they judge the explanations they offer as satisfactory. (Levi's most important criticism of Elster's alternative view below is that it, in effect, amounts to certifying mystery-raising in this sense.)

The change in Levi's thoughts on this matter is probably to the better. But the concept of 'integration' is more difficult to come to grips with than the earlier story about micro-bases. To begin with, it presupposes an idea about what kind of theory the disposition predicate is to be integrated into. Levi has little more to say about this than that the theory should be part of the established body of full belief.

(L final) Levi program in progress, final step:

The disposition predicate is adequately integrated into a theory that is part of the established body of full belief.

This admits of a pluralistic view of science. The nature of integration can take many forms depending both on the structure of the theory and on the specific demands and goals of the research program (see e.g. Dupré 1993, pp. 261--264).

To analyze the degree of integration in actual cases is not a simple matter. However, returning to the crucian carp, it is evident that many attempts to integrate the disposition have been made. This work has partly taken the form of explaining why the emergence of such a defense is fitness-increasing. How efficient it is in avoiding predation is a central piece of knowledge. And the effects of prey size on pike behavior and how this relates to optimal foraging models have been examined in this research program, for instance in Nilsson and Brönmark (1999). Why it is not a constitutive defense has been answered by investigating the costs of becoming deeper bodied, how predation pressure [p. 317] varies, and so on. What kind of cues that trigger the disposition have also been investigated. It was shown in Brönmark and Pettersson (1994) that the cues are chemical rather than visual and

it was furthermore confirmed that the cues are not released by injured conspecifics or from the predator per se, but only from predators with a piscivorous diet. This makes the disposition adaptive in habitats with a suite of predators or when predators undergo niche shifts. For instance, if the perch and pike in a pond feed on say crayfish and other invertebrates the morphological defense is not triggered. The relevant cue is not released until the predators start feeding on fish, that is, when the individuals become piscivores.

2. Dispositions as ways in which things happen

Contrary to Levi, some have assumed that explanation by mechanism or disposition is a *substitute* for covering law explanation. Jon Elster is one example. While Elster employs the concept of mechanism that I am sympathetic to, I believe that what he says can be translated roughly into the language of dispositions. Levi (2003) makes the same point in his discussion of Elster's theory.^{li}

First, an introduction to Elster's view. The background against which Elster proposes his account is captured in his answers to the two questions: Are there lawlike generalizations in the social sciences? If not, are we thrown back on mere description and narrative? Elster's answer to both is negative. The ideal of lawlike explanation in history and the social sciences is implausible, claims Elster. To escape explanatory nihilism the idea of a mechanism is introduced. It is supposed to do its explanatory work at a level between law and description (Elster 1999, p. 1).

The relation between laws and dispositions is, as we have seen, a very close one for Levi, but Elster disconnects them. The perhaps clearest formulation is from his 1989 book:

"Laws by their nature are general and do not suffer exceptions. One cannot have a law to the effect that 'if p, then sometimes q.' Mechanisms, by contrast, make no claim to generality.

When we have identified a mechanism whereby p leads to q, knowledge has progressed

because we have added a new item to our repertoire of ways in which things happen." (Elster 1989, pp. 9--10)

[p. 318] In Elster's world lawlike generalizations are scarce, while mechanisms abound. Moreover, his mechanisms often come in *pairs*. Some people prefer what they can have; others tend to want what they do not or cannot have. Here we seem to have one adaptive and one counteradaptive preference, nicely mirrored in the proverbs referring to sour grapes and forbidden fruit (Elster 1999, p. 7). Unreachable grapes are sour. Forbidden fruit is sweet. It is not a unique case. For any proverb one seems to be able to find one that asserts the opposite.

Elster's rationale for claiming that introduction of mechanisms does not add to the number of laws must be that mechanisms can interact in many ways. Lawlike generalizations are scarce partly because mechanisms abound. There are two characteristic ways in which mechanisms may intervene: type A and type B. Type A interventions are preemptive. If the disposition to have adaptive preferences is triggered, the disposition to have counteradaptive preferences is not (and vice versa). Type B interventions are modifiers. The net effect differs from the effects of the component dispositions. There is a variety of type B interventions. Elster (1999, p. 8) distinguishes between B₁ mechanisms, where one (external) cause triggers both component dispositions and B₂ mechanisms, where one component triggers the other. Both type A and type B mechanisms make prediction problematic. In the first case the indeterminacy concerns which (if any) of several causal chains will be triggered. In the second case we can predict the triggering of two causal chains, but the net effect is indeterminate. In the aquatic example, the demands to forage and to avoid predation govern the behaviour of fish. But while the triggering of these dispositions is easy to predict, the net effect is not.

Elster's view is attractive too. *Prima facie* there is at least one other reason why dispositions are introduced than to provide stopgap covering law explanations, namely to explain how things happen. This alternative origin of dispositions should also be kept track of.

(E1) *Elster-program in progress, step 1:*

A disposition predicate identifying a way in which things happen is introduced

3. Two differences between Levi and Elster

There are real differences between Levi and Elster. Most obviously, Levi's dispositions are surefire while Elster's mechanisms are not. The latter can be combined, and type A and B mechanisms cannot be surefire nor can their components. A consequence of Levi's committal to surefire dispositions is that he cannot accept configurations of A and B type. Levi's position is therefore [p. 319] exposed to many of the counter examples currently in vogue. If neither A nor B interventions are admissible, then the existence of *finks*, *antidotes*, and *intrinsic maskers* must also be denied.

A finkish disposition ceases to exist upon the instantiation of the disposition's characteristic stimulus condition and so the manifestation or response is not brought about. C. B. Martin's (1994) electro-fink example is paradigmatic. Here is a version of it: We have an electrical wire disposed to transmit a certain wattage for a certain duration. To this wire we connect a sensitive and fast-acting circuit-breaker (the fink). Now, the stimulus (=closing the circuit) that would normally trigger the disposition's manifestation (=transmitting the wattage) also triggers the fink (=the circuit-breaker), which makes the disposition to transmit the wattage disappear, and the manifestation process is cancelled. It takes some time before the fink reacts, but it also takes some time to transmit the wattage, and it can be aborted before completion (Lewis 1997).

While not put to the test, most of us would say that the fink and the disposition can exist side by side as two dispositions had by different objects. The fink does not influence the disposition of the wire at that time. But conditional accounts of Levi's kind would not say that. I agree with Levi (2003, p. 149) that coming to know that there is an electro-fink makes one disposed to abandon the claim that the wire has the surefire disposition to transmit a certain wattage for a

certain time. But whereas he thinks that what is abandoned is the belief that the wire has a disposition I think that what is abandoned is the belief that this disposition is surefire.

Similarly for antidotes. An antidote interferes with the operation of the disposition without destroying its causal basis. It merely breaks the causal chain leading from stimulus to response (Bird 1998). An antidote to a poison may change the patient's physiology so the poison cannot do the damage it normally does or by repairing the damage done before it can result in illness or death. Intrinsic maskers, finally, can neither be admitted by Levi. George Molnar (1999, p. 5) scans Greek mythology and comes up with Tantalus, whose ability to drink was masked by his disposition to cause all fluids he approached to evaporate; and King Midas, whose disposition to turn everything he touched into gold masked his ability to nourish himself. In his late book, Molnar (2003, p. 93, footnote) even adds the case of an intrinsic masking of an intrinsic masker:

"Among the satellites now in orbit is one designed to receive infrared signals from deep space. As the satellite's own heat system would mask the incoming signals, the antennae by which the signals are received have to be continuously cooled with liquid nitrogen. This cooling is a case of intrinsic masking of an intrinsic masker."

[p. 320] Finks, antidotes, and maskers are not acceptable to Levi, at least not in an early stage of inquiry. But they all fit nicely with Elster's view. Plainly, all three are mechanisms of type A (the philosophy of dispositions could have use for some of his type B mechanisms as well). Thus, Levi's and Elster's approaches to dispositions clearly differ in this way.

The second difference between Levi and Elster is that Levi's dispositions add to the number of laws, while Elster's mechanisms identify ways in which things happen. Explicitly, Elster only claims that identifying a way in which things happen is to do more than just to describe but less than to state a law: It is to identify an easily recognizable causal pattern. As will be seen in the

section on Salmon, I think the conception of dispositions as ways in which things happen promises more but let us settle with what Elster explicitly claims for now. It is enough for creating a difference between the two views. Does it have further consequences?

Even if I haven't seen Elster making this point, dispositions as ways in which things happen seem sometimes to be introduced into research programs where there is a covering law.

Sometimes the laws are felt to be of the wrong kind. Early research about crucian carp is a good instance in case. Because of the morphological differences, the two morphs were at that time classified as distinct species.

Already in 1838, a Swedish priest, C. U. Ekström, rejected the idea that there were two species of this carp. Not observing the actual change in particular individuals, he examined lakes where a transition from one type of fish to the other had taken place. Rather than concluding that one species had miraculously transformed into another, he conjectured that the different types of fish represented two morphs of the same species. Ekström (1839, p. 225) had a clear opinion on the more precise explanation, namely that differences in resource levels affected the body morphologies of crucian carp.ⁱⁱⁱ This leads to the following two generalisations (ranging over crucian carps):

- (CC1) $(x)(t)\{ \text{the habitat of } x \text{ is resourceful at } t \supset x \text{ develops into the deeper bodied morph at } t(+\Delta t) \}$
- (CC2) $(x)(t)\{ \text{the habitat of } x \text{ is not resourceful at } t \supset x \text{ develops into the streamlined morph at } t(+\Delta t) \}$

One interesting thing about CC1 and CC2 is that they seem to be true, at least in natural environments. It is even the case that some contemporary [p. 321] Finnish ecologists still hold them to be explanatory of the fact that there are two different morphs of crucian carp. And these covering laws may well be true also on the morphological defense story. Northern pike are very efficient both as colonizers and as predators, but they are gape-limited so there is a size-refuge for prey. In Scandinavia you will hardly find a lake without pike. Crucian carp have

been of economic interest. Farmers used to put them in all kinds of more or less temporary ponds with comparatively low resource levels, especially after some time since the populations were normally dense. Since crucian carp is extremely vulnerable to predation, we will expect to find only two kinds of environments where it exists: On the one hand in pikeless ponds where it forms dense populations; on the other in lakes with pike and comparatively few individuals of crucian carp. Resources are sparse in the first kind of habitat and rich in the other. Ekström even called the two morphs the pond- and the lake-morph, and if we disregard the morph/species-distinction, "Dam-ruda" and "Sjö-ruda" were already established Swedish names for them.

It is implausible to think that Brönmark and Miner introduced their disposition in an effort to provide a stopgap explanation along the lines suggested by Levi's L1: no relevant gap seems to have existed. It is more likely that E1 motivated the introduction: they wanted to find a way -- or maybe the way -- in which this morphological change happens.^{iv}

4. Etiological and constitutive aspects of explanation

Wesley Salmon (1984, pp. 269--270) usefully distinguished between "etiological" and "constitutive" explanations. Etiological explanations explain a given fact by showing how it came to be as a result of antecedent events, processes, and conditions. A constitutive explanation, on the other hand, does not explain in terms of antecedents. The explanation shows, instead, that the fact to be explained is constituted by underlying mechanisms. For instance, according to Salmon, many cases of physical reduction qualify as constitutive explanations. Both etiological and constitutive explanations are relevant aspects of the full explanation. For illustration, let us have a look at Salmon's (1984, pp. 270--271) own example:

In order to give a full explanation of the destruction of Hiroshima near the end of World War II, it would be necessary to refer to an atomic bomb and to explain [p. 322] the explosion in

terms of the assembly of a critical mass of U-235. Such an explanation would embody constitutive aspects. The explosion is explained in terms of a self-sustaining chain reaction, and this notion is causally explained in terms of the mechanisms of nuclear fission. The same explanation of the destruction of Hiroshima would include reference to the dropping of the bomb from an aeroplane and the detonation by implosion of a critical mass of fissionable material at a certain place above the city. These are etiological factors because they are antecedent events that contributed causally to the occurrence of the explanandum-event.

From this point of view, whether one opts for L1 or E1 has perhaps to do with the kind of explanatory project or explanatory phase one is involved in. It is to be expected for historic reasons that covering laws occur in etiological explanation, and that L1 marks an etiological interest. L1 is deep-rooted in a Humean tradition. In Elster (1983) it is also clear that E1 implies work on the constitutive aspects of explanation. Search for mechanisms in the social sciences was connected to the program of methodological individualism -- the idea that all social phenomena can be explained in terms of individuals and their behaviour. Nowadays, Elster is not equally outspoken about reductionistic matters, but it is still fair to say that E1 is connected to constitutive explanation. To the extent that Elster is moving away from that conception there are others interested in pursuing projects similar to the original. John Dupré (1993, p. 106) is one example:

"Reductive explanation is required to account for how things of a certain kind do what they do; but they typically do not help us to understand or to predict what, among the behaviours of which it is capable, a complex thing will do."

What L1 and E1 primarily teach us according to this view, inspired by Salmon, is that disposition predicates can be used in both etiological and constitutive explanation. Can E1 and L1 also be understood as two starting-points leading to the same kind of complete explanation, that is, is the idea of a full explanation applicable? It is to be noted that Levi

accepts the possibility of intervening dispositions, such as finks, at later stages when but only when the original stopgap explanation can be removed without cost. At (L final) the disposition predicate has lost its placeholder function entirely. When this happens, opposing or masking dispositions provide no further threat to the inquiry. So for Levi the bridge offered is OK so long as L1 comes first. Elster should also be in favour of reconciliation, although he is sceptic about the possibility to find lawlike generalisations in the special sciences: "[M]echanisms are good only because they enable us to explain when generalizations break down. They aren't desirable in themselves, only *faute de mieux*." (Elster 1999, p. 6). [p. 322] It seems then that E1 and L1 could be understood as two starting points ideally leading to the same full explanation.

Here is a possible objection to that project. The explanans of the constitutive explanation in Salmon's example concerns the assembly of a critical mass of U-235. What explanandum does it fit? Arguably, it primarily fits an explanation of the bomb's property of being explosive. The self-sustaining chain reaction, on the other hand, is part of the explanans of an event, the explosion of the bomb, which is a different explanandum. A distinction in terms of different explananda is there to make. On the one hand we seem to explain either a property or an object by explaining how it is constituted; on the other hand we explain an event or change etiologically by explaining why it took place. Many examples of this kind of distinction and its consequences can be found in Dupré's 1993 book. But he differs from Salmon in being sceptical about the possibilities for constitutive explanation to function in an etiological explanation. Recall the last part of the above quotation: "but they typically do not help us to understand or to predict what, among the behaviours of which it is capable, a complex thing will do." Dupré continues: "The latter is generally to be addressed in terms of the autonomous understanding of the phenomena at the higher level" (Dupré 1993, p. 106).

If the objection is correct, etiological and constitutive explanation are on different tracks. There is no bridge between them. In one sense the problem concerning the differences between Levi's and Elster's views of dispositions then dissolves. There is no need to reconcile the two

perspectives since they will never meet halfway. Salmon's ideas have been useful but in a negative way. Levi examines dispositions functioning on the etiological level. Elster and/or Dupré propose an account of dispositions on the constitutive level. But that result would be troublesome for later phases of Levi-dispositions becoming real. How can integration of initially problem-raising disposition predicates be achieved if we assume that we have an autonomous understanding of the phenomena occurring as stimulus and response? Levi should be careful not to follow Dupré's lead.

And Dupré is entitled only to the claim that we cannot *in general* assume that constitutive and etiological explanations can be combined. There may still be plenty of cases where Salmon's ideas are applicable. In those cases it provides a bridge that potentially both Levi and Elster might benefit from.

It is almost a dilemma. Dupré's view presents one horn and Salmon's view can be seen as the other. Besides offering a bridge that is useful *eventually*, the notion of full explanation accentuates the tension between L1 and intervening dispositions *right from the start*. I am not sure that Levi can live happily with the idea that inquirers should stick to the idea that dispositions generate [p. 324] covering laws in such circumstances. I think that in a step closely following L1, that is, much earlier than (L final), Levi should be prepared to make suitable changes. If this can be done at limited cost, things look bright. If not, then maybe Levi should give up L1 altogether.

That would not be the end. There would still be an interesting story to tell about integration. The reality of dispositions could be another kind of work in progress leading to the same outcome. To say with Levi that the reality of dispositions is a work in progress is to say that dispositions are real only when their placeholder mission has been accomplished (Levi 2003, p. 152). Speaking metaphysically, Levi is in favour of type A and type B. All but only real dispositions can handle such cases because real dispositions are not restricted by L1.

5. Dispositions: Metaphysics and inquiry

Everything but the previous paragraph seems to have been driven by epistemological considerations. Does Levi's approach tell us anything about the *metaphysics* of dispositions? That depends on what we include in the metaphysical study. My impression is that we include much more than is usually acknowledged. To begin with, many discussions in metaphysical texts concern *existence criteria*. For one example, versions of the Eleatic Stranger's test (the mark of being is power) abound in contemporary metaphysics and especially in the metaphysics of dispositions. Another illustration is found in work on Ramsey sentences. Some metaphysicians take these as providing existence criteria for what properties there are. To answer that question, D. H. Mellor takes all predicates in statements of laws of nature. He then conjoins them, replaces all the predicates with variables, and gets a Ramsey sentence which says that 'there are in the world properties that occur in this and that way in laws of nature'. "So, for me", continues Mellor in a *Theoria* interview, "this Ramsey-sentence provides an existence criterion, i.e. a claim about what determines what factual properties there are in the world. I think we need such a criterion, because without one it's too easy to postulate properties without having any clear idea of what counts as a property, or what determines whether some property you've postulated really exists." (Maurin & Persson 2001). In the present context, Levi (2003, p. 141) discusses the possibility that successful integration of disposition predicates give rise to two characteristics also figuring as well-known criteria for properties: The problem-solving steps make safe that dispositions display themselves in more ways than one and that two objects which differ with respect to one property must differ with respect to another. Questions concerning existence criteria seem as epistemological as [p. 324] they are metaphysical in the sense that they use fundamentally epistemological considerations to motivate metaphysical conclusions. There is nothing particularly strange about this. We also use explanatory considerations, arguments from simplicity, etc, in metaphysical enterprises. There is, to my knowledge, no exclusive metaphysical machinery. Moreover, students of metaphysics do not

employ more rigorous acceptability criteria. They cannot even since good evidence is so hard to come by in metaphysics.

A more promising suggestion would be that metaphysical questions typically differ from other kinds of questions in philosophy and science. "What makes the descriptions given in a scientific theory true?" is unlikely to be found in other kinds of inquiry than metaphysics. For one thing it is more general than most similar questions posed within that science.^v According to this suggestion, whether Levi's approach tells us anything about the metaphysics of dispositions depends on whether the questions he poses could appear in metaphysical inquiry (or whether the kind of conclusions he comes to could function as answers to questions posed in metaphysical inquiry). It cannot be denied that Levi's questions more often than not are of the right kind. On the plausible assumption that the theories we integrate into are supposed to be true, Levi's account interlocks nicely with metaphysical interests.

Conclusion

More than thirty years ago Isaac Levi made an intriguing suggestion about how further inquiry may improve upon a problem-raising disposition predicate's chances of eventually being taken to express a real property. First, it should function in a stopgap explanation. For a while, as long as nothing better is suggested, it will be safe in that position. But this is because it also carries a promise of transforming into a problem-solving predicate in the future. Should this promise not be fulfilled, or should the participants in the program suddenly decide that it already constitutes a satisfactory explanation, it degenerates to the point that it becomes mystery-raising. By being adequately integrated, on the other hand, we have every reason to think that the disposition is real, and this is what Levi intends with the slogan: "The reality of dispositions is a work in progress".

Levi does not, however, provide the complete story of the rise and fall of disposition predicates. Especially the part about how disposition predicates are introduced lacks an alternative,

captured by Elster's suggestive remarks about ways in which things are. As it stands it is a conception of dispositions that seems to be in open conflict with Levi's postulate in L1, which, as we have seen, is problematic also for other reasons. I think of Elster's suggestion as an important addition to Levi's picture and a weakness of Levi's current position that it cannot allow for many interactions between different dispositions until the programme is fully completed. I also think that it would be congenial to Levi's general approach to inquiry to develop this view of his on dispositions further so that several beginnings can be accepted.

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Endnotes

ⁱ We should perhaps add this extra time now and in the parallel cases, although it is not included in Levi.

ⁱⁱ It is an interesting thought, but one that I cannot pursue at this point, that the translation is less than perfect. Evidence, but not an argument, for this is the fact that George Molnar, who was as liberal concerning interventions as Elster is, switched from "dispositions" to "powers" in later writings (Molnar 2003). Maybe mechanisms are more fundamental than dispositions. Mechanisms might give rise to dispositions but not vice versa. If Levi would agree, reconciliation between the two programmes would be substantially facilitated.

ⁱⁱⁱ "Att Dam-rudan, försatt i frihet, återtager sin naturliga breda form, synes äfven deraf, att ju oftare hon omplanteras i nya dammar, der öfverflöd på näring finnes, desto bredare blir kroppsformen."

^{iv} From what I have learned from professional ecologists it is not uncommon to suggest to a PhD-student that he or she should first establish a good and interesting correlation in the area of interest, and then go on to suggest mechanisms explaining it.

^v Compare Mellor in the *Theoria* interview.