

SCIENCE

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MODERN CONCEPTS IN PHYSICS AND THEIR RELATION TO CHEMISTRY

By DR. IRVING LANGMUIR

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ONLY about thirty-five years ago, during the nineties of the last century, knowledge of the physical sciences had advanced to such a point that many of the foremost physicists and chemists began to believe that the rate of progress of fundamental knowledge must be slowing up. The concepts of length, mass, time, energy, temperature, electric and gravitational fields, etc., had been given precise meanings and were regarded as having an absolute existence quite as certain as that of matter itself. The phenomena of nature were explainable in terms of natural laws expressing relations between these absolute quantities. It seemed that the most important of these laws of physics and chemistry had already been discovered and that the work that remained to do was largely a matter of filling in the details and applying these great principles for practical purposes.

The laws of mechanics had been verified experimentally with a high degree of precision so no one doubted that they were rigorous laws of nature. Back in about 1830 Hamilton had succeeded in generalizing these laws in a few simple equations which seemed to contain all the essential truths of mechanics. It was only necessary to know how the kinetic and potential energy of any given system varied with the momentum and the coordinates of its parts in order to have at least a formal solution of the way in which the system would behave at all times. Thus all future work in mechanics need only be considered an application of Hamilton's equations.

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