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Crystalline Solids

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Domestication, he talks about the origin of species from a closely related species. He leaves the origin of classes, orders, and genera to the imagination of the reader. If the reader was religiously inclined, as was Asa Gray, he could leave the origin of higher taxa to God, or if he were atheistically inclined, as was Haeckel, he could eliminate God altogether. There was, at any rate, room enough for philosophical and theological discussion, and, indeed, the later part of the 19th Century was filled with it.

Positivists, however, were clear that God had no place in science, and Ernst Mach, the Austrian physicist, who had been flunked out of school by the Jesuits and told to become a carpenter, set himself the task of rigorously stripping science of all concepts which had a theological or even philosophical foundation. The concept of "law", which Newton had so successfully used, and which Darwin had so ardently cultivated, Ernst Mach on the other hand mightily despised. Newton, a fundamentalist, had believed that God had directly promulgated the three laws of motion, but Mach argued that a so called "law" in science was nothing more, and nothing less, than an "economical description of observational data". Einstein, following Mach, pointedly avoided using the term "law" altogether and hence we have the "principle" of relativity instead of the "law" of relativity.

In Vienna, there arose a school of logical positivism, who were direct followers of Mach, and who attempted to systematically examine terms used in science to see what they actually meant, terms like "time", "space", "hypothesis" and "law". These were terms which scientists tended to use without ever really defining them, and it was in these terms that "extrascientific" concepts, like "god", crept in. However, when the logical positivists attempted to define rigorously these scientific concepts, they ran into problems. To define one word, you must use another word, which, in turn, needs to be defined, and so on indefinitely. Finally Gödel showed that sooner or later you must begin with an undefined term, or, more accurately, you must begin with a term which is not defined by science or philosophy, but whose meaning is assumed through the historical experience of using it in the community. Hence Toulmin has argued that to understand the philosophy of science, you must understand the history of science. If you want to know what the word "time" means, you have to go back through history and understand the historical context in which the accepted usage of the word developed.

We have now come full circle. The original concepts of Geology emerged not only from an empirical study of nature, but also from the historical experience of Western Europe in the 17th, 18th and 19th Centuries. In using these terms to describe Nature, the original geologists were not able to escape their involvement in the social, political and theological events around them - nor are we, or if we do escape, it is at the peril both of science and of society.

MS received November 26, 1975.

Crystalline Solids

By Duncan McKie and Christine McKie
Thomas Nelson and Sons Ltd., London, 628 p., 1974.
£6.50 (about $14)

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The declared object of this book is to provide an introduction to the study of crystalline solids for students in a first year course; a number of more advanced sections have been included to appeal to students in a second year of crystallographic study. The authors also propose that it may appeal to graduate students who have come to crystallography from other disciplines. We consider these objectives too extensive for a treatment satisfactory to any of the classes of subjects it is intended for.

In fact, we consider the book unique in its breadth: crystal morphology, atomic structure, X-ray crystallography, crystal chemistry, crystal physics, optics, thermodynamics, analytical chemistry are all included and treated in a reasonably comprehensive manner.

The illustrations are generally clear. While the development of specific topics is admittedly not rigorous, it does nevertheless convey a physical understanding of the subject. The inclusion of thermodynamics (Part II) is certainly unusual in an introductory text to crystallography; much of this part of the text is concerned with classical thermodynamics and the tie with crystallography via statistical thermodynamics is indeed very tenuous.

As a tool of learning in the hands of first or second year students, we feel that the inclusion of exercises on the various topics would have been very helpful: we did not see any. The book may be more successful as a reference manual.

The number of introductory texts in crystallography published in English is considerable. This one is unique for its breadth: at the current price, its acquisition as a reference manual would appear interesting to us.

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