Explaining explanations

Andrzej Stasiak

Explanations: Styles of Explanation in Science

by John Cornwell (ed)

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The majority of time that we scientists spend on professional activities is devoted to explanations. Grant writing comprises explanations of the subject, the advantages of the proposed experimental approach

and the need for requested funds. In active research, explanations are sought for experimental results, and are then conveyed to others during group discussions, meeting presentations and when writing scientific papers. Teaching is nothing other than explanation. Despite the paramount significance of explanations, we rarely ask ourselves whether science explains things or merely describes them. We also rarely analyse whether the explanations that we use are causal or 'effectual'. Luckily, philosophers of science and scientific philosophers ponder such questions and have even held symposia on the nature of explanations. *Explanations: Styles of Explanation in Science* is the result of such a symposium, held in 1999 at Jesus College, University of Cambridge, UK. The book's editor, John Cornwell, has compiled 12 chapters from authors representing various disciplines of philosophy and science. Overall, the book makes interesting reading, but with the exception of the last chapter ('Passing it on: redescribing scientific explanation' by Jon Turney), it will not help to improve the readers' ability to explain.

A recurrent subject in several chapters is teleology. I still remember the philosophy course during my studies in which the

lecturer insisted that science could not answer the question of why something happens but could only tell us how it happens. I do not remember any more details from these lectures but the second chapter of the book, written by physicist and Nobel laureate Steven Weinberg, made it clear to me that my academic teacher was a follower of the influential Austrian philosopher Ludwig Wittgenstein, one of the key figures in the neo-positivistic movement of twentieth century philosophy. Wittgenstein made a clear distinction between description and explanation, in which the latter could only be teleological, in other words stating the purpose of the thing being explained. Therefore, according to Wittgenstein (and those who accept his philosophy), science can only describe the world—not explain it—as the laws of nature have no purpose. However, Weinberg does not share Wittgenstein's point of view and strongly attacks philosophers or anyone else who ascribe meanings to words that are different from their meaning in general use. According to Weinberg and several modern philosophers of science (such as Peter Achinstein, Carl Hempel, Philip Kitcher and Wesley Salmon), science explains things, and these explanations are what scientists in a given field routinely use as explanations. Armed with this working definition of an explanation, Weinberg describes how physicists can explain a given physical principle by showing that it can be deduced from another, more fundamental, physical principle.

In the first chapter of the book, 'What good is an explanation?', Peter Lipton (a philosopher of science) discusses why explanations are better made using causes than effects. However, effects can be used to explain. According to Lipton, a statement that "the function of the polar bear's white fur is camouflage" is not teleological because it is simply meant to explain that natural selection has acted in such a way that, due to camouflage, whiter individuals have a greater chance to catch prey and thus survive. I liked this non-teleological (causal) explanation but was soon very disappointed when biologist David Hanke strongly rejected any effects-based biological explanations in his chapter 'Teleology: the explanation that bedevils

biology'. In his crusade against teleology, Hanke insists that swallows' wings or ants' jaws do not have any purpose, because they are not manufactured and not designed. I strongly preferred Lipton's interpretation that these features evolved and were selected in such a way that they allowed their holder efficient flying or strong biting, although the organisms had no intention of evolving in this way nor was there a higher intention that guided the process of evolution. Therefore, following Lipton's example of the camouflage of white bears, it should be correct to say that one of the main functions of swallows' wings is flying, an explanation that does not rely on teleology because it does not postulate any conscious intention, but is nevertheless effects-based.

It makes sense to use natural selection to explain some biological phenomena by their effects. Can this be extended to physics and cosmology for example? Yes, it can. Enter the anthropic principle, a popular theory that attempts to explain why the properties of the universe are just right to allow life to exist, and suggests that events and human observations are inextricably linked. Using the anthropic principle one can ask, for example, why our universe has already lasted more than 13 billion years and not just 10,000 years. The answer is simple: 10,000 years would not be enough time to allow human existence (and thus, questions about the universe). The third chapter of the book, written by cosmologist and Astronomer Royal Martin Rees, ends with the suggestion that our universe could be just an "atom" in a multiverse punctuated by repeated big bangs, each of which leads to the creation of individual universes that may have different underlying physical laws. The physical laws that we study can therefore be considered special, as they are in the universe that allowed our presence and were therefore selected for investigation by its effect: us.

I recommend this book to all readers interested in philosophy and sociology of science.

Andrzej Stasiak is at the University of Lausanne, Switzerland.

E-mail: andrzej.stasiak@lau.unil.ch

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