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Is There a Scientific Method?

The question of whether there is a scientific method produces a game that any number can play. If philosophers—with a knowledge of science limited for the most part to the finished product—can speak of a method, or even *the* method, then scientists—with firsthand experience in groping for new scientific ideas—can speak of as many methods as there are problems or even deny that in discovery there is such a thing as method at all. Yet, perhaps, a careful answer to the question would reveal that, despite differences in interest and emphasis, all the players are on the same side.

In broadest outline, science has as its purpose the discovery of true generalizations or laws of nature, these generalizations being used to explain particular happenings. For example, you explain the bursting of a particular water pipe in a particular house during a particular winter in terms of the severity of that winter and the generalization that water always expands on freezing. Or you explain the occurrence of a particular eclipse in terms of earlier positions and velocities of the planets and Newton's law of universal gravitation.

Method enters science in the business of how you go about increasing the probability that a given generalization is true. If you merely reel off a greater and greater number of positive instances, then you are using the wrong method. The unity underlying all inquiries is that to turn the trick you must seek other kinds of instances as well. Thus, to increase the probability that all *A*'s are *B*'s, you must not only examine joint occurrences of *A* and *B* but must seek out circumstances in which at least *A* is not present and circumstances in which at least *B* is not present. The classic, if not altogether complete, formulation of method in this sense was given by the 19th-century philosopher John Stuart Mill in his five canons of inductive inference.

An illustration in miniature of scientific method is Edward Whymper's explanation of the curious evaporation that invariably holds in the high Alps. Whymper, who is better known as the first man to scale the Matterhorn, would awake in the morning to discover that a considerable quantity of wine had disappeared from his flask during the night. Since the Chamonix porters in his party always vigorously denied having seen anyone touch the flask, there seemed no explanation of the event other than the unusual dryness of the high mountain air. But Whymper, by examining a circumstance in which, so to speak, neither *A* nor *B* was present, found a way to increase the probability of the truth of his suspicions, and, incidentally, to save his wine. He showed that the evaporation ceased completely when he used the flask as a pillow during the night.

In this illustration, there is reference to an underlying method, but there is no claim to an automatic procedure for solving problems. Of course, given a set of variables, *A*, *B*, *C*, and *D*, you can examine mechanically all possible combinations in a search for invariable relationships. But, to decide in the first place what variables are relevant to the problem requires an insight for which no rules are available.—J. T.