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The Two Factor Theory of the Mind–Brain Relation

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Abstract. The analysis of mental concepts suggests that the distinction between the mental and the nonmental is not ontologically fundamental, and that, whereas mental processes are one and the same things as the brain processes with which they are correlated, dispositional mental states depend causally on and are, thus, "distinct existences" from the states of the brain microstructure with which 'they' are correlated. It is argued that this difference in the relation between an entity and its composition/underlying structure applies across the board. all stuffs and processes are the same thing as is described by a description of their microstructure. In all cases where the manifestation of a disposition extends beyond the "skin" of the dispositional property bearer, dispositions invariably depend causally on the structure, usually the microstructure, of the bearer.

Key words: causal dependence, correlation, dispositional mental states, distinct existences, mental processes.

1. The Incoherence of the Mental/Physical Distinction

In a recent article (Place, 1999) I criticized Ryle's failure, acknowledged in his *Dilemmas* (Ryle, 1954), to develop an adequate account of the notion of "a category" in the following paragraph:

> Ryle's failure to sharpen up the notion of 'a category' is unfortunate for two reasons. Firstly, because he needs to rebut the claim made by Descartes and his followers that the distinction between the mental and the physical, between the *res cogitans* and the *res extensa*, is a distinction of category, using the term 'category' in its Aristotelian sense in which a category is the kind of thing you end up with if you go on asking the question 'And what kind of a thing is that?', and of which the category of substance (ουσια) is the prime example. Secondly, because the distinction he himself draws between "disposition verbs", "activity verbs" and "achievement verbs" corresponds to the distinction between *states of affairs* of which dispositions are an instance and which persist unchanged over a period of time, *processes* which are extended over time with continuous change and *instantaneous events* (stops and starts) whereby one state or process ends and another begins, which occur at moments of time, but are not extended over time. Not only do these groupings have a much better claim to be described as 'categories' than do the mental and the physical, it is evident that the distinction between these three basic categories

> can be drawn on either side of the mental/physical divide. That means, if I am not mistaken, that if *they* are categories, 'the mental' and 'the physical' are not.

In this passage I argue

1. that the distinction between the mental and the physical is *not* a distinction between two fundamentally different categories of thing;
2. that the distinction between states of affairs, processes and instantaneous events *is* a distinction between three fundamentally different categories of thing; and,
3. that the distinction between states of affairs, processes and instantaneous events cuts across that between the mental and the physical.

If these three propositions are true, it would be surprising if the relation that holds between mental processes and brain processes were the same as that which holds in the case of mental states and brain states or between instantaneous mental events and instantaneous brain events. I shall argue, as I have been arguing for more than forty years that that is indeed how things are.

I still think, as I put it in 'Is consciousness a brain process?', that

> In the case of cognitive concepts like 'knowing', 'believing', 'understanding', 'remembering', and volitional concepts like 'wanting' and 'intending', . . . an analysis in terms of dispositions to behave (Wittgenstein, 1953; Ryle, 1949) is fundamentally sound. (Place, 1956, p. 44)

I also think that a different account of the mind–brain relation is to be given in the case of these dispositional mental states from that which is called for in the case of the mental processes which I referred to collectively by the term "consciousness". Mental processes, I maintain, just *are* processes in the brain. Dispositional mental states, on the other hand, are not, in my view, states of the brain. Unfortunately, apart from indicating my adherence to the Wittgenstein–Ryle dispositional analysis of such concepts, thereby excluding them from the scope of what became known as the mind-brain identity theory, I said nothing at that time about the relation between dispositional mental states and the brain states with which they are undoubtedly correlated.

2. The Critique of Ryle's Hypothetical Analysis of Dispositions

This proved to be a serious omission. The year after my paper appeared, Peter Geach (1957) published, in his book *Mental Acts*, a critique of the hypothetical analysis of dispositional concepts in general (Chapter 3) and the dispositional analysis of mental state concepts (Chapter 4). In making these criticisms, Geach was advocating a return to something like traditional mind–body dualism. It was left to Brian Medlin (1967) and David Armstrong (1968) to combine the criticism of Ryle's dispositional theory with the proposal to extend the identity theory from the case of mental processes to dispositional mental states, now construed

as categorical internal states of the person rather than as a matter of the truth of certain hypotheticals about his or her possible future behavior. Because of the prejudice among philosophers in favour of a unitary solution to the mind–body problem and my own failure to argue the case for the alternative view, it is the Medlin–Armstrong version of the identity theory that has prevailed.

3. Obstacles in the Path of the Two-Factor Theory of the Mind–Brain Relation

In arguing for what I eventually (Place, 1967, p. 60) came to see as the correct account of the relation between dispositional mental states and the states of the brain with which they are correlated, the view that the dispositional state is causally dependent on, and cannot therefore, be identical with the underlying state of the structure of the entity whose dispositional property it is, I have been hampered by two other factors besides the prejudice I have already mentioned on the part of philosophers in favour of a unitary solution to the problem. The first is the problem that arises concerning the categorical, here and now existing, status of dispositions. If you say that dispositions are distinct existences from their structural underpinnings, dispositions become very peculiar entities indeed. They seem to consist in nothing over and above what would happen in the future, if certain conditions were to be fulfilled. Yet dispositions exist now, not just in some indefinite and possibly never to be realized future. How can that be? How much more comfortable to suppose, not just in the case of mental dispositions, but in the case of dispositions in general, that the disposition just *is* what undoubtedly exists here and now, its structural underpinning.[1]

The other factor which has made my view difficult to defend is that the style of philosophizing on which it relies, the conceptual analysis of ordinary language using simple nontechnical and common-place examples, has gone out of fashion in philosophical circles in recent years. Why that should be I shall not attempt to explain, except to say that its fall from favour appears to have coincided with the cognitive revolution which undermined behaviorism as a standpoint in psychology and linguistics, another outmoded intellectual position to which I still subscribe.

4. Conceptual Analysis and the Problem of Mental Self-Knowledge

Nor is there much that I can say by way of introducing what for many will be an unfamiliar way of doing philosophy. Suffice it to say that, as I construe it, conceptual analysis is a branch of empirical sociolinguistics which studies the semantic and pragmatic conventions governing the construction of intelligible sentences in

[1] I speak of the 'structural basis' of a disposition rather than, as others have done, of its "categorical basis." This is because careful analysis of the examples shows that, while the underlying consists in part of the categorical spatio-temporal arrangements of the parts, there are also the dispositional properties of the parts that hold the structure together.

natural language. Its contribution to issues such as the mind–body problem is to unravel the complex interplay of such factors in our ordinary "folk psychological" talk.

The conceptual-analytic evidence that persuades me that a different account has to be given of the mind–brain relation in the case of mental dispositions from that which applies in the case of mental processes comes from Ryle's (1949) book *The Concept of Mind*. In his chapter on "Self Knowledge" (Chapter V1) he says

> Even if you claimed that you had experienced a flash or click of comprehension and had actually done so, you would still withdraw your other claim to have understood the argument, if you found that you could not paraphrase it, illustrate, expand or recast it; and you would allow someone else to have understood it who could meet all examination-questions about it, but reported no click of comprehension. (Ryle, 1949, pp. 170–171)

The point I take Ryle to be making in this crucial passage is that whereas we have what he elsewhere describes as "privileged access" to private experiences such as the occurrence of "a flash or click of comprehension", we have no such privileged access to our mental dispositions. This is shown by the absurdity of the following:

(a) "James is very intelligent"
"How do you know?"
"He told me he was"

(b) "James knows what time it is"
"How do you know?"
"He told me he did"
"But did he tell you what time it is?"
"No".

Ryle's explanation of the absurdity of these interchanges is that "being intelligent" and "knowing what time it is" are not introspectible inner states of the person concerned; they are dispositions, something like the brittleness of a glass which only manifests itself under certain broadly specifiable conditions. In the case of the glass, the brittleness manifests itself only when the glass is dropped onto a hard surface, is struck by a hard object or is otherwise subjected to severe mechanical stress. In the case of 'being intelligent', the disposition manifests itself only when the individual is confronted by a difficult intellectual or practical problem. In the case of 'knowing the time', it manifests itself only when the individual is asked or asks him or herself that question. In both these mental cases, asking the individual questions is a good way of finding out whether the predicate in question applies; but these questions are not like the questions a doctor asks when he or she wants to know whether the patient feels pain and what sort of a pain it is. They are questions designed to *test* the individual's ability to solve the problem posed by it in the case of intelligence or to answer the question correctly in the case of knowing the time. Whether the answer given solves the problem in the one case or is correct in the other is a matter which is decided by objective criteria, not by the individual concerned, as in the pain case.

5. Privileged Access to Mental Propensities

It is sometimes argued that mental propensities, such as believing a certain proposition to be true, wanting something to come about or intending to do something, are in a different category from mental capacities in this respect, in that in these cases the individual *does* have privileged access to his own dispositional mental state from which others are excluded. But this is only because in these cases stating what you believe, asking for what you want and stating your intentions are in themselves manifestations of the dispositions in which believing, wanting and intending consist.[2] The same is true of statements in which the individual sets out what he or she knows. But in this case, in order to qualify as knowledge, what the individual says must be true and, with the doubtful exception of statements describing one's own private experiences, no one has privileged access to the truth of one's own propositions. In the case of beliefs, desires and intentions no such correctness qualifications apply. Except in cases where the individual is deliberately lying so as to conceal their true propensities, *any* expression of belief, desire or intention will count as a manifestation of the disposition in question.

6. The Dispositional and Categorical Aspects of Pain

There is, of course, an argument that comes down to us from Wittgenstein's observation that "the expressions of pain replace crying" (Wittgenstein, 1953, II, Section 244) to the effect that the same analysis can be given of our knowledge of our own pains. The reason for this is not far to seek. It is part of the concept of pain that pains are unpleasant, things we want to alleviate, get rid of and, wherever possible, avoid, and wanting, as we have seen, is an archetypical dispositional notion. But this kind of wanting differs from, say, wanting an apple in that whereas to say that someone wants an apple does not imply that there exists an apple that they want, to say that someone is in pain *does* imply that there exists a sensation that they want to be rid of. That sensation, moreover, is an ongoing process which, unlike for example "the infernal blare of the neighbour's radio" is sensed only by its owner.

7. Sharpening the Distinction Between Two Forms of Mental Self-Knowledge

Even in those cases, such as believing, wanting and intending, where we have some kind of privileged access to our own mental state, we do not sense our own beliefs, desires or intentions. We just know intuitively what they are. Moreover, whereas the privileged access we have to private events such as the sensation of pain or Ryle's "click of comprehension" can only be explained by the fact that they are

[2] I have given a detailed account of this view as applied to the concept of 'believing' in "The infallibility of our knowledge of our own beliefs" (Place, 1971).

events occurring inside their owner's sensory apparatus, the privileged access we have to our own beliefs, desires and intentions does not come from the fact that they themselves are internal states of our sensory apparatus. It comes partly from the fact that the act of reporting them is itself a manifestation of the disposition in which they consist and partly from the fact that these dispositions are manifested in occurrent thoughts and feelings to which we do indeed have privileged access in the same way that we have privileged access to our sensations. But even then, our access to our own beliefs, desires and intentions ceases to be privileged, once those dispositions have been manifested in behavior, in a way that no private experience loses its privileged status. If it is in fact raining, once I have put up my umbrella or run for shelter, it no longer makes sense to doubt the existence of my belief that it is, in the way that, despite my groaning, you can still doubt the existence of my pain. For although the groaning is as much a manifestation of a disposition as is putting up the umbrella or running for shelter, the cause of that disposition, the pain sensation, is inaccessible to others in a way that the cause of the belief that it is raining, the rain itself, is not.

8. From Epistemology to Ontology

What these epistemological differences show is that mental processes and events are things of a very different kind or category from mental dispositions. They also show that whereas our inability to detect the private thoughts and feelings of another person is to be explained by the fact that these events are taking place inside their owner's skin, our inability to detect another's mental capacities and propensities simply by inspection is due to the fact they have not yet been put to the test. It is not due to the fact that these states are located inside their owner's skin. It may be true that they are so located. I do not think it is. But that is not why we cannot detect their presence. The existence of a disposition whether 'mental' or 'physical' can never be demonstrated, unless and until it is manifested in some shape or form. Showing that an entity has the internal structure which is normally associated with its having a certain capacity or propensity counts for nothing if, when subjected to the appropriate test, no such manifestation appears.

9. The Categorical/Structural Basis of Dispositions

The notion that dispositions, particularly physical dispositions such as the brittleness of glass, have what was referred to as a "categorical basis" in the microstructure of the dispositional property-bearer has been a commonplace ever since Gilbert Ryle's *The Concept of Mind* first brought the topic of dispositions to the attention of philosophers. Thus, in his *Thinking and Experience* published in 1953 Ryle's contemporary and colleague at Oxford Henry Price wrote:

> There is no *a priori* necessity for supposing that *all* dispositional properties must have a 'categorical basis'. In particular, there may be mental dispositions which are ultimate . . . (Price, 1953, p. 322)

This passage has a number of interesting implications:

1. It implies that most, if not all, *physical* dispositions have a 'categorical basis'.
2. Since the adjective *categorical* as applied to the basis is evidently intended to contrast with the *hypothetical* character of the dispositions themselves, as claimed by Ryle, and since Leibniz's Law rules out the possibility that *one* and the same thing should *be* categorical under one description and hypothetical under another, it *implies* that the disposition and its categorical basis are two distinct and *separate* things which are presumably related in such a way that the categorical basis stands as cause to the disposition as effect.
3. If, as Ryle claims, the relationship between a disposition and its manifestations or "exercises", as he calls them, is not a causal relation, the effect of Price's supposition that there are some mental dispositions which have no 'categorical basis' would be to put such dispositions wholly outside the causal nexus, in agreement with much traditional thinking about such matters.

In his *Mental Acts* published in 1957 Peter Geach concludes a withering attack on Ryle's hypothetical analysis of dispositions with these words:

> A physicist would be merely impatient if someone said to him: 'Why look for, or postulate, any actual difference between a magnetized and an unmagnetized bit of iron? Why not say that if certain things are done to a bit of iron certain hypotheticals become true of it?' He would be still more impatient at being told that his enquiries were vitiated by the logical mistake of treating 'X is magnetized' as categorical, whereas it is really hypothetical or semi-hypothetical. (Geach, 1957, p. 6)

The implication of what Geach is saying in this passage is that when the physicist looks inside the iron bar for an explanation of its magnetic properties he is studying the very nature of the dispositional property itself. In other words Geach is rejecting the idea implicit in Price's contrast between the hypothetical character of the disposition and the categorical nature of its basis in the microstructure of the property bearer that this is a causal relation between "distinct existence", to use Hume's phrase, in favour of the view that the disposition and its categorical basis are one and the same thing.

This view which was later to become the cornerstone of Medlin's (1967) and Armstrong's (1968) "central state materialism" has at first sight a number of conspicuous advantages over its never very clearly expounded predecessor:

1. It appears to offer the advantage of ontological economy. Instead of two things, the dispositional property and its categorical basis, we now have only one thing described in two different ways: (a) in terms of its potential manifestations and (b) in terms of its microstructural constitution.

2. When applied to the mind–body relation it has the additional advantage of allowing the conclusion that all mental things, and not just mental processes as I had argued in 1956, are brain things. Mental dispositions are states of the brain.
3. It readily explains our common sense understanding of such matters according to which the brittleness of the glass exists long before it actually breaks.
4. The existence of the categorical basis thus provides a convenient truthmaker for the otherwise problematic subjunctive conditional to the effect that if the appropriate conditions *were to be* fulfilled, a manifestation of the disposition *would* exist or occur.

On the other hand, if the disposition and its basis are one and the same thing, it no longer makes sense, as C. B. Martin has pointed out (Armstrong *et al.*, 1996, pp. 81–86), to contrast the hypothetical character of the disposition with the categorical character of its basis in the microstructure of the property-bearer. Both are equally categorical. It was tor this reason that in *Dispositions: A Debate* (Armstrong *et al.*, op. cit.) I gave up talking about the categorical basis of a disposition and spoke instead about its basis in the microstructure of the property-bearer. Finally, under the influence of the sharpness example where the knife's ability to cut and the needle's ability to pierce depends on features of its *macrostructure*, the fineness of the edge or point, rather than on its *microstructure*, I began to speak of the "structural basis" of the disposition. In so doing, I was conceding that dispositions exist categorically before and in the absence of their manifestations. What I was not conceding was that the structural basis and the disposition are one and the same thing.

10. Dispositions and Their Structural Bases are Two Distinct and Causally Related Things

Those such as Geach (1957), Medlin (1967), Armstrong (1968), and Martin (Armstrong *et al.*, op. cit.) who hold that dispositions and their structural basis are either one and the same thing or two aspects of the same thing typically do so on purely a priori grounds, on grounds of ontological economy (Ockham's razor). My view, the view that, with one notable group of exceptions to be considered in a moment, the structural basis of a disposition stands as cause to the disposition as effect, though inspired in the first place by Ryle's hypothetical analysis of dispositional *statements* to which I still subscribe, is based on an examination of a number of examples where the structural basis of the disposition is a matter of common knowledge. Following Hume, I take it as axiomatic that if two things are causally related they must be, to use his phrase, "distinct existences". They cannot be two descriptions of one and the same thing.

I first came to this conclusion from an examination (Place, 1967; Armstrong *et al.*, op. cit., p. 30) of the relation between the horsepower of an internal combustion engine and such features of the internal structure as the cubic capacity of its

cylinders. More recently (Armstrong *et al.*, op. cit., pp. 114–115), I reached the same conclusion in the light of the relation between the propensity of a knife to cut or a needle to pierce and the fineness of its edge or point. Another example which makes the same point is the following:

Suppose we have an electrical circuit linking:

(a) a live battery,
(b) an ON/OFF switch,
(c) a changeover switch, and
(d) two lamps, one red, one green.

Suppose further that these are wired up in such a way that, when the ON/OFF switch is closed and the changeover switch is in the left position, a circuit is made via the red lamp, but not via the green lamp, whereas when the changeover switch is in the right position, a circuit is made via the green lamp, but not via the red.

In this setup, so long as the ON/OFF switch is closed and the changeover switch is to the left, only the red lamp will be illuminated. When the changeover switch is moved to the right, the red lamp will go out and the green lamp will come on. But consider what happens when the ON/OFF switch is in the open (OFF) position. In this case, whatever the position of the changeover switch, neither lamp will be illuminated. But suppose we *now* move the changeover switch from left to right. Neither lamp will come on. Nevertheless, something has changed. What has changed is the dispositional property of the system. Before, if the ON/OFF switch had been closed, the red light *would have* come on. Now, if it were to close, the green light *would* come on.

In such a case, I submit, there is no temptation to say that the change in the position of the changeover switch is *the same thing as* the change in the dispositional property of the system. They are two different things: one of which, the position of the changeover switch, stands as cause to the other, the change in dispositional property, as effect.

11. Stuffs, Processes and Compositional Type-Identity

This is in sharp contrast to what we are inclined to say about the *process* whereby the changeover switch moves from the one position to the other. Here we *do* want to say that it is the *very same* process as that which results in the change in the dispositional property of the system from one in which closing the ON/OFF switch brings on the red lamp to one where it brings on the green. The same principle applies in all cases where the kind of entity that is at issue is a stuff like water or common salt or a process like convected heat or a flash of lightning. In these cases it would be absurd to suggest that being H_2O is the cause of something's being water, that being NaCl is the cause of something's being common salt, that being in molecular motion is the cause of convected heat, that being an electrical discharge through the atmosphere is the cause of something's being a flash of lightning. In all

these cases we are dealing, not with a causal relation between distinct existences, but with two descriptions of the very same thing.

12. Compositional Type Identity in the Case of Dispositions: Solidity, Fluidity and Volatility

In the final chapter of *Dispositions: A Debate* (Armstrong *et al.*, op. cit., pp. 168–169), C. B. Martin cites an example of a compositional type-identity involving a disposition. This is the case of the fluidity of liquid which is the same thing as the propensity of its constituent molecules to roll over one another. By the same token, the solidity of a solid is the propensity of its constituent molecules to preserve their relation and proximity to one another, while the volatility of a gas consists in the propensity of its constituent molecules to fly apart unless constrained by an airtight vessel from so doing.

The first thing to be said about this series of examples is that although this identification of a dispositional property with its molecular counterpart provides an essential prolegomenon to an explanation of the phenomenon, it does not by itself provide us with an explanation of why the molecules composing some substances under some conditions tend to roll over one another, why others remain stationary and why yet others fly apart. That explanation, when it is given, will be a causal explanation and the cause will be something over and above its effect, the existence of the disposition.

Secondly, since this is an identity relation, Leibniz's Law requires that both sides of the equation be dispositional properties, the only difference being that one is a dispositional property of the whole, while the other is a dispositional property of the parts that make up the whole.

Thirdly, it is tolerably certain that every dispositional property, provided that, unlike the Aristotelian entelechies, it has been properly specified, has a causal explanation in terms of the structure of the property-bearer. A possible exception here is the "charm" of the quark, a dispositional property whose bearer, the quark, is on our present understanding, too small and featureless to have any kind of structure that would explain the dispositional property without which we would have no reason to postulate its existence.

Fourthly and by contrast, the cases such as solidity, fluidity and volatility, where a compositional type-identity is specifiable between a molar and molecular description of a disposition, are rare, if not very rare. Such identities would seem to apply only in cases where the manifestation of the disposition is a state or process which exists or takes place entirely within the substance of the property-bearer. It seems that where a dispositional property manifests itself in its effect on things external to the property-bearer, no such compositional type-identity is specifiable. The reason for this is that identities are subject to Leibniz's Law which holds that every predicate that is true of something under one description must also be true of it under any other description that applies to the same thing. Now dispositions

are characterised by their manifestations. This means that they are located where those manifestations exist or occur. If the manifestations take place outside or at the point of interaction between the property bearer and the external world, as in the case of the horse power of an engine that is manifested at the drive shaft, the iron bar whose magnetic properties are manifested in the magnetic field surrounding it or the circuit described above whose dispositional properties are manifested in the two lamps, the dispositional property is located somewhere quite different from the microstructural features on which the existence of the dispositional property depends. Consequently, the possibility that they might be one and the same thing is ruled out by Leibniz's Law. Only where the manifestations are located within the substance of the property-bearer can the disposition and its counterpart at the molecular level have the same location. Only then, as in the solidity, fluidity and volatility cases, can the two descriptions be descriptions of one and the same thing.

If that is correct, since mental dispositions, such as beliefs, desires and intentions, evidently affect the way the property-bearer interacts with his or her environment, we can be tolerably certain that this is a case where no compositional type-identity will be specifiable between the mental disposition and the brain state with which it is found to be correlated, when that is discovered. As in other cases where the disposition manifests itself in the interactions between the property-bearer and things external to it, the relation between a mental disposition and the brain state with which it is correlated will prove to be a causal relation between "distinct existences" in which the brain state stands as cause to the mental disposition as effect.

13. Unmanifested Dispositions as Laws of the Nature of the Property-Bearer

We have seen that one of the principal advantages that accrues from the supposition that dispositions and their structural basis are one and the same thing is that it enables us to make sense of the claim that a disposition exists as a matter of categorical fact, even though it has not yet been manifested and nay never be so. According to Ryle, when we ascribe an unmanifested dispositional property to something, *all* we are saying is that if, sometime in the future, certain conditions were to be fulfilled, certain manifestation events would occur. This cannot be right. There must be some here-and-now-existing state of the disposition owner that makes that prediction true. But if as now appears, it is only in exceptional cases that we can identify the unmanifested disposition with a state of the underlying structure of the property bearer, and, given that even in these cases the underlying structure turns out to be just *another* unmanifested disposition, in what does an unmanifested disposition consist?

In order to explain how I came to the answer to this question that I now give, I need to go back to the origins of the debate between myself and David Armstrong which was later broadened to include contributions from C. B. (Charlie) Martin and published in 1996 as *Dispositions: A Debate* (Armstrong *et al.*, op. cit.). The start-

ing point of this debate was a paper entitled "Causal laws, dispositional properties and causal explanations" which I published in 1987 in *Synthesis Philosophica*, the international version of the Serbo-Croat philosophy journal *Filozofska Istrazivanja*. In this paper I argued for the following theses:

1. The difference between an accidental generalization and a causal judgment lies in the fact that the latter entails a counterfactual to the effect that if the one event or state of affairs (the cause) had not occurred or existed, the other event or state of affairs (the effect) would not have occurred or existed.
2. Since no such events or states of affairs actually existed the truth of a causal counterfactual can never be established by observation.
3. The only way to establish the truth of a causal counterfactual is by deducing it from a universal law statement which, to use Goodman's (1955–1965) term, is said to "sustain" it.
4. But as Goodman also points out the law statement that "sustains" a counterfactual need not be universally quantified over a class of individuals to which a predicate applies. A dispositional statement restricted to the behavior of a particular individual will do just as well, provided the occasion referred to in the counterfactual falls within the period over which the disposition obtains.

In *Dispositions: A Debate*, in common with both my fellow participants, I endorsed C. B. Martin's truthmaker principle. The principle, however, is subject to a variety of interpretations. As I interpret it, it holds that a contingent assertion is true and a contingent negation is false if and only if the event or state of affairs whose existence the assertion asserts or the negation denies actually exists. Since the event or state of affairs they depict never existed, the claim that a causal counterfactual is true presents a particular difficulty for such a view. Goodman's observation that the truth of a causal counterfactual is deduced from a law statement allows us to recognise that causal counterfactuals share a truthmaker with the law statements which "sustain" them; while his further observation that dispositional statements function as law statements in sustaining causal counterfactuals shows us that in such cases, and perhaps in all cases, it is the existence of the disposition that acts as the truthmaker.

When this observation is combined with the evidence reviewed above showing that dispositions depend causally on and are thus "distinct existences" from the underlying structure of the property-bearer, it is a short step to the view to which I now subscribe, namely that the dispositional properties of particular things are substantive laws of the nature of the property-bearer. This view only occurred to me after *Dispositions: A Debate* had gone to press. I suddenly realised that the dispositional properties of particular entities were playing the same role in my theory that Armstrong's (1997) substantive Laws of Nature were playing in his, the role of acting as truthmaker for the law statements formulated by scientists in so far as they are true. From this it was but a short step to the idea that the dispositional properties of particular things are the substantive laws, not, as for Armstrong, of nature in general, but of the nature of the individual entities

whose dispositional properties they are. This is essentially the same view as that argued for by Nancy Cartwright (1989) in her *Nature's Capacities and their Measurement*. She too rejects Laws of Nature in general as constituents of the Universe. She sees the laws formulated by scientists as rough and ready generalizations describing the typical "capacities", as she calls them, of individual entities.

You may say that this makes dispositions very queer entities indeed, and I would agree that it does. But one has only to think of black holes to realize that substantive laws of the nature of the individual property-bearer are no queerer than many of the entities postulated by contemporary physics and a deal less queer than Armstrong's substantive laws of nature in general. What is shocking, perhaps, is to find such entities in our own backyard, as it were, in familiar things like the brittleness of the unbroken glass, the flexibility of the rubber that has never been stretched and the desire that has never been evinced, let alone acted on.

14. Towards a Neuropsychological Theory of the Mind–Brain Relation

I contend that the two factor theory of the mind–brain relation I have outlined is much better placed than is its rival, central state materialism, to point us in the right direction when searching in the brain for the neural correlates of the mental processes, mental events and dispositional mental states whose existence we acknowledge at the level of common sense observation. So long as the identity theory was restricted to the mental process/brain process relation, the only conceptual problem confronting the neuroscientist who is looking for the brain processes in which, on this view, conscious experiences and other mental processes consist, is the problem of showing how the properties we attribute to those experiences could be the properties of a brain process as Leibniz's Law requires. That problem, as I showed in "Is consciousness a brain process?", disappears once we recognise that all we ever say about a conscious experience when we describe what it was like to have it is how it resembles some other experience or type of experience which we identify by reference either to its publicly observable causal antecedents and/or to its publicly observable behavioral effects (what it makes us say or do). Once that is appreciated, we realise, as I put it then, that

> . . . there is nothing that the introspecting subject says about his conscious experiences which is inconsistent with anything the physiologist might want to say about the brain processes which cause him to describe the environment and his consciousness of that environment in the way he does. (Place, 1956, p. 49)

Once the identity theory is extended from the case of mental processes to include dispositional mental states, a viper's nest of new problems confronts us. How do we explain the causal role of propositions in the control of behavior (or 'action', as it was now called)? How could something as abstract as a proposition have a causal role, let alone be a state of the brain? What neural counterparts

could there possibly be for the grammatical objects of psychological verbs, such as 'believing', 'wanting' and 'intending'? What could intentional inexistence or referential opacity possibly amount to in neural terms?

These problems, if not entirely resolved, are at least made much more tractable, once it is accepted that mental dispositions and their neural basis are two causally related things rather than one and the same thing. It becomes apparent that these problems arise partly from the peculiar nature of dispositions in general, physical as well as mental, and partly from the peculiar way in which mental dispositions are characterised in ordinary language. Viewed in this light, the task of looking for a state of the brain that gives *the system as a whole* these dispositional properties without actually having them itself appears much more manageable.

For example, one set of problems which disappear once the matter is viewed in this way are Donald Davidson's (1970–1980) worries about the causal role of propositional attitudes, the apparent impossibility of constructing a nonvacuous covering law universally quantified over agents which would provide a logically acceptable foundation for our common sense belief in the causal potency of the agent's beliefs and desires with respect to the way she talks and behaves, together with the possibility, not say probability, that the brain state that correlates with my belief that today is Monday is quite different from that which correlates with your belief that it is. As is well known, these worries led Davidson to his espousal of what has become known as "token-identity physicalism", the doctrine that every particular (token) mental state is identical with a particular brain state; but there are no "psycho-physical bridge laws" connecting mental state types to brain state types.

It should be apparent that the alleged absence of "psycho-physical bridge laws" is no problem, once you accept Goodman's observation that a dispositional statement restricted to the behavior of a single individual is all that is needed to "sustain" a causal counterfactual as much in the physical as in the mental domain, that dispositional statements are the only covering laws needed to underpin causal judgments, and that the existence of dispositions, *qua* substantive laws of the nature of the property-bearer are all that is needed to account for the lawfulness of nature. Add to this the suggestion that dispositions are the "invisible glue" that bind a cause to its effects and there is no longer any reason to be puzzled about the causal role of mental states, and, perhaps more important, no a priori reason to deny the possibility of formulating generalizations on the basis of empirical research about the relations between mental states and their neurological underpinning.

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