NUCLEAR CHEMISTRY, THE NEUTRON AND ARTIFICIAL RADIOACTIVITY

By Professor WILLIAM D. HARKINS
UNIVERSITY OF CHICAGO

(1) INTRODUCTION

Nuclear chemistry is just a decade old, yet it is now the most active of all the special branches of science. Nuclear reactions are very similar to ordinary chemical reactions, except that they deal with matter which is a million million times more dense than ordinary matter, and on this account the forces are extremely high and the energies involved are a million times greater than those of ordinary atomic chemistry.

Address presented before Section C of the American Association for the Advancement of Science, and the St. Louis Section of the American Chemical Society, St. Louis, January 1, 1936. The section on deuterium (heavy hydrogen) has been omitted, and in its place an abstract of a paper "Deuterium as a Reagent in Nuclear Chemistry" presented at the April meeting of the American Chemical Society, has been substituted.

The purpose of this address is to outline some of the nuclear work done at the University of Chicago and especially to emphasize the point of view developed during the last few years, which is that only reactions of the chemical type occur among nuclei. Thus atoms may be artificially synthesized, but not artificially disintegrated.

Thus when two atomic nuclei meet they first combine to form a new nucleus, which on account of its large content of energy is unstable and therefore has a life which is short in large scale time, but not excessively short on a nuclear time scale. This intermediate product nucleus may then disintegrate in any one of a number of ways, which depend upon the nature and state of the metastable nucleus. Thus the disintegra-