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# A New Challenge for Objective Uncertainties and The Propensity Theorist

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**Abstract:** The paper is concerned with the existence of objective uncertainties. What would it take for objective uncertainties to exist, and what would be the consequences for our understanding of the world we live in? We approach these questions by considering two common theories on how we are to understand the being of propensities and how it pertains to possible outcomes that remain unmanifested. It is argued that both or these theories should be rejected, and be replaced with a theory we call *unrestricted actualism* according to which the possible outcomes of propensities (whether realized or unrealized) are denizens of the actual world.

**Keywords:** propensity theory, philosophy of probability, dispositions, actualism, possibilism

## A New Challenge for Objective Uncertainties and the Propensity Theorist

The paper is concerned with the existence of objective uncertainties. What would it take for objective uncertainties to exist, and what would be the consequences for our understanding of the world we live in?

We approach these questions by asking what the being of propensities requires and if propensities are the objective uncertainties we need. We take propensities to be dispositional properties to yield a certain probability distribution (i. e. a chance distribution) over a range of possible outcomes. What is more, we assume that propensities are universals rather than, say, tropes, or equivalence classes that dispositional predicates correspond to.

In addition we assume that propensities are had by objects, where the term ‘object’ is interpreted liberally so as to include not only ordinary particulars like

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atoms and coins, but also token state of affairs, events, situations and chance set-ups.

We have no intention to go into probabilistic formalisms and their interpretations. We just want to explore a few of the preconditions for the existence of objective uncertainties in the world. If our analysis below is correct only some interpretations of probabilistic formalisms will be useful measuring such objective uncertainties.

First, what exactly is meant by the term ‘being’? Usually we take ‘the being of  $x$ ’ to refer to  $x$ ’s identity or that by virtue of which  $x$  is what it is (Locke 1964, 270). This is an important concept in its own right, but we would like to make a distinction between identity and being, and reserve the latter term for a thicker notion. More precisely, we take the being of  $x$  to consist of everything that is necessitated by the fact that  $x$  exists, *in virtue of*  $x$ ’s identity (cf. Bird 2007, 100). Furthermore, the sentences ‘ $x$  exists’, ‘ $x$  is’ and ‘ $x$  is real’ are here understood to express the same proposition and taken to be true if and only if there is something that is identical to  $x$ .<sup>1</sup> The clause ‘in virtue of  $x$ ’s identity’ is required because although all necessities are necessitated by everything, not all necessities are part of everything’s being.

For example, the empty set  $\emptyset$  is necessitated by Socrates in that it is impossible for Socrates to exist and  $\emptyset$  not to exist. However, we take it that no one would claim that the empty set constitutes a part of Socrates’ being (Cf. Fine 1994).

Now, and much to the point we are making in the paper, since propensities are dispositional properties, a part of their being will be various possible outcomes. This is because what it is for an object to have a propensity is for it to have a dispositional property to yield a certain chance distribution over the possible outcomes of the appropriate trial. The being of a propensity involves the existence of possible outcomes simply because it necessitates those outcomes by virtue of what it is—its identity.

But, of course, these outcomes may be merely possible in that, although they are possible, they are never actualized as manifestations. This holds for propensities, and should arguably hold for all objective uncertainties.

To illustrate, consider a radium isotope  $^{226}\text{Ra}$  with a 50/50 chance of decaying within 1, 600 years. According to the propensity theory, this is to be understood as the  $^{226}\text{Ra}$  isotope having a propensity of 0,5 to decay during a 1, 600 year interval. Now, suppose that the isotope does not in fact decay during that time period. *The possibility of it decaying still exists*. This must be the case since without the possibility, the isotope would not have the propensity in question,

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<sup>1</sup> Since we are primarily concerned with properties, we take it that  $x$  might be either a first- or higher-order entity.

nor would the possible outcome have a specific probability (namely 0,5) of being manifested. Yet, since the possible outcome is unmanifested, it is never actualized, and so, remains a mere possibility. The same should be true for all objective uncertainties.

Now, this is problematic because according to propensity theorists, propensities (*qua* dispositional properties) are as real and as actual as any other property discussed by science (cf. Popper 1959; Mellor 1995). But then, how can the being of something that is thought to have proper existence involve essential reference to something that is merely possible and not within the realm of actual existents (cf. Armstrong 1997, 79)? This is certainly a problem for objective probability attributions. For it would imply that outcomes have chances even though they do not exist. How can that be? How can the possibility of the isotope decaying have a chance 0,5 of actually occurring even though that possibility remains a mere possibility and never decays? Are we simply misled by the fact that our language seems to ascribe uncertainties to merely possible outcomes (cf. Mellor 1995, 22–23)? For instance, what chances are properties of are not really the outcomes *per se*, since these may not exist, but rather properties of the chance set-ups that determine the chance-distribution over the set of possible outcomes. If this is correct, then the mere possibility of the outcomes need not be a worry for property attribution.

There is, however, a more serious problem in the vicinity. Relations necessitate the existence of their relata in that it is impossible for a relation to obtain without relating anything. If we accept propensities *qua* objective uncertainties, into our ontology, it seems that this is exactly what we would have to deny. For then we have to allow for entities that enfold within themselves a relation to a distinct entity, a possible outcome, which may—but most often—does not exist. Even more worrisome is the fact that the mere possibilities are said to constitute a part of the very being of propensities. Propensities are what they are partly due to the fact that they necessitate possible outcomes. This is puzzling for it would seem to make the being of propensities extremely watered down, almost to the point of being non-existent.

There are a number of solutions to this problem. One is to simply deny that propensities can exist unmanifested, and so, deny that the isotope has the propensity to decay when it is not actually decaying. This is not a solution open for the propensity theorist since it denies the existence of propensities *qua* dispositional properties. What is more, non-trivial counterfactuals cannot be made true by anything since they collapse into the corresponding material conditionals (Bird 2007, 109). Thus the sentence ‘had the radium isotope <sup>226</sup>Ra been bombarded with alpha particles its half-life would have changed’ is true so long as it is not in fact bombarded with alpha particles.

An alternative solution, is to say—in accordance with modal realism—that propensities can exist unmanifested, but that their existence does not solely depend on this world. Their existence also depends on what exists in other equally real possible worlds. Unfortunately, this makes (at least a part of) the being of propensities unactualized in the sense that their existence entails the existence of possible outcomes that are not part of the actual world. As a matter of fact, if there is nothing more to the being of a propensity than a particular set of possible outcomes as some theorists maintain (Bird 2007), then it becomes hard to see how a modal realist could possibly claim that propensities are part of the ontological inventory of the world in which the propensity attribution is made. Moreover, it is hard to see how objective probabilities can be made to fit with modal realism and, in particular, with the view that possible worlds are causally isolated from each other. For according to a dispositional view of properties, mere possibilities can be both causes and effects. A student might have an intense fear of being embarrassed or humiliated if asked a question in the classroom. Even if not called on, the mere possibility might still cause the student to experience anxiety.<sup>2</sup> Conversely, we are able to cause changes in the set of possible outcomes of a propensity by tampering with the experimental set-up. Thus for example, we can cause the possibility of a coin to land on a particular table to go out of existence by simply destroying the table or we can bring into existence an unmanifested disintegration of a non-fragile object by cooling (Bird 2007, 114). Modal realism can make no sense of such claims.

In our view, the best solution to the relata problem is what we have chosen to call *unrestricted actualism*. We agree with Bird (2007, 112) that by talking of ‘non-actual’ possibilities it is tempting to think that there are only two options here. Either: (a) there really are no ‘non-actual’ possibilities (Megarian actualism); or (b) there are such things, but only at other non-actual worlds (modal realism). To get a better grip on unrestricted actualism it is useful to talk about ‘unrealized’ possibilities rather than ‘non-actual’ possibilities. Of course, if we take ‘unrealized’ to simply mean ‘non-actual’ then to allow for the existence of unrealized possibilities amounts to little more than a denial of actualism (the view that everything that exists is actual). But as Bird (2007, 112) points out,

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<sup>2</sup> It could be argued that what really causes the student to experience anxiety is not the mere possibility of being called upon but her belief that this is so. Yet, if causation is a matter of probability raising (as we think it is), the mere possibility would still count as a cause. Assuming that the student has some knowledge of her environment, the probability of the student experiencing anxiety in the presence of the mere possibility of being called upon would be higher than in its absence.

correctly in our opinion, we can understand the notion of realization in a way that is consistent with actualism but denies Megarian actualism by taking all possible outcomes (whether realized or unrealized) to be denizens of the actual world. The important distinction is then not between actual possibilities and non-actual possibilities but between realized possibilities and unrealized possibilities where only the former have non-modalized properties. Thus for example, a realized manifestation of the  $^{226}\text{Ra}$  isotope is a decaying of the isotope, whereas an unrealized manifestation does not have this property. Like the realized manifestation, the unrealized manifestation is an actual existent. However, unlike the realized manifestation, the unrealized manifestation is not a decaying of the isotope, but merely such that it possibly is a decaying of the isotope.<sup>3</sup> In view of this, there is no reason whatsoever to think that the being of propensities is somehow unreal or extends beyond this world into some other possible world. There is only the actual world  $w_{@}$ , and for any propensity  $\varphi$ ,  $w_{@}$  enfolds within itself everything that is necessitated by the fact that  $\varphi$  exists, in virtue of  $\varphi$ 's identity.

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<sup>3</sup> This is akin to, but not identical with, the conception vindicated by Linsky and Zalta (1994) and Williamson (1998) according to which the important distinction is between the concrete and the contingently abstract. What we call 'realized possibilities', they call 'concrete'; and what they call 'contingently abstract', we call 'unrealized possibilities' (see Bird 2007). The difference between these two conceptions is that we think that unrealized possibilities are causally efficacious, and thus, not abstract. Genuinely abstract entities (e. g. sets and numbers) on this view are remitted to what Linsky & Zalta and Williamson call the 'necessarily abstract'.

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