

Rejoinder to Professor Teller

At the outset of his comments Professor Teller expresses disquiet at what seems to him my claiming to have a rule which is capable of automatically generating the hypothesis to be adopted when given nothing but the experimental data. Such a claim would indeed be quite preposterous since everybody knows that there are no clear-cut principles for the production of hypotheses, but that these are suggested by the imaginative insights of a high talent which conjectures without the aid of any rules of scientific discovery. Subsequently, he expresses the hope that I may not have had such a claim in mind.

I have, of course, explicitly explained at considerable length that I wish to make a sharply different claim. I have been dealing with a situation where a hypothesis to account for all the observations had already been suggested by a scientist. But as soon as this is done, one can mechanically generate out of the suggested hypothesis infinitely many parasitic rival hypotheses by the simple method I have described. The principle of maximum parsimony determines which one to adopt among these hypotheses.

But let me come to the truly surprising part of Professor Teller's paper, which is his expression of puzzlement by what is meant by extraneous evidence. He says: "[W]hat is to count as genuine evidence and what extraneous to the evidence? Why should not the outcome of drawing lots or the word of a specially designated person (Professor Schlesinger's examples of extraneous information) simply count as part of the evidence to be used in evaluating hypotheses?" (p. 344) Although I find it almost impossible to believe that Professor Teller should not himself be able to answer this question, let me briefly reply: When we are, for example, searching for a hypothesis correlating the time traveled by a particle and the distance covered during that time, then the fact that in three seconds the particle traveled four feet I take as genuine evidence supporting the hypothesis which shall be admitted as a candi-

date for adoption, because such a hypothesis logically implies that such a fact obtains. On the other hand, the word of a specially designated person is not logically implied by that hypothesis. The same goes for the results of drawing lots.

He then continues by saying, "I am also wholly unclear about what is meant by saying that past observations *in themselves* do or do not determine choice of hypotheses. Consequently, I am at a loss over what the connection is supposed to be between such determination and the presence or absence of things 'extraneous'" (p. 345). Once more the situation does not seem to call for elaborate explanations. By past observations I mean, of course, past observations of what is genuine evidence. When we have used nothing beside genuine evidence but the fact that it is genuine evidence (which is determined logically by seeing that the hypothesis concerning the law governing the phenomena under investigation logically implies it) and the principle of maximum simplicity (which is once more a purely logical operation) in choosing our hypothesis, then the genuine evidence alone, unaided by any extraneous fact, determines which hypothesis we adopt.

Why is such a practice to be preferred? I think a brief answer is simply this: if there is merit in basing hypotheses on evidence, then the more we base them on the evidence the better. The best thing is to base a hypothesis maximally on the evidence, that is, base the hypothesis on the evidence and nothing else.

Lastly, I should like to make a point or two about Professor Teller's lexicographical example. First, it is to be noted that the construction of the lexicon involves insurmountable difficulties. Given any hypothesis, there are infinitely many ways in which it can be worded. But perhaps what Teller had in mind is that we restrict the number of letters to be used. In this case, though there is a vast number, there is still only a finite number of formulations for each hypothesis. But there are infinitely many hypotheses. We cannot begin ordering these hypotheses into our dictionary until we have formulated them all!

Thus we cannot have the required dictionary. But we shall ignore this matter. Suppose there were only a finite number of hypotheses and that these were listed in some order. Using this lexicon, we would be resorting to the extraneous empirical information in what of the many possible ways the hypotheses have actually been ordered.

There is also another point. The principle of maximum parsimony

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is unique among all the principles which select the hypothesis to be adopted by taking account of its complexity: it, and it alone, leads to a determinate hypothesis. The principle to select our hypothesis through Professor Teller's lexicon is one among many comparable principles, each of which will yield determinate results; every dictionary listing all the hypotheses according to some order will choose for us a definite hypothesis. We would then need a higher order principle to help us to decide which lexicon to use. 'Choose the lexicon devised by Teller' is such a principle. It, however, raises the same problems once more on a second level. First, we would have to be furnished with the extra empirical information of which dictionary has been compiled by Teller. Secondly, we would need a third-order principle which would make us choose Teller's dictionary rather than some other.