

matter, or protoplasm, was constituted of the natural elements; living beings were nothing but huge systems of tiny particles, each of which obeyed Newton's laws of motion. Hence, if one could obtain, at only one point in time, all the velocities and positions of all the atomic particles of all the creatures in all the universe, and if he possessed a super-computer by which to process this data, then he could predict the exact destiny of all beings, once and for all!

Of course it was realized that on a practical scale this was impossible, but in principle it could be done. Perhaps God did just this; He solved all of the differential equations for the universe, as it were, and hence He foreknew each destiny; yes, He had even determined it because didn't He create the particles and the laws of motion? Wasn't He a clever billiard player who could predict the game after the first shot?

As a matter of fact, modern psychology still clings to this philosophy to a great extent. Man is a "victim" of inheritance and environment. If one had enough facts about both at his birth, one could predict the type of individual he would be, whether criminal or law-abiding, what his intellectual capacity would be, habits, etc. There is a great deal of political thinking today which assumes that poverty produces crime - hence eliminate poverty through welfare and eliminate crime. People are no better, it is said, than their immediate environment. Bad children are a result of bad parents, etc. Again this is predestination; a man is predestined to some end and has no individual choice in the matter.

About 1900, certain discrepancies became apparent in the prevailing atomic theories. After great effort, Planck, Einstein, Bohr, and many others, developed the quantum mechanics theory. I shall not detail it here as it is quite a subtle concept, but it subsequently evolved into a theory leaning very heavily upon probability and the laws of chance. The real departure from classical Newtonian physics was summarized in Heisenberg's uncertainty principle which, in essence, states that it is impossible to simultaneously know the exact position and velocity of any particle. One may measure the position precisely, for instance, but the very act of so measuring will forever destroy all knowledge of its velocity; and vice versa. We may only know this information approximately. There will always be an area of doubt about the whereabouts of any single particle. Hence, we know nothing about its history, and can predict nothing about its future, except to a certain degree of approximation. And, mind you, this has nothing to do with the precision of our measuring devices or the delicacy of our instruments. It is a theoretical limit beyond which we cannot pass.

Of course, this destroys the Newtonian concept of infinitely precise predictability. We are left with an area of doubt. What actually happens to an atomic particle after it leaves our presence? Who knows? If we cannot foreknow the destiny of elementary particles, how then of the macro-cosmos which is constructed entirely of these particles? And indeed atoms are quite unpredictable. If excited, sometimes they disintegrate but in different ways; we can never predict the exact way. We can only say that of a thousand atoms equally excited, say 300 will decay one way and 700 another.

It is at this point that the possibility of something akin to "free will" makes its entrance. Let us consider a typical physical law. Ohm's law says, if we know the applied voltage across a given conductor with certain geometrical and