

DISPOSITIONAL EXPRESSIONS

1 INTRODUCTION

The class of dispositional expressions is varied, and its extension is debated and potentially very broad. Goodman (1954: 3) says that it ‘includes not only predicates ending in “ible” and “able” but almost every objective predicate, such as “is red”.’ We may distinguish covertly dispositional expressions: ‘soluble’ and ‘fragile’ for example, and overtly dispositional expressions: ‘disposed to dissolve when immersed in water’, ‘disposed to break when struck’. What makes these *dispositional* is, roughly speaking, that they indicate that the objects of which they are predicated would behave in certain ways (their manifestations) in certain circumstances (their stimuli).

Dispositional expressions are one kind of thing. Dispositions are another. The former is a subclass of predicates. The latter is a subclass of properties. The connection between the two is not at all straightforward. For dispositional and non-dispositional expressions may co-refer (‘avarice’ and ‘the property most conspicuously displayed by Molière’s Harpagon’). And while the class of dispositional predicates is neither empty nor exhaustive, it is a matter of debate whether any or all properties are truly dispositional in nature. Paradigm dispositional expressions (e.g. ‘soluble’) indicate the definite occurrence of a manifestation in suitable circumstances; the corresponding properties are ‘sure-fire’ dispositions. In addition to these are terms (such as ‘irascible’) that indicate some degree of liability for the manifestation to occur in suitable circumstances. Correspondingly, in addition to sure-fire dispositions there is a class of disposition-like properties that includes capacities, tendencies, and propensities.

While there has been a continuous tradition of generating and refining analyses of dispositions since the 1930s, the function and nature of such analyses have not been constant. Initially philosophers focussed on analyzing dispositional expressions or concepts (linguistic or mental items), but more recent philosophical concern purports to be more with the properties themselves (features of the world). At the same time the motivation for attempts at analysis has shifted. The tradition starts with Carnap’s attempt to reconcile the role of dispositional terms in science with his verificationism. In the middle part of the twentieth century, interest in dispositions centered on Ryle’s dispositional view of the mind and then later on the functionalist theory of mental states. More recently, fundamental natural properties have been held to be dispositional in nature and the analysis of dispositions is invoked in accounting for the laws of nature. This eighty-year history of the analysis of dispositions reveals changing conceptions of the function of philosophical analysis and its relationship to the philosophy of language.

2 CARNAP ON TESTABILITY AND DISPOSITION CONCEPTS

Carnap’s interest in dispositional expressions stems from a dilemma presented by his commitment to a certain brand of empiricism. That empiricism gives a special place

to science. Science is the paradigm of what can be known and what can be said. Indeed the logical positivists sometimes suggest that science is coextensive with the extent of possible knowledge. According to Ayer (1936) 'There is no field of experience which cannot, in principle, be brought under some form of scientific law, and no type of speculative knowledge about the world which it is, in principle, beyond the power of science to give.' Given this emphasis on the primacy of science, it is important for the positivists to accommodate rather than reject the statements of science—which stands in contrast to their attitude towards the statements of metaphysics. And dispositional expressions play an important role in the statements of science. Carnap's principal example is the predicate 'soluble', but many central terms in science may be considered dispositional also (although particular cases may be disputed). 'Fitness' in evolutionary biology concerns an organism's disposition to survive and breed (Mills and Beatty 1979); 'electric charge' denotes a body's disposition to exert a force on another charged body (Broad 1933: 267); and so forth. Thus the commitment to science implies to a commitment to provide a satisfactory philosophical account of such predicates.

This empiricism also seemed to the positivists to provide a particular role for philosophical analysis. For the all-encompassing role of science also, it appeared to them, demands that philosophy should not be regarded as making contentful statements about the world. If philosophers claim to be so doing, then their efforts would fail and should be excluded from philosophy. Hence the rejection of metaphysics. The propositions of philosophy, says Ayer (1936: 76), 'are not factual but linguistic in character . . . they express definitions, or the formal consequences of definitions.' Such a view requires a demarcation principle, to differentiate those statements that are factual (the statements of science) from those that purport to be factual but which are not (the statements of metaphysics). Furthermore, since philosophy is in the business of supplying definitions, it invites us to supply principles that constrain what counts as an acceptable definition. As is well known both tasks are achieved by the verification principle, which Carnap (1936: 420) expresses thus, 'the meaning of a sentence is in a certain sense identical with the way we determine its truth or falsehood; and a sentence has meaning only if such a determination is possible.' Like Ayer, Carnap (1935) emphasizes that philosophy is primarily concerned with language, 'The function of logical analysis is to analyze all knowledge, all assertions of science and of everyday life, in order to make clear the sense of each such assertion and the connections between them. One of the principal tasks of the logical analysis of a given proposition is to find out the method of verification for that proposition.'

So logical empiricism demands that the role of philosophy is to analyze the propositions of science in terms of their method of verification, and in the light of the central role they play in science, it requires that we provide such an analysis of sentences containing dispositional predicates in particular. However, if we take the method of verification to require direct observation, then a problem arises, for the satisfaction of dispositional predicates is not always directly observable. That a

particular crystal is soluble is not directly observable, so long as it is not placed in water. A sample of barium sulphate and a sample of sodium chloride may look just the same. If neither is immersed in water, then there is no apparent difference between the solubility of the former and in the insolubility of the latter. Likewise a charged particle and a neutral particle will behave the same so long as there is no electric or magnetic field. Since an important scientific difference is not always directly verifiable, we have a *prima facie* challenge to verificationism.

While the immediate context of Carnap's article 'Testability and meaning' is the analysis of a key class of scientific predicates, logical empiricists also had a broader concern with dispositions. Phenomenalism has always been attractive to empiricists as a way of maintaining the exclusive epistemological role of experience without succumbing to scepticism. But since a simple reduction to actual experiences leads to well-known problems, unless one resorts to Berkeley's theological solution, it is natural to consider reduction to *possible* experiences, as in Mill's 'permanent possibilities of sensation' or later Mach's 'functional relations of elements' (where elements are, more or less, the same as sensations). It is natural to interpret Mach's relations as dispositions. Mach himself intended 'function' to have its mathematical sense. But then, Schlick (1918: 212–14) complains, we would be reducing a material thing to 'something quite shadowy', and furthermore something that is a relation between things that do not exist (the possible but non-actual sensations).

So, in order to satisfy the verificationist demand that meaningful statements should be verifiable, the testing that will verify or confirm the presence or otherwise of a disposition needs to be more than direct observation. It might be tempting to think that 'solubility' and 'charge' name unobservable properties of things that cause their behaviour in water or in electro-magnetic fields. But this is precisely the kind of metaphysics that positivism rejects. Instead we should understand these expressions in terms of the kind of observable test that would confirm their correct application. Clearly an appropriate test of the difference between a soluble item and an insoluble item is to observe their dissolving or not dissolving *when the items are placed in water*. So, according to Carnap (1936), a natural first pass at a definition of 'x is soluble' is 'whenever x is placed in water, x dissolves'.

The use of 'whenever' is a mistake, for as Mellor (1974: 106) notes, this makes solubility an immutable property. It may be that in using 'whenever' Carnap was influenced by a sense of the modal nature of disposition ascriptions, to which we shall come later. Be that as it may, whether an object is soluble *now* should not depend on how it is at previous or later times, for things can gain and lose dispositions. If we ignore this error, we can express Carnap's view thus:

$$(D) Sx \text{ iff } (Wx \rightarrow Dx)$$

where 'Sx' symbolizes 'x is soluble'; 'Wx' is 'x is placed in water'; 'Dx' is 'x dissolves'. Wx is the *test* condition (later *stimulus* condition) and Dx is the *response* condition (also *manifestation* condition).

The objection to (D) that Carnap immediately raises concerns an item that is never

in its history placed in water, for example a match which is never placed in water and then is burned up. We see that the right hand side of (D) is satisfied trivially. Thus the match counts as soluble even though it clearly is not.

Carnap then considers the ‘bilateral reduction sentence’:

$$(R) Wx \rightarrow (Sx \leftrightarrow Dx).$$

(R) provides a test both for the presence of and for the absence of solubility, and to that degree satisfies the requirements of the verification principle concerning meaning. On the other hand, as Carnap recognizes, (R) does not say anything about the solubility or otherwise of some item that is not in water. And so (R) does not provide any way of eliminating talk of solubility.

These points against (R) were also made by Storer (1951). Storer’s response was to note that a soluble item not in water is like, in other respects, items that are in water and dissolving and is unlike, in that respect, items that are insoluble. So to say that something is soluble is to say:

either it is in water and dissolves; *or* it has some property B, such that B is possessed by some other item that is in water and does dissolve and B is not possessed by any item that is in water and does not dissolve.

Storer’s proposal is notable in that it is the first to introduce a component that would later become to be thought of as the *causal basis* of the disposition. This is moving away from Carnap’s concern with verifiability, to the extent that the possession of the causal basis is not itself something that is guaranteed to be verifiable. For example, the sort of property that Storer had in mind would be ‘being sugar’. Being sugar is not a directly verifiable property, and might be held to be one that is verified by the identification of its characteristic dispositions. Furthermore, without restricting the quantification over properties (e.g. to natural properties) there are substitutions for B that make any object soluble (e.g. the property of being identical either to this stone [insoluble, not in water] or to that sugar cube [in water and dissolving], which is a property possessed by the stone).

More immediately problematic is the fact that we can imagine that an object might have a disposition yet be the only thing of its kind to have that disposition. If it does not undergo the relevant test procedure (e.g. being placed in water) then Storer’s analysis will deny that the object has the disposition. For example, we might imagine that industrial chemists devise an entirely new material that is soluble. The basis of its solubility is a novel feature of this material, and so no other substance dissolves in virtue of possessing this property. If the chemists only ever make one sample of this material which they burn in due course, without ever placing in water, then this material will not count as soluble. On the other hand, had the chemists made a second, identical sample, which they did place in water (and so which does dissolve), the first sample would count soluble. In short, the objection is that whether or not an object has a disposition such as solubility cannot depend on whether other similar objects exist and are subjected to the relevant test.

3 INTRODUCING STRONGER THAN MATERIAL CONDITIONALS

Carnap and his contemporaries sought to provide an analysis of dispositional concepts employing only second order, classical, extensional logic. The suggestion that the second order quantification should be limited to natural properties is one proposal that would break away from this restriction. A more important proposal in the same direction concerns the nature of the appropriate conditional. Ryle (1949: 123) asserts that, ‘To say that this lump of sugar is soluble is to say that it would dissolve, if submerged anywhere, at any time and in any parcel of water.’ Storer (1951: 134) says concerning definitions of dispositional concepts (such as colour predicates):

The peculiarity of all such definitions is the occurrence of sentences of the type: “If so and so *were to happen*, then such and such *would be* the case”. In a current phrase, all definitions of dispositional predicates involve the use of contrary to fact conditionals.

So both Ryle and Storer recognize the connection between dispositions and counterfactuals, but retreat from making much of this connection when giving further detail, primarily because of empiricist concerns at the metaphysical implications of taking counterfactuals at face value. Counterfactual conditionals (and other subjunctive conditionals, which are understood to be included) have a modal component, seemingly telling us about non-actual potentialities. Ryle takes it that there can be no fact of the matter concerning non-actual potentialities. Consequently the sentence ‘this lump of sugar would dissolve if placed in water’ does not assert some factual truth, such as the attribution of a property to a thing. Rather, along with law-statements, such assertions must be understood as inference-tickets: one is entitled to infer from ‘this lump of sugar is in water’ to ‘this lump of sugar is dissolving’. In effect the modal feature of dispositions is located in the inference-ticket. Ryle does not tell us what features of the world entitles us to employ such an inference-ticket.

Storer points out that the second half of the second disjunct in his analysis (‘B is not possessed by any item that is in water and does not dissolve’) is equivalent to: everything that is B is such that if it is placed in water then it dissolves. That covers the conditional component of the counterfactual conditional, but not the modal. The modal feature is in effect what Storer is trying to capture by the idea of there being a causal basis that is shared between an item not undergoing the test and other items that are being tested. Implicitly, Storer is suggesting that the causal basis is a property that would bring about the response in the object, were it to be tested—but without resorting to modal language.

In the light of the forgoing it is not surprising that philosophers should eventually conclude that dispositions could not be analyzed using the material conditional. Rather, a stronger than material conditional needs to be employed, which we may symbolise by ‘ \Rightarrow ’ (without saying too much about its nature). We can also use ‘Sx’ to denote the test/stimulus condition, ‘Mx’ to denote the response/manifestation condition, and ‘D_(S,M)’ to denote the disposition to yield manifestation M in response

to stimulus S.

Sellars (1958) asserts that ascription of a disposition is simply to assert a relation of implication between the stimulus and manifestation. Hence:

$$(W) D_{(S,M)}x \text{ iff } Sx \Rightarrow Mx.$$

The philosophical task, according to Sellars, is to explain what ' \Rightarrow ' means. Sellars himself draws on the idea of 'causal implication' (which we find also in Pap 1958), and expresses the idea found in Storer and also in Burks (1955), that we may need to appeal to the idea that when there is dispositional relationship between Sx and Mx there is a kind or property to which x belongs and which plays some kind of causal or nomological role in bringing about Mx . These authors were concerned whether their notions of causal implication are compatible with a Humean regularity view of causation and law (Malzkorn 2001: 343).

4 THE CONDITIONAL ANALYSIS OF DISPOSITIONS

The position in the 1950s was that philosophers recognized that dispositional and counterfactual assertions are related and that both of these have connections with statements concerning laws and causes. Goodman (1954) distinguished the analysis of counterfactuals from analyzing the meaning of law statements. On the other hand, by his own admission, Goodman was unable to articulate the details of their relationship. Furthermore, he remained committed to a Humean view of laws that distinguishes them from other regularities only in virtue of our propensity to use them in inferences and predictions (cf. the Rylean inference-ticket view of dispositions and laws mentioned above).

The discussion of the analysis of dispositions was given a major impetus by the development of a semantics for counterfactuals by Stalnaker (1968) and Lewis (1973), following earlier work by Kripke on semantics for modal logic. The semantics provided for counterfactuals made them philosophically respectable, while also articulating their problematic relationship with laws. Lewis also provided an account of causation in terms of counterfactuals, allowing a further dissociation of counterfactuals, laws, and causes. Thus it was possible to see that the causal conditional of Burks, Pap, and Sellars is a conflation of two related but separate notions, the counterfactual conditional and causation.

Furthermore, Lewis's account is based on an objective Humean view of laws rather than one depending on inference tickets or habits, thus providing a firm metaphysical basis for understanding dispositions from a Humean/empiricist perspective. At the same time, concern about the empiricist credentials of any analysis was waning as a result of a more general retreat of empiricism in the philosophy of science, and the resurgence of interest in metaphysics, especially modal metaphysics, thanks to the work of Kripke and others.

In the light of the above, we can replace the ' \Rightarrow ' in (W) with a pure counterfactual conditional: ' $\Box \rightarrow$ '. Thus (W) becomes what would become known as the (simple)

conditional analysis of dispositions, the basis of much of the recent discussion of dispositional expressions:

$$(CA) D_{(S,M)}x \text{ iff } Sx \Box \rightarrow Mx.$$

By the 1960s, it was widely accepted that dispositional statements either mean the same as or at least entail counterfactual or subjunctive conditionals. Armstrong (1969: 23) tells us, as if it were not much more than a platitude, that, 'If we consider the attribution of (say) brittleness to a particular piece of glass then one outstanding feature of the attribution is that it licenses certain *conditionals*. If the glass remains unbroken, then conditionals will be 'counterfactual'. If the glass had been struck, it would have broken.' However, until Stalnaker and Lewis, counterfactuals were themselves sufficiently mysterious and even suspect that authors felt obliged not to rest content with analyzing dispositions in terms of counterfactuals but were required to bypass the counterfactuals and to give an account in yet further terms that reflect wider philosophical (typically metaphysical) concerns. After Lewis, it was possible to distinguish acceptance of the (subjunctive/counterfactual) conditional account of the meaning of disposition statements from discussion of the metaphysics of dispositions. Thus (CA) was generally accepted, while debates focused on metaphysical issues that will be mentioned below.

5 OBJECTIONS TO THE CONDITIONAL ANALYSIS AND FURTHER DEVELOPMENTS

The conditional analysis, however, suffers from now well-known flaws. Martin's (1994) counterexample of a *finkish* disposition exploits the fact that in a normal case of stimulating a disposition in order to bring about its manifestation, that process takes time. The object may be stimulated at time t but the manifestation occurs only at $t+\delta$. Dispositions come and go. Very hot glass is not fragile. So a fragile glass might lose its fragility by being heated. Let us imagine that were the stimulus to occur at t that would cause the disposition to disappear very quickly, certainly well before $t+\delta$. As a consequence, the process that would normally lead to the manifestation is interrupted, and the manifestation does not occur. So, for example, striking a fragile glass causes it to be heated very rapidly, sufficiently rapidly that the process of breaking is halted, and the glass does not break. In such a case the glass is fragile at t , but, since it is struck at t but does not subsequently break, it is *false* at t that were the glass struck it would break. (See Lewis (1997) for an attempt to reform (CA) to handle finks.)

Other objections focus on the fact that even if the disposition remains in place, its presence plus the stimulus may not be causally sufficient to bring about the manifestation. For environmental conditions may need to be appropriate, and the causal process may need to take place in a particular way. If such conditions are interfered with, the manifestation may not occur. Such interferers are *masks* (Johnston 1992) or *antidotes* (Bird 1998).

The 1990s and 2000s saw increased interest in the analysis of dispositions coming

from a number of quarters. In the philosophy of language, Kripke (1982) considered and rejected dispositional accounts of rule-following, meaning, and understanding. But Martin and Heil (1998) argued that such a rejection depends on accepting (CA). The falsity of (CA) means that a counterfactual account of X and a dispositional account of X will differ in certain cases. Consequently problems with a counterfactual account of, for example, intentional or free action (Frankfurt 1969) may be overcome by preferring an account in terms of dispositions or related states, such as capacities (Smith 1997). In both cases, the objections can be seen to be trading on finks or masks/antidotes.

As it stands, (CA) provides an analysis only of overtly dispositional locutions, such as ‘is disposed to dissolve when placed in water’. Nonetheless, most of the discussion of the analysis of dispositional expressions concerns covertly dispositional locutions such as ‘soluble’, proceeding on the assumption that the equivalence between the covert and overt expressions is straightforward and obvious. For example, we found that (CA) seems to be refuted because something may be fragile yet it is false that it would break if stressed. But such a counterexample works only on the assumption just discussed, that the covertly dispositional ‘*x* is fragile’ is equivalent to the overtly dispositional ‘*x* is disposed to break when stressed’. However, if that assumption is mistaken then the existence of finks and antidotes cannot be taken immediately to refute (CA). It might instead refute the simplistic equation of covertly and overtly dispositional expressions (cf. Lewis 1997: 153; Choi 2003: 576–7). Indeed Choi (2008) undertakes a defence of (CA) on precisely this basis.

A problem arises when we combine (CA) with the standard Stalnaker–Lewis semantics for counterfactuals. That semantics include the centering condition: $A \wedge B$ entails $A \Box \rightarrow B$. Thus any two facts are related by the subjunctive conditional ‘ $\Box \rightarrow$ ’. (CA) says that any two possible or actual states that are subjunctively related are dispositionally related. Combining these tells us that any two facts are dispositionally related. Since that is clearly false, either (CA) needs amendment or the Stalnaker–Lewis semantics does. Since there are independent reasons for wanting to adjust the latter, it might be worth considering whether further adjustments to the semantics for ‘ $\Box \rightarrow$ ’. For example, we may give up not only centering but also weak centering: $A \Box \rightarrow B$ entails $A \rightarrow B$. If we do this, then it is no longer clear that finks and antidotes suffice to refute (CA). For then a case where the stimulus S occurs but the manifestation M does not occur is consistent with $S \Box \rightarrow M$. That might be justified if what replaces weak centering is the condition that only in *normal* worlds where $S \Box \rightarrow M$ is true, is $S \rightarrow M$ also true (e.g. worlds without finks or masks/antidotes; cf. Gundersen 2002, 2004).

While such moves permit us to strengthen the tie between dispositions and subjunctive/counterfactual conditions, other developments propose movement in the opposite direction, for example the proposal that dispositions should be aligned with habitual or generic propositions.

6 METAPHYSICAL CONSIDERATIONS AGAIN

Carnap's original analysis was motivated by the (anti-)metaphysical considerations that underlie his verificationism. The latter is a doctrine concerning the meanings of expressions, and so the 'analysis of dispositions' is conceived of as providing a reductive account of linguistic expressions or concepts. A central concern was to avoid an analysis in terms that were equally troubling to a verificationist, such as unobservable properties or stronger-than-material conditionals.

The view that without suitable analysis dispositions were to be deemed not entirely respectable remained even after the verificationist impetus to Carnap's project had waned, and counterfactual/subjunctive conditionals themselves were accepted. (CA) tells us that to predicate a disposition of an object is equivalent to asserting a subjunctive conditional of it. But that tells us little about how the world and in particular the object in question must be for the dispositional or subjunctive predications— $D_{(S,M)}\mathbf{a}$ and $\mathbf{Sa} \Box \rightarrow \mathbf{Ma}$ —to be true. Ryle's inference-ticket phenomenalism rejects the idea that there is any particular way the actual world is. But as metaphysics itself returned to respectability, the question became more pressing: what would make either side of (CA) true? A common answer is that the subjunctive/counterfactual conditional is made true by the existence of some *categorical* property plus the laws of nature. Thus:

‘ $D_{(S,M)}\mathbf{a}$ ’ is made true by, for some categorical property F, \mathbf{Fa} and its being a law of nature that $\forall x(Fx \wedge Sx \rightarrow Mx)$

A categorical property is held to be one that has no troubling dispositional or conditional character, but is necessarily always fully manifest—shape and duration are often held to be examples, albeit disputed ones. As Mellor (1974: 157) puts it (not his own view): ‘Dispositions are as shameful in many eyes as pregnant spinsters used to be—ideally to be explained away, or entitled by a shotgun wedding to take the name of some decently real categorical property.’

In the light of the above, the following remarks are sometimes made:

(I) The dispositional–categorical distinction is primarily a conceptual or linguistic distinction, not a metaphysical one. The dispositional–categorical distinction is not a distinction between categories of properties, but between classes of expression, between those that permit a conditional analysis and those that do not (Strawson 2008; cf. Mumford 1998: 65).

(II) Dispositional expressions ($D_{(S,M)}$ in the above) are ones that characterize properties (such as F in the above) via their typical effects in the actual world with its actual laws of nature (Armstrong 1969, 1997, Quine 1973; Mackie 1973). Or they refer to higher-order functional properties (e.g. the property of possessing some categorical property such as F in the above) (Prior et al. 1982; Prior 1985). In the context of the philosophy of mind, where mental states may be seen as dispositions, the former yields an identity theory, whereas the latter

yields the functionalist view.

(III) Correspondingly, the failure of (CA) thanks to finks and masks/antidotes is sometimes held (a) to undermine the distinction between dispositional and categorical *expressions*, and (b) to vindicate the *metaphysical* programme of rehabilitating dispositional properties real properties as distinct from being either just as the shadows of conditionals or identical to categorical properties or higher order functional properties realized by categorical properties (Wright 1990, Martin 1994: 7; Mumford 1998: 63; Schrenk 2010: 171; cf. Mellor 1974).

Such debates reflect some unclarity about the nature of attempts to analyze dispositions and the relationship between the semantics and metaphysics of dispositions. As the idea that philosophical analysis is a matter of investigating our concepts comes under question (Williamson 2007), it might appear that the alternative in this case will hold that the philosophical activity of analyzing dispositions concerns those properties, the dispositions, rather than our concept of disposition. But to take such a view requires that there is indeed a distinct class of things the dispositional properties. That is what (I) above denies. (I) itself is plausible to the extent that it is plausible that (CA) or something like it is true. Conversely, if it is true that we cannot find a straightforward analysis of dispositions, it become more plausible that our dispositional expressions do pick out a distinct class of properties, properties that are dispositional in nature. The position has a rough analogue in the analysis of knowledge. If the simple justified true belief account of knowledge were correct, then that would indicate that 'knowledge' is a term that serves simply to pick our a subclass of beliefs, those that meet certain additional conditions. In which case it is plausible that the analysis of knowledge is just a matter of analysis a concept. On the other hand, as Williamson (1995) argues, the failure of attempt to analyze knowledge into belief plus other conditions is evidence that states of knowing are not a subclass of the states of belief, but constitute a distinct kind of mental state. In which case the analysis of knowledge (conceived more broadly than simply supplying necessary and sufficient conditions) is an investigation into the nature of knowledge itself.

On the other hand there is uncertainty as to whether the dispositional and disposition-like expressions themselves form a unified class. The distinction between covert and overt dispositional expressions has already been mentioned; it is not agreed that we can assimilate these to a single class. Moreover, terms for abilities, capacities, tendencies, and propensities have similarities to disposition terms, but no clear unification of all these is yet available. Putting that variety on one side, there are questions about what sort of thing such terms could refer to. The expression 'dispositional property' carries with it a degree of ambiguity. Some terms in basic physics refer to properties that are argued to be dispositional in nature or *essentially* dispositional, for example 'inertial mass', 'charge', 'velocity', and so forth (Ellis and Lierse 1994; Bird 2007; Lange 2005). Such properties are fundamental natural properties and so are good candidates for being sparse universals. On the other hand the paradigm disposition expressions discussed in the literature, such as 'fragility',

denote properties that are neither fundamental nor obviously natural (note the diversity of things that can be fragile and the manner of their being fragile, such as both an old parchment and the economy). If it is appropriate to think of these as referring to entities at all, the referents will be abundant universals. If ‘T’ refers to a sparse universal, it is plausible to think that the analyzing T is analyzing the thing, the universal T, and that this is a different exercise from analyzing the concept *T* (or the term ‘T’). On the other hand, if ‘T’ denotes an abundant universal, then it is rather less clear that there is distinction between analyzing T and analyzing the concept *T*. For the existence of abundant universals seems to be little more than an ontological shadow of the possibility of predication by the concept *T*—if, that is, there are abundant universals at all. So if properties that are paradigmatic dispositions such as fragility, solubility, malleability, etc. are not natural properties, then it is difficult to see how there can be a project of analyzing dispositions that is different from analyzing the concept *disposition*.

7 CONCLUSION

The earliest phase of the history of analyses of dispositions conceives itself as engaged in the task of analyzing dispositional expressions or concepts, providing substitutions equivalent in meaning. It was motivated by radically empiricist (anti)-metaphysics and epistemology which give rise to the verificationist criterion of meaningfulness. Carnap’s own failed attempts show that it is impossible to provide a complete analysis of dispositional expressions that complies with that criterion. The same empiricism limits Carnap to use of truth-functional connectives, so his ‘conditional’ analysis of dispositions invokes only the material conditional, which is too weak for the purposes required of it (e.g. characterising what is true of a soluble item that is not in water and distinguishing it from a non-soluble item not in water). Some authors noted that a soluble item not in water will often be similar to a soluble item that is placed in water (and so is dissolving). This approach is of interest because for the first time it introduces the idea of what we would now call the *causal basis* of the disposition, and because it raises questions concerning the naturalness of properties. Metaphysical questions of a kind inimical to radical empiricism are beginning to come to the fore. The true break with Carnap’s intended programme comes when it is understood that the material conditional needs to be replaced by something stronger and so non-truth-functional. This eventually settles on the counterfactual/subjunctive conditional, giving the standard (simple) conditional analysis of dispositions. It settles on this slowly partly because of residual empiricist scepticism about such conditionals but also because such conditionals were poorly understood—a state of affairs remedied by the possible-world semantics of Stalnaker and Lewis in the late 1960s and early 1970s.

The conditional analysis, backed up by a semantics for the conditional, is only the beginning of the contemporary story of the analysis of dispositions. This debate is pursued not, as it was by Carnap, to avoid substantive metaphysics but in order to aid it, first in order better to understand the commitments of a dispositional–functional

account of mind and then thanks to dispositional essentialist accounts of natural properties and laws. Nonetheless, the business of analyzing dispositions is still seen primarily as one concerning the nature of disposition expressions and concepts. But as such an approach is questioned by the recent debate regarding the nature of philosophical analysis itself: is analysis concerned with concepts or with the things themselves? The intertwining of the metaphysics and semantics of dispositions suggests that the plausibility of competing answers to that question may itself depend on the outcome of the actual process of analysis itself—a process that is by no means complete.

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