HEISENBERG'S FORMULATION OF QUANTUM MECHANICS

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In the previous presentation, we considered the investigations of the new physics in the realm of the very fast. A study of the velocity of light led to the formulation of the theory of special relativity. In the present discussion, we shall look at another achievement of the new physics, quantum mechanics, which developed from investigations in the realm of the very small.

The Role of Light

The usual way to study an object is to look at it. To do this it is first necessary to illumine the object. But when the object is very tiny, there are many difficulties. In order to "see" the object, the wave length of the light must be smaller than the object viewed. This is no real problem for objects that we study with a magnifying glass or a microscope, but when we study atoms, of some 10^{-8} centimeters in diameter, the light to be used must have an extremely short wave length. However, such light, as it turns out, has very high energy and disturbs the interior of the atom, and so it is impossible to get a true picture of the undisturbed atom.

But if the object we are studying emits light, then the characteristics of the light should give us a clue to the nature of the source of the light. This is just what happens when we study the atoms, for all atoms, when they are sufficiently excited, will give off radiation.

Radiation from Hot Bodies

During the last years of the past century, much attention was given to the nature of radiation emitted from incandescent bodies. It was found that as the temperature of a body is raised, the body will give off a whole spectrum of light, but certain colors, or wavelengths, seem to predominate. As the temperature of the body rises, the frequencies at which the maximum radiant energy is emitted also rise. Thus for