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Getting to Know the World Scientifically

An Objective View

Springer

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Preface

Scientific knowledge is nothing if not objective. Men are not flown to the moon on the basis of the whim of any Tom, Dick or Harry, or even the president of the United States, however much they might wish it. No such project would have been feasible prior to WW2 but was made possible by the application of sound scientific knowledge built up over the generations and the well-established expertise of implementing it in engineering practice. Such engineering feats and the acquisition of scientific knowledge on which they depend are fundamentally social phenomena, relying on the accumulation of knowledge and what Hilary Putnam has called the sharing of the linguistic burden. The wheel has not been reinvented with each new generation, which has not had to begin from scratch. Knowledge has been passed on from generation to generation, modified, elaborated and supplemented in the process as demanded by the ever-expanding experience by scientists standing, as Newton famously put it, on the shoulders of others. As the body of accumulated knowledge expanded beyond the grasp of any one individual, surpassing the likes of the so-called universal minds such as Leibniz and Newton who commanded substantial proportions of the available knowledge of their day but became a phenomenon of bygone centuries, experts from different fields cooperated in tackling the increasingly complex issues that the scientific community addressed. Research teams typically comprise experts in various fields of specialisation, each drawing on others' knowledge which they respect and comprehend to the extent of being able to understand its role in the overall investigation. And so it is in modern, everyday life where we are prepared to grant that there are, for example, chalk hill blue butterflies that someone more knowledgeable than ourselves could identify and classify even if we can't do it ourselves or oaks that are distinguished as pedunculate or sessile even if we haven't the faintest idea of what marks the distinction and why.

Despite the many ostentatious demonstrations of the achievement of scientific knowledge, the social aspect of science and complexity of its projects has led critics to question its objective status in the name of social constructivism, postmodernism and relativism. The critique is often directed at a straw man, a once-influential view that is long since outdated, or a misrepresentation of a more interesting view: the world consists of a countable jumble of facts like a collection of lego pieces

in a box, the logical positivists' doctrine that scientific progress amounts to the accumulation of more and more observations, the early Wittgenstein's picture theory of truth, and so on. Often, the case presented amounts to a non sequitur. The fact that knowledge claims are formulated in terms of concepts that emerged from a historical process of deliberation doesn't imply that the claims themselves are "social constructions" rather than what is true of the world. We use our concepts to describe the world. It might well be felt that the critique of objectivity can be safely ignored as the outpourings of a group of uninteresting sociologists, as many scientists have done, were it not for the disastrous influence it has had on secondary school curricula and teaching practice.[1] At all events, I won't be trawling through the social constructivism literature here. Rather, the plan is to give some account of how the social dimension of science underlies its objectivity, and to take up and criticise some lines of thought underlying relativism, which is one of the main sources of inspiration for social constructivism.

Relativism is associated with antirealism—one of the classical issues in the philosophy of science. Antirealism postulates that science is concerned with the systematic recording of observations, capturing regularities in the concomitance of the observable features of common-sense bodies with a view to predicting the occurrence of observable features in the future. This calls for efficient unifying organisation, linking apparently unconnected observable features, which is promoted by the postulating of unobservable entities and their associated features. These provide a theoretical foundation in terms of which the observational regularities can be simply and efficiently encompassed in a unified system. On this understanding of the observational and theoretical parts of the body of scientific knowledge, the theoretical core might be removed once its unifying aid has served its heuristic purpose of bringing the observational regularities into place without detriment to the overall truth of the body of knowledge. For, according to the antirealist, whatever evidence supports this body of knowledge is based on observation, and that merely supports the observational part. Traditional empiricists following Berkeley have held some such view, maintaining that observations concern the private sense data experienced by individual minds, which is what constitutes observational knowledge. This is idealism, according to which even the everyday, common-sense objects around us are theoretical constructions facilitating the organisation of this knowledge although in principle redundant. But sustained critique had extinguished the last vestiges of the sense data-based notion of observation by the mid-twentieth century. The logical positivists of the 1920s and 1930s construed observational knowledge in terms of intersubjectively agreed perception. That fell by the wayside in the 1950s when the theory dependence of observation was generally recognised (although the idea goes back to Duhem at the turn of the century). Antirealists, who bear the onus of delimiting an appropriate notion of

[1]The pernicious influence of social constructivism on Swedish schools, which have seen a marked decline in standards as recorded by international comparisons since the mid-1990s, has been well documented by Åsa Wikforss (2017).

observational knowledge, have subsequently taken some steps to accommodate theory dependence in their conception of observation. But there is no support for such projects in scientific practice, where observation is not understood to delimit a more directly accessible domain of nature. The realist response advocated here, which with some qualifications affirms the literal truth of scientific theories, follows Duhem's understanding of experimental practice as not involving any such distinction between the accessible and inaccessible domains of nature and allies it with Duhem's historical thesis of the continuity of science.

These broad themes are developed in what is intended as an introduction to some fundamental issues in the philosophy of science, which I hope will be of value both for students of philosophy and science. Part I deals with knowledge and values. Chapter 1 starts the ball rolling with a presentation of the classical conception of knowledge as initiated by the ancient Greeks and elaborated during the development of science, introducing the central concepts of truth, belief and justification. Aspects of the quest for objectivity in claims to know are taken up in the following two chapters. Justification is discussed in Chap. 2, rounding off with a discussion of the interplay of values and statistics in scientific inference, and the objective claims of truth are taken up in Chap. 3. Moral issues are broached in Chap. 4 which discusses some aspects of the use and abuse of science, taking up the responsibilities of scientists in properly conducting their business and decision-makers in their concerns with the import of science on society.

Part II looks at some philosophies of science. Some philosophers see the progress of science primarily in terms of rejecting old hypotheses and theories and replacing them with new ones, whereas others see science as progressing primarily by accumulating knowledge, saving as much as possible from older theories in the course of developing new theories accommodating new experimental and observational results. The Austrian philosopher Karl Popper, discussed in Chap. 5, is a well-known representative of the first group, and the French physicist, historian and philosopher Pierre Duhem, a well-known representative of the second group, is taken up in Chap. 6. A concluding chapter discusses the natural attitude of taking the theories of modern science to be literally true, i.e. realism, in the light of arguments drawn from the history of scientific progress in favour and in criticism of this stance.

Some points in the first chapters may already be familiar to some students. But I hope this will be mitigated by the general context of the presentation by placing epistemological issues raised in philosophy courses in a scientific context and relating experimental procedures to epistemology. Moral issues are raised in Chap. 4 and some of what is said there might be thought controversial. But this hopefully raises important issues and serves to stimulate reflection and guide discussion. The discussion of positivism in Chap. 5, largely on the basis of Ayer's understanding, may seem overly simplistic in the light of the recent interest in the detailed history of the development of logical positivism. But this is not the place to go into a more rigorous historical treatment, bringing to light the subtlety of thought of figures such as Carnap and Reichenbach. I have tried to illustrate points with examples taken from contemporary or historical science rather than leaving them in the abstract, but without pursuing details to the extent of confounding readers unfamiliar with

the relevant specialised knowledge. References often provide or lead to further information. I have tried on the whole to avoid technical matters of logic, although it is sometimes appropriate to mention where they enter the debate. Again, references point to way for those interested in pursuing such matters.

This book is largely based on a course in the philosophy of science that I have given over the years at Stockholm University for a mixed group of students and occasionally staff from other departments, including some who were reading or had read philosophy and others reading sciences, engineering, humanities and social sciences. I am grateful for the interest and enthusiasm evident from their questioning, which has had a considerable influence on the final form of this book.

Stockholm, Sweden Paul Needham
April 2017

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