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THE SYMMETRY OF TIME IN PHYSICS*

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A FEW years ago I presented[1] the outline of a theory of light which required a radical change in our ideas of temporal causality. Instead of assuming the time-honored unidirectional causality, in which cause inevitably precedes effect, it proved necessary to assume that the present phenomena of a system are determined no more by the past states of the system than by its future states. Several recent developments in physics make this assumption seem less startling now than then; indeed I am fully convinced that there is no other way in which we can account for the known phenomena of light. Moreover, new discoveries in wave mechanics indicate that any conclusions concerning the emission of light must be extended to the emission of every kind of material particle.

By such considerations I was led, in "The Anatomy of Science," to examine with some care the meaning of time, as the word is used in physical science. It often happens that a common concept of daily life may profitably be simplified or refined when it is to be employed in a single branch of science. In studying the vastly complex phenomena of nature, as they come to us through our sense impressions, we could make little headway did we not segregate and idealize certain groups of like phenomena for the purpose of special study. Such segregations define the several branches of science, of which one of the most highly specialized and idealized is physics. Only a few types of phenomena are included within its bounds, and in its study we consciously abstain from employing many of our commonest ideas, such as purpose, goodness, beauty. In the physical sciences a statue of Praxiteles is a certain mass of crystalline calcium carbonate; the shape may or may not be mentioned. It was the scientific arrogance of a previous age that called a law of physics a law of nature. To speak so is to forget the bounds that we have ourselves established.

* Address given on the occasion of the presentation of the gold medal of the Society of Arts and Sciences, New York, April 17, 1930.

[1] Nature, 117: 236, 1926.