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SCIENCE

The Chinese A-Bomb

The first official Washington comment on the significance of the recent Chinese detonation correctly indicates that new short-term hazards have not greatly increased, but it does not adequately recognize some longer-term problems.

Only a few facts are available to help one in evaluating the significance of the Chinese detonation. The Atomic Energy Commission has stated, "Additional evidence on the Chinese Communist test of October 16 indicates it was a fission device employing U^{235} . . .," and, "U.S. intelligence has always led us to estimate that the Chinese Communists were constructing both plutonium production reactors and gaseous diffusion isotope separation facilities."

Production of weapons-grade uranium-235 is an impressive technological achievement indicative of considerable industrial capability. Successful construction and operation of a gaseous diffusion plant capable of producing substantial quantities of weapons-grade U^{235} requires both materiel and skill. Such a plant contains more than a thousand individual units connected in series. Each unit must be constructed with precision—small imperfections can destroy their effectiveness. Moreover, special metallurgical techniques must be available. After the units are assembled their performance must be monitored, controlled, and integrated. This requires a great deal of electronic instrumentation.

A technically incompetent people could not have succeeded in producing weapons-grade U^{235} without massive help; the French, after 6 years, have not yet announced production of highly enriched uranium. Nevertheless, the new accomplishment was not surprising to many U.S. scientists who have had contact with individuals of Chinese extraction and have known of their first-class aptitude for science and technology.

When a nation builds a successful gaseous diffusion plant it gains great flexibility in nuclear technology. A plant which can produce weapons-grade U^{235} can be tapped to yield uranium having almost any U^{235} content. In this country our nuclear power reactors often utilize material containing U^{235} in the range of 1.5 to 4 percent. The Chinese have the option of producing such uranium. Problems of constructing a reactor are greatly simplified when enriched uranium is available. When ordinary uranium is used, together with graphite, great care must be taken to avoid loss of neutrons either to nuclear poisons or through escape from the reactor to the shielding. With enriched uranium, reactors may be smaller and a wider variety of construction materials can be used. Thus, with enriched uranium, the Chinese have available more options in designing reactors for efficient plutonium production or other purposes than they would otherwise have.

More serious is a greatly enhanced capability of producing tritium, a key constituent of thermonuclear bombs. Tritium is often produced by the reaction of neutrons with lithium-6. Introduction of lithium into an ordinary reactor tends to stop the chain reaction. This tendency can be overcome by introducing enriched uranium. If the Chinese do not now possess quantities of tritium, they can obtain it. In view of the Chinese achievement thus far there is no basis for hoping that they will not achieve a hydrogen bomb—perhaps in the latter part of this decade.

Another member has joined the nuclear club. He already has impressive credentials, and his long-term potentialities should not be underestimated.—PHILIP H. ABELSON