12 October 1962, Volume 138, Number 3537

SCIENCE

SCIENCE, now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in triplicate. The AAAS assumes no responsibility for the safety of manuscripts. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. For detailed suggestions on the preparation of manuscripts, see *Science* **125**, 16 (4 Jan. 1957).

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Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢. Single copies, 35¢. School year subscriptions: 9 months, $7.00; 10 months, $7.50. Cable address: Advancesci, Washington.

The Need for Skepticism

The synthesis of xenon tetrafluoride and related compounds described in the current issue (p. 136) makes necessary the revision of many chemistry textbooks. For about 50 years, students taking elementary courses in the subject have been taught that the noble gases are nonreactive. Millions of pupils have absorbed this dogma and faithfully parroted it back at examination time.

The first evidence that xenon might participate in chemical combination was obtained by Neil Bartlett, who suggested that compounds of the type $XePtF_6$ could be made. This discovery has been followed up by a team of scientists at Argonne National Laboratory. The work they present is clear-cut and convincing. Xenon reacts with fluorine to form more than one relatively stable compound. A variety of different procedures independently confirm the chemical constitution of the new product. Indeed, the ease with which XeF_4 is made and its properties are explored is almost shocking. One can introduce the two gases into a simple system, heat the mixture for 1 hour at 400°C, and observe the formation of crystals. The experiment can be performed readily by any chemist and by many other scientists, even though they may have had only elementary training in chemistry. Some caution must be employed, for fluorine is poisonous and reactive, and the xenon fluorides may be dangerous. However, xenon and fluorine are available commercially in safe containers. Thus the essential ingredient in discovering XeF_4 was not money or equipment, but an idea. Even the choice of fluorine as a reactant seems obvious since it is the most reactive of all the elements.

There is a sobering lesson here, as well as an exciting prospect. For perhaps 15 years, at least a million scientists all over the world have been blind to a potential opportunity to make this important discovery. All that was required to overthrow a respectable and entrenched dogma was a few hours of effort and a germ of skepticism. Our intuition tells us that this is just one of countless opportunities in all areas of inquiry. The imaginative and original mind need not be overawed by the imposing body of present knowledge or by the complex and costly paraphernalia which today surround much of scientific activity. The great shortage in science now is not opportunity, manpower, money, or laboratory space. What is really needed is more of that healthy skepticism which generates the key idea—the liberating concept.—P.H.A.