

Science and Philosophy

by

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One of the essential presuppositions of science is that behind the array of colors, shapes, smells, tastes and sounds which are immediately known, there are things which cause them, and exist independently of our minds. Without this presupposition no scientific explanation is possible. The only science that would be left would consist of a general laws of phenomena. This has been urged by some philosophers, e.g. Auguste Comte and other positivists; but phenomena, when viewed as the sole reality, are so complex in their interrelationships that they leave the human intelligence in total confusion. Unless science tries to explain phenomena by an underlying reality, its task would be beyond human abilities, and even if successful would not satisfy the scientific curiosity which asks the question "Why?"

Of course, this reality does not merely consist of things. Otherwise a list of all the things in the universe would tell you all about it, and this is obviously false, since you wouldn't even know that Rock Island is in Illinois. Reality consists of facts, which are structures of things. Some facts are merely the logical combination of other facts, but ultimately there are facts which are purely structures of things, and not analysible into other facts. They are called atomic facts. The terminology used here is largely due to Bertrand Russell and Ludwig Wittgenstein, during time of his Tractatus Logico Philosophicus. However most realists

would agree with the content of the above, although they might say it quite differently.

On the subject of reality, Theobald does not clearly commit himself. In quoting Aristotle (p.120, 1.4), he seems to be agreeing with realism, but at another point (p.133, 1.23) he says, "What is real depends upon the way we ponder experience, the way we ~~think and think~~ about it." Certainly what we think is real has this dependence, but reality itself cannot. Perhaps this is what he meant, but he didn't say it there. Later, however, he did say (p.133, 1.5), "The meshing of language and experience crystallizes what for us is real." So his position is not clear. Theobald is generally excellent in his criticisms of operationalism, instrumentalism, etc. He says (P.21, 1.8), "We must therefore recognize that thinking and communication about the world is not made possible by scrutinizing sensations, but that first and foremost, we talk about objects and events, and any analysis into sensations comes later, if at all. We must reject the view that when we talk about objects and events in the world around us, we are really talking about personal experiences of them." This is fine, so far as it goes, although I think he underestimates the importance of sensations and the part of language which does refer to them. Also, whether the world around us he speaks of is or is not dependent upon us, he is not clear about.

Language has many uses. For science, the most important use is that it can convey truth and falsehood. In the language

of the logical atomist, there are elementary propositions which correspond to all possible atomic facts. An elementary proposition is true if the corresponding possible atomic fact is real. An elementary proposition is false if the corresponding possible atomic fact is not real. Other propositions are constructed logically from the atomic ones, and their truth or falsehood thus depends logically upon the truth or falsehood of the component atomic propositions.

In an atomic proposition the combination of the words indicates a structure in reality. Some of the words indicate the things involved in the structure, while others, and the way they are combined, indicate the structure of the things. Thus our concepts of what things are and their manner of combination enter into language. Language also provides means of description in this way. One of Russell's great discoveries in logic was his theory of descriptions, which explains how this is done.

Language of course has many other uses besides that just described. In his early period, Wittgenstein thought the above was the only use of language. When he realized there were other uses, he was so shocked by this infidelity that he decided reality was an illusion produced by our languages, and from which philosophers, in particular, needed to be cured.

Theobald's discussion of truth parallels the one on reality. What is true depends upon your language. Presumably there would be a correspondence between the true proposition in a given language

and the reality for that language, but both are relative to that language.

Logic and mathematics are unique discipline for they provide undeniable truth and have no need for empirical observation. Logically true statements are ones like, "It is raining or it is not raining," which is true in any weather. Until recently, Logic and Mathematics were considered to be different fields, but with symbolic notation introduced in logic and the foundations of mathematics slowly developing, the idea developed that all of mathematics can be deduced from logic. This task was undertaken by Alfred North Whitehead and Bertrand Russell in Principia Mathematica. Although it was not perfect, and there are still problems in the field, the thesis that mathematics can be deduced from logic is now widely accepted.

Mathematics and logic are, of course, used extensively in the empirical sciences. In classical electromagnetic theory, for example, there are very few fundamental equations. Basically, Maxwell's four equations for the electric and magnetic fields and the Lorentz force equation. In themselves, these equations would be virtually impossible to test experimentally, because of their generality of form. However, in conjunction with Newton's laws of motion and the deductive laws of mathematics, all the classical phenomena of electricity and magnetism can be explained, and thus the theory tested. Thus mathematics, which is not an empirical science plays an important role in the empirical sciences.

One of the basic concepts of science is that of causality. Without it there can be no scientific explanation. Causal laws in physics, for example, do not usually take the form "A causes B," where A and B are some physical events. Rather, they are usually of the form of differential equations and explain how a system changes over time. Thus to explain the motion of a stone thrown upward with velocity v , at height h . One uses Newton's second law $F = ma$, with the gravitational force $F_g = -mgh$. So that

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Thus, the laws of physics allow one to predict and explain future events from present ones, so they are causal laws even though they do not have the form, "A causes B"

One of Wittgenstein's in Tractatus Logico Philosophicus is relevant at this point. He said (5.1361), "Belief in the causal nexus is superstition." He did not intend, however, to deny the laws of physics. He thought that the entities in physics were not simple but complexes of simples, so that when the laws of

physics would appear to predict one fact from others, the predicted fact was really logically contained in the others to start with. This was not realized because the propositions were not in their analyzed form and in the unanalyzed form it was not possible to make the logical deductions necessary to see it. Thus far the Wittgenstein of the Tractatus, all laws are logical and all of science would be known if we could just analyze all propositions into elementary propositions.

What is wrong with Wittgenstein's account of the laws of Physics? They predict events in the future of the events used to predict them. Any logical combination of present facts, elementary or otherwise, can only be a present fact. So that no future fact can be contained, logically in them. So the laws of physics, for example, are causal laws, not logical.

We have seen that causal laws cannot be rejected, while retaining the laws of, say, physics. However, the question remains as to why any causal laws should be believed. Causal laws are all the result of generalization of observed regularities in thesequences of events. Suppose that the event B is observed to follow the event A regularly and that whenever A is observed, B follows. Is there any reason to suppose it will continue to do so in the future? One might say, in the past, I thought it would in the future, and it did. But, this only applies to past futures, not to future futures. Some postulate about the uniformity of nature, as suggested by by such thinkers as Mill (although he was uncertain of its

logical status), Whitehead and Russell, appears to be required before induction is possible. The justification of such a postulate is, perhaps, the greatest problem of the philosophy of science.

Theobald (p.68, l.18) appears to have misunderstood the reason for this postulate. He seems to think that it was being used so that induction, while its real purpose was to make induction plausible. It is also not important whether or not it occurs to scientists in practice, scientists do not have time to deal with such problems, at least not as scientists.

Theobald made a point that a proposition is a description or explanation according to its context. (p.39, l17) This is a half-truth. Suppose someone asks why some event B happens. He is given the description of an event A, which it is evident from a theory, widely held, that A is the cause of B. The proposition involved is both an explanation of B and a description of A. So that, in truth, a proposition is not an explanation or description, merely in the context of its use. A proposition can never both describe and explain the same event. In being descriptive of one event, however, it may on the basis of some theory, provide an explanation of another event.

Theobald makes a point that the observation of an electron in a closed chamber is as good as the observation of an hare (p.23, l.27) This is another half truth. Neither the hare nor the electron is ever seen. In the case of the apple, brownness, fuzziness, etc. are seen. Both the hare and the electron are theoretical entities. As far as I could tell, Theobald did not even recognize that the

hare was a theoretical entity, (p.23, l.33) though this is hard to believe. Although both are theoretical entities their manner of indirect observation is not identical. The observation of the hare depends only upon light striking it and being reflected into the observers eye. The observation of the electrons depends upon the water vapor condensing along the electrons path and then light striking this trail and being reflected into the observers eye. The theory behind it is more complicated than the theory in the case of the hare and so there is a greater chance of error. Thus there are both similarities and differences between these two types of observation.

Empirical science begins with phenomena with our intuitions. Phenomena are in themselves real. In addition to phenomena there are the causes of the phenomena, which is independent of our minds but which can interact with our minds. Of course, not all of our intuitions are caused by external objects. Some are caused by the malfunctioning of the senses, some by imagination, and some by memory. In themselves, they are all real, and are indistinguishable. They are distinguished in how they relate to external reality. In presentative intuition we intuite something which is present to our senses. In imagination, we create an intuition of something which may or may not be actual, and is generally not present to the senses. In memory we recreate or recall an intuition which was once present to the senses though it generally is no longer present. All these forms of intuition are essential to empirical science.

Without memory, the scientist could not record data, for he has to use his memory after he turns from his instrument to make the recording, and again when he uses the data, he must remember how it was obtained. Without imagination science would never progress; no new experiments or theories could ever be suggested.

What is the relation between our intuitions which are real, and the things external to them which can cause them? How are Mind and Matter related? In The Analysis of Mind and The Analysis of Matter, Russell has suggested that they are the same thing, viewed from different aspects. Mind is closer to the nature of the things from which reality is constructed, though as we know mind it is much more complex and developed than reality would be if it were completely analyzed. Matter is the product of arranging things according to their external relations, and is just as real. Thus viewed mind and matter are naturally related, and there is no need for suggesting parallel worlds, as Descartes, or rejecting mind as matter, as in materialism or idealism.

Whitehead has also objected to the bifurcation of reality. Due to his background in mathematics and physics, he was able, in Process and Reality and his other works to put together one of the most successful metaphysics in its explanation of physical and mental reality and their relation. In some ways it resembles Russell's theory mentioned before. The actual entities of the world are emotional in nature, they are "drops of experience". They prehend each other both physically and conceptually. In a

physical prehension, an actual entity is affected by another actual entity, merely as an actual entity. It is out of the structure of these physical prehensions that physical reality is constructed. In a conceptual prehension, an actual entity is affected by an eternal object in another actual entity. An eternal object is a shade of green, some tone of sound, etc. It is out of these that mental reality is constructed. Whitehead's metaphysics is more than could be achieved by empirical science. It is an attempt to provide an explanation for science, or perceptions, their relation to each other, and in addition provide a kind of values, which science could never do.