FURTHER ANTIDOTES: A RESPONSE TO GUNDERSEN

By Alexander Bird

Dispositions, parts and wholes

The world at any particular time consists of a large number of things which possess a variety of dispositions. Many of those dispositions will subsequently be manifested, as a result of some appropriate stimulus. The claim in my 'Dispositions and Antidotes' was that some object might possess a disposition and continue to possess it, and also receive the appropriate stimulus, yet fail to yield the manifestation.[1] This

[1] A. Bird, 'Dispositions and Antidotes', *The Philosophical Quarterly*, 48 (1998), pp. 227–34.

might happen because of the interference of some other entity in the world, what I call an *antidote*. The existence of antidotes supports C.B. Martin's rejection of the conditional analysis of dispositions.[2]

Objects have parts, which may also be objects. Objects are distinct from their proper parts and typically have properties different from those of their parts. This goes for dispositional properties too. A light bulb has a disposition to emit light when attached to an electrical circuit. This disposition is shared by one proper part, the filament, but not shared by another, the glass part of the bulb. In discussing the dispositions of the filament and the glass I am not asking what those parts might do when physically separated from each other and the rest of the bulb. Rather I am stating what dispositions these different parts have while still part of the fully functioning bulb; indeed, these are the dispositions that these things have as part of some state of the world at some particular time. Because we think of dispositions as intrinsic properties, it is true that typically objects retain their dispositions when physically isolated from other objects. But it need not always be so. The filament may lose its disposition to emit light continuously, if it is removed from the rest of the bulb, since in air it will burn up almost instantaneously.

Gundersen's guess is therefore correct.[3] When ascribing the disposition to chain react to the uranium pile, I am not thinking of the pile 'on its own' in *physical* isolation, away from the boron rods and fail-safe mechanism. Rather I am considering the pile as an entity distinct from the objects surrounding it – and as mereologically distinct from the objects of which it is a proper part. Although a part of the total reactor, the pile is a distinct entity, and these two entities, reactor and pile, may have different dispositions. Indeed, I claim they *do* have different dispositions. The state of the world of which I am giving a partial description is one in which there is a uranium pile above critical mass, which is currently penetrated by boron moderating rods; facts about the different dispositions possessed by different entities in this state of the world include

1. The uranium pile is disposed to chain react
2. The mereological sum of the pile and the lowered boron rods is not disposed to chain react.

Antidotes

I hold that (1) is true even though the pile will not manifest its disposition by actually chain reacting. And this is not because the appropriate stimulus is lacking. Originally, I did not state what the stimulus was – it was understood to be something fulfilled in the situation under description, and clearly Gundersen has taken it so too. For completeness, I should specify some stimulus, which I shall regard throughout as being fulfilled. For instance, the pile might have been fractionally under critical mass and the stimulus been that of adding enough U_{235} to bring the pile above critical mass. (David Lewis has suggested that if we have a boiling-water reactor, the

[2] C. Martin, 'Dispositions and Conditionals', *The Philosophical Quarterly*, 44 (1994), pp. 1–8.

[3] L. Gundersen, 'Bird on Dispositions and Antidotes', *The Philosophical Quarterly*, 50 (2000), pp. 227–9 above, at p. 228.

stimulus might be that too much of the water boils off.) Since the disposition is present, the stimulus is fulfilled, but the manifestation is lacking, it follows that a conditional analysis of the dispositional claim in (1) must be false.

Is there an explanation of why the manifestation fails? Yes; it is the presence of the boron rods, absorbing the neutrons produced by fission, thus preventing a chain reaction. The boron rods are an antidote to the disposition to chain react – they hold it in check. As Gundersen points out, the following is, on my story, true:

3. The uranium pile (with the boron rods lowered) is disposed to chain react

and so therefore is

4. The uranium pile is disposed to chain react in a context where the rods are lowered

and given that there will not be a chain reaction,

5. The uranium pile is disposed to chain react in a context where the rods are lowered, but the pile will not actually chain react in a context where the rods are lowered.

Sentence (5) is intended to state the counter-example to the conditional analysis of dispositions. However, we might read the disposition in the first conjunct of (5) in one of two ways:

D1. The disposition to chain react (in a context where the rods are lowered), or
D2. The disposition to chain-react-in-a-context-where-the-rods-are-lowered.

The second conjunct of (5) is

A. The pile will not chain react in a context where the rods are lowered.

For (5) to be a true counter-example, we need to tie (A) to (D1). But, as Gundersen points out, it seems relevant only to (D2). And that gives no counter-example, since the pile does not have the disposition stated in (D2). For a counter-example we need

A*. The pile will not chain react.

But (A) does not entail (A*). And so it is at best unclear whether (A*) is true. And correspondingly it is unclear whether (5) states a genuine counter-example to the conditional analysis.

Response

A little formalization might help:

d = the uranium pile has the disposition to chain react
m = the uranium pile will chain react
*d** = the uranium pile has the disposition to chain-react-in-a-context-where-the-rods-are-lowered
*m** = the uranium pile will chain-react-in-a-context-where-the-rods-are-lowered
r = the rods are lowered.

I shall use a contextual propositional operator C_x to be understood thus: $C_x(p)$ = in a context such that x, p is the case. So, in particular, $C_r(\neg m)$ = in a context where the rods are lowered, the uranium pile will not chain react.

Since we are assuming that the relevant stimulus is fulfilled, the conditional analysis requires

6. $d \rightarrow m$
7. $d^* \rightarrow m^*$.

The problem Gundersen raises is that the most I have shown is that $C_r(\neg m)$. Now $C_r(\neg m)$ does entail $\neg m^*$. This would be a counter-example to (7) only if d^* were true, which it is not. On the other hand, I have argued that d is true, but then $C_r(\neg m)$ does not entail $\neg m$. And so I do not seem to have a counter-example to (6) either.

There is more than one way of phrasing my response. First, to return to my opening remarks, we may ask what dispositions and events exist and occur in a given state of the world. The state of the world we are interested in is one described, albeit incompletely, in my illustrative story. It is one that includes among other things the context of the boron rods being lowered and the presence of the relevant stimulus for d. I shall call this state w. It is sufficient for a counter-example to the conditional analysis to show that w is possible, where it is the case that in w, d is true and m is false. It is agreed that in w, d and $C_r(\neg m)$. Since, as just remarked, w includes the context r, it follows that in w, $\neg m$. In so saying I invoke only the principle $(C_x(p) \ \& \ x) \rightarrow p$, which states: if, in the context x, p and x, then p. Which seems unobjectionable. What else could 'In the context x, p' mean? (It seems to me that 'In the context x, p' is either equivalent to, or entails, '$x \rightarrow p$'.)

Alternatively (but equivalently), one may look at matters thus. Since $(d \rightarrow m)$ is a consequence of the conditional analysis, it is true in any context. Hence, on the supposition that the conditional analysis is true, $C_r(d \rightarrow m)$. It is accepted that in the context of the boron rods being lowered, the pile is disposed to chain react, hence $C_r(d)$; and it is also accepted that in the context, the pile will not actually chain react, $C_r(\neg m)$. To get a contradiction, we need a contextual version of *modus ponens*, *viz.*, $C_r(d \rightarrow m)$, $C_r(d)$, *therefore* $C_r(m)$. This is clearly valid, and so the contradiction is obtained, and the supposition of the truth of the conditional analysis is refuted.

Which disposition?

Gundersen's paper does raise other questions which should be addressed here. So far I have assumed that the disposition under discussion is one whose stimulus is fulfilled. But perhaps the disposition possessed by the pile is not the disposition to chain react when the mass is above critical, or the disposition to chain react when the water is lost. Rather, it might be that the disposition is the disposition to chain react (or, better, melt down) when both the water is lost (mass is above critical, as preferred) *and* the boron rods are absent. This disposition has a compound stimulus, and since the boron rods are lowered, the stimulus is not fulfilled, and so on the conditional analysis there is no reason to expect the manifestation.[4]

[4] This response was suggested to me by David Lewis in February 1998. See also Lewis, 'Finkish Dispositions', *The Philosophical Quarterly*, 47 (1997), pp. 143–58.

The *analysanda* we are considering are of the form 'the disposition to manifest *m* under stimulus *s*'. On the approach just mentioned, to satisfy the conditional analysis in its application to some actual disposition, every possible antidote must in principle be detailed and held to be absent within the specification of the disposition's stimulus. There are all sorts of potential antidotes to a disposition, maybe limitlessly many. And so for an actual disposition it will be impossible to write down what *s* is. Even if the schematic conditional analysis is correct we cannot give literally true instances of it. This in turn raises a different question of analysis: how are we to analyse concepts like 'poisonous', 'fragile', 'soluble'? If we were to try '*x* is (water-) soluble iff *x* has the disposition to dissolve when placed in water', as I have just indicated, there are no simple dispositions of that sort, since the stimulus clause ('when placed in water') does not mention the absence of antidotes which would prevent, e.g., a sugar cube dissolving in water. If that analysis of 'soluble' were correct, then nothing would be correctly called soluble. If things are correctly to be called soluble, as we think they are, then we must have '*x* is (water-) soluble iff *x* has the disposition to dissolve when *s**', where the specification of *s** includes being placed in water and the negation of all possible antidotes. Is something which is soluble in this qualified way really soluble? Lewis tends to think that it is, but regards the question as essentially idle. Even if the simpler analysis were correct, it would be misguided pedantry to deny that a sugar cube is soluble. There is imprecision in our talk, and the degree to which it is permissible is the task of pragmatics to assess. This, I suspect, is a key difference between supporters of the conditional analysis and its opponents. While I take the foregoing to suggest that an implicit reference to 'normal circumstances' or some other indexical element is an ineliminable part of our characterization of dispositional concepts, Lewis regards these matters as belonging to the general pragmatic topic of what qualifications we may permissibly leave unmentioned.

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