WHAT ARE PEOPLE SAYING?

Cause, Chance and Creation

Philip Morrison, physicist, wrote an article under this title for the series "Adventures of the Mind" in the *Saturday Evening Post* (April 30, 1960). He discussed the mechanistic world view which followed Newton. This philosophical view, he claims, affected not only physics and philosophy but the views of men generally.

Feats like the prediction of the time of an eclipse of the sun, possible with high accuracy for a thousand years ahead, became the hallmark of a powerful science. Its proponents claimed that one day they could so explain everything. But there is a clear and common-sense retort. Life is not at all like solar eclipses; novelty and surprise, building a tangled complexity of events, are much more the essence of the world than is the serene dance of the planets, however intricately they weave.

So the physisict's view became first less plausible, then hardly more than absurd. Even in the last decades, the mechanical theory of the world is often taken to be the last word of physics. If this were so, I should make no wide claims for the implications of our science. For the world is patently not clockwork, not even clockwork with a few loose screws. In fact, what has happened is that physics has come nearer maturity: it can understand not only the neat and the mechanical but all the tangle of events in the everyday world in one and the same way, a richer way, a subtler way, than it first learned to chart for the motions of planets. (p. 32)

Quantum theory with its principle of indeterminancy and its considerable use of statistical principles has produced its crop of those who seem to deny the age-old category of cause. Yet one can hardly accept this conclusion on the basis of this article, even though Morrison as a physicist does not question in any way the formalism of quantum theory.

There is much said in the article about the theory of the structure of the atom being the product of its own history. This implies a question as to the identity of these atoms—specifically, are all gold atoms exactly alike?

The story can be told from the other side. It is possible to "prepare" a normal atom, confining it with electric forces, say, in such a way that one knows exactly where the electrons are. But then that atom has no long-lasting pattern; its electrons will move about in a way which depends upon every detail of the original preparation, as they would in the Newtonian physics. No sign of identity would remain. No two atoms would be sure to evolve in exactly the same way. Whenever atoms are found identical,

then their electrons are not to be located except by stating their potential positions; as soon as the electrons are indeed located and tagged, then the development in time becomes specific to the initial set-up, and the remarkable self-healing identity is lost. (pp. 112–114)

The events of the last few years in physics have done much to bend if not break the mechanical determinism that began with Newton's *Principia*. Laplace, his most successful disciple as author of the famed *Mécanique Céleste*, said:

"An intelligent being who, for a given instant," came to know all the forces of nature and all the positions of every particle, could predict every event to end of days in one sure formula. "Nothing would be uncertain for him; the future, as well as the past, would be present to his eyes." . . . Thomas Huxley, the defender of Darwin, seemed to see the world so; he wrote once that even in the play of spray on the waves in a stormy sea, all was predetermined to the last degree. (Morrison, p. 110)

But physics seems to have shown that even granting this superior intelligence the conclusion is wrong in principle because the "given instant" cannot be satisfied. Einstein's instant is not uniquely determined, and the finite velocity by which information can be transmitted places further restrictions on gathering such information. Finally the successes of quantum theory have in effect made further inroads into determinism.

The success of this new theory is the final attack upon the fatalism of Laplace. For we now see that the myriad particles which indeed do make up our universe form an unfolding pattern of events whose every *potential* future state may be predicted. But just what events are realized *in fact* can be foretold only in the statistician's sense, with a sureness that grows the greater the larger the piece of matter, or current of energy, with which the prediction is concerned. There is room to breathe in such a world. Yet it is no world of caprice or chaos. (p. 114)

From the dominating position in its support of determinism, which it now forsakes in large measure, what of physics? Morrison thinks:

The aims and the values of men are not and will not be made by physicists. But if those values are to remain the basis of a way of life, they will need to come to terms with physics. (p. 114)

What of science in general? He says: ". . . science can never be complete, never without its insecure frontiers. This is the essence of science."

E. F. A.