

SCOPE AND AIM OF THIS BOOK

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The different branches of scientific inquiry may be divided into two major groups: the empirical and the nonempirical sciences. The former seek to explore, to describe, to explain, and to predict the occurrences in the world we live in. Their statements, therefore, must be checked against the facts of our experience, and they are acceptable only if they are properly supported by empirical evidence. Such evidence is obtained in many different ways: by experimentation, by systematic observation, by interviews or surveys, by psychological or clinical testing, by careful examination of documents, inscriptions, coins, archeological relics, and so forth. This dependence on empirical evidence distinguishes the empirical sciences from the nonempirical disciplines of logic and pure mathematics, whose propositions are proved without essential reference to empirical findings.

The empirical sciences in turn are often divided into the natural sciences and the social sciences. The criterion for this division is much less clear than that which distinguishes empirical from nonempirical inquiry, and there is no general agreement on precisely where the dividing line is to be drawn. Usually, the natural sciences are understood to include physics, chemistry, biology, and their border areas; the social sciences are taken to comprise sociology, political science, anthropology, economics, historiography, and related disciplines. Psychology is sometimes assigned to one field, sometimes to the other, and not infrequently it is said to overlap both.

In the present series of books, the philosophy of the natural sciences and the philosophy of the social sciences are dealt with in different volumes. This separation of topics is to serve the practical purpose of

permitting a more adequate discussion of the large field of the philosophy of science; it is not intended to prejudge the question whether the division is also of systematic significance, i.e., whether the natural sciences differ fundamentally from the social sciences in subject matter, objectives, methods, or presuppositions. That there are such basic differences between those large fields has been widely asserted, and on various interesting grounds. A thorough exploration of these claims requires a close analysis of the social sciences as well as of the natural sciences and thus goes beyond the scope of this little volume. Nevertheless, our discussion will shed some light on the issue. For from time to time in our exploration of the philosophy of the natural sciences, we will have occasion to cast a comparative glance at the social sciences, and we will see that many of our findings concerning the methods and the rationale of scientific inquiry apply to the social as well as to the natural sciences. The words 'sciences' and 'scientific' will therefore often be used to refer to the entire domain of empirical science; but when clarity demands it, qualifying phrases will be added.

The high prestige that science enjoys today is no doubt attributable in large measure to the striking successes and the rapidly expanding reach of its applications. Many branches of empirical science have come to provide a basis for associated technologies, which put the results of scientific inquiry to practical use and which in turn often furnish pure or basic research with new data, new problems, and new tools for investigation.

But apart from aiding man in his search for control over his environment, science answers another, disinterested, but no less deep and persistent, urge: namely, his desire to gain ever wider knowledge and ever deeper understanding of the world in which he finds himself. In the chapters that follow, we will consider how these principal objectives of scientific inquiry are achieved. We will examine how scientific knowledge is arrived at, how it is supported, and how it changes; we will consider how science explains empirical facts, and what kind of understanding its explanations can give us; and in the course of these discussions, we will also touch upon some more general problems concerning the presuppositions and the limits of scientific inquiry, scientific knowledge, and scientific understanding.

SCIENTIFIC INQUIRY:

INVENTION AND TEST

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2.1 A case history as an example

As a simple illustration of some important aspects of scientific inquiry let us consider Semmelweis' work on childbed fever. Ignaz Semmelweis, a physician of Hungarian birth, did this work during the years from 1844 to 1848 at the Vienna General Hospital. As a member of the medical staff of the First Maternity Division in the hospital, Semmelweis was distressed to find that a large proportion of the women who were delivered of their babies in that division contracted a serious and often fatal illness known as puerperal fever or childbed fever. In 1844, as many as 260 out of 3,157 mothers in the First Division, or 8.2 per cent, died of the disease; for 1845, the death rate was 6.8 per cent, and for 1846, it was 11.4 per cent. These figures were all the more alarming because in the adjacent Second Maternity Division of the same hospital, which accommodated almost as many women as the First, the death toll from childbed fever was much lower: 2.3, 2.0, and 2.7 per cent for the same years. In a book that he wrote later on the causation and the prevention of childbed fever, Semmelweis describes his efforts to resolve the dreadful puzzle.¹

He began by considering various explanations that were current at the time; some of these he rejected out of hand as incompatible with well-established facts; others he subjected to specific tests.

¹ The story of Semmelweis' work and of the difficulties he encountered forms a fascinating page in the history of medicine. A detailed account, which includes translations and paraphrases of large portions of Semmelweis' writings, is given in W. J. Sinclair, *Semmelweis: His Life and His Doctrine* (Manchester, England: Manchester University Press, 1909). Brief quoted phrases in this chapter are taken from this work. The highlights of Semmelweis' career are recounted in the first chapter of P. de Kruif, *Men Against Death* (New York: Harcourt, Brace & World, Inc., 1932).

PHILOSOPHY
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