

SCIENCE

FRIDAY, NOVEMBER 2, 1917

CONTENTS

- The Structure of Atoms, and the Evolution of the Elements as related to the Composition of the Nuclei of Atoms:* PROFESSOR WILLIAM D. HARKINS 419

Scientific Events:—

- Chemicals and War in England; Faculty Changes at the Massachusetts Institute of Technology; The University of Pittsburgh and the Army Medical Service; The War and Navy Departments and the Coast and Geodetic Survey* 427

- Scientific Notes and News* 330

- University and Educational News* 432

Discussion and Correspondence:—

- Algonkian Bacteria and Popular Science:* DR. HENRY FAIRFIELD OSBORN. *The Teaching of Optics:* DR. DAVID VANCE GUTHRIE. *Trans-Pacific Agriculture:* DR. O. F. COOK. *Benjamin Franklin and the Struggle for Existence:* PROFESSOR B. W. KUNKEL 432

Scientific Books:—

- Lunge on the Manufacture of Sulphuric Acid:* PROFESSOR JAS. LEWIS HOWE. *An Encyclopædia of Peaches:* F. A. W. 438

Special Articles:—

- Comparison of the Catalase Content of the Breast Muscle of Wild Pigeons and of Bantam Chickens:* W. E. BURGE. *Cilia in the Arthropoda:* DR. NATHAN FASTEN. *Rhythmic Banding:* DR. HARRY N. HOLMES 440

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

THE STRUCTURE OF ATOMS, AND THE EVOLUTION OF THE ELEMENTS AS RELATED TO THE COMPOSITION OF THE NUCLEI OF ATOMS¹

THE general theory of the structure of the atom which seems to be most closely in harmony with the facts is that developed by Rutherford. His theory assumes that the atom consists of a central nucleus or sun, and that the satellites of the miniature solar system are the negative electrons. The central nucleus is supposed to contain almost all of the mass of the atom, and is charged with positive electricity. That this nucleus is very minute in comparison with the size of the atom is indicated by the work of Rutherford, of Geiger and Marsden, and of Darwin, who find that the deflection of alpha particles, which are shot from radioactive atoms at speeds which approach 20,000 miles per second and so pass directly through other atoms, is of such a character as to indicate that the positive charge of the atom is very highly concentrated. Thus Darwin's work indicates that the maximum diameter of the nucleus of a hydrogen atom (1.7×10^{-13} cm.) is only about one-one hundred thousandth of the diameter usually assumed for the atom. On this basis the atom would have a volume a million-billion times larger than that of its nucleus, and thus the nucleus of the atom is much smaller in com-

¹ Address presented at the Symposium on the Structure of Matter at the New York meeting of the American Association for the Advancement of Science. A bibliography will be found in the following papers: *Jour. American Chemical Society*, 37, 1367-1421 (1915), 39, 856-879 (1917); *Philosophical Magazine*, 30, 723-734 (1915).