

On the Vagueness of ‘Novelty’ and Chance as an Explanation of Predictive Success

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Successful predictions of novel phenomena play an important role in the debate on scientific realism. According to the Miracle Argument, the approximate truth of a theory is the best or even the only explanation of successful predictions of ‘novel’ phenomena – i.e., phenomena of a kind not used in the construction of the theory. In the case of successful predictions of this kind, the agreement between theoretical prediction and experimental findings cannot be explained with reference to the theory’s accommodation to the facts.

I. In the first part of the paper, I shall argue that ‘novelty’ ought to be construed as a vague concept: There is no sharp distinction between ‘novel’ and ‘plain predictions’. Firstly, to speak of phenomena of a different kind as those used in constructing a theory presupposes an explication of *kinds of phenomena* we lack. Secondly, one of the aspects that make a successful novel prediction stunning is its *specificity*. Obvious examples are numerical predictions (of physical constants, for instance), and these predictions that can be more or less specific. Finally, the *history of science* indicates that scientists do not regard all novel predictions as equally important. – If ‘novelty’ is a vague concept, it will be difficult to tell whether or not a theory is predictively successful.

II. One objection to the Miracle Argument refers to the possibility of an accidental agreement between the theoretical prediction and observation: the fulfilment of the prediction may be a fluke. If predictive success were due to chance, there would be nothing to be explained.

A forceful variant of this objection refers to the vast number of predictively unsuccessful scientific theories. Most theories either do not make any successful predictions of novel phenomena or make no novel predictions at all. These unsuccessful theories are abandoned by the scientists and thus (wrongly) neglected by methodologists; taking them into consideration, it seems less astonishing that some theories are successful.

It is hardly possible to answer the question whether or not predictive successes a result of an accidental agreement directly: for neither do we know the number of unsuccessful theories, nor do we know which fraction of successful to unsuccessful theories is explainable by chance. I shall argue that it is possible to overcome these shortcomings by considering the distribution of predictive successes among the theories. If predictive successes were due to chance, one would expect that there are more theories with only a few successes than theories with lots of successful predictions. But the contrary is the case: predictive successes are statistically correlated. If a theory makes one successful prediction, this makes it more probable that it makes a second one. This feature is hardly reconcilable with chance. This distribution is independent of the question how strict the notion of ‘novelty’ is defined, i.e., whether it is meant to include only the most remarkable or a wider class of predictions. Thus, the vagueness of ‘novelty’ does not pose a problem for this line of reasoning.