Technology Review, November 1961

[[image]][[/image]]

[[caption]]Captain Wingerson, Professor Rose, and James S. Tulenko (left to right) discussing a new design for a magnetic container.[[/caption]]

built by Mr. Tulenko will operate with electrons, which are much lighter than the ions. As a result, this scale model will have to be only eight feet long.

Large-scale experimental machines of many types have already been built in this country, England, and Russia, in the hope of achieving thermonuclear reactions. The plasmologists at M.I.T., however, have maintained that the first step should be to acquire more fundamental knowledge of the nature of plasmas, their instabilities, and their behavior in magnetic fields. This basic research has led to the discovery at M.I.T. of the Wingerson corkscrew effect and many other important plasma phenomena. Such studies will be extended with Mr. Tulenko's scale model while other graduate students are dealing with other aspects of thermonuclear problems.

Captain Wingerson returned to the Institute two years ago to resume his studies, and met the requirements for a doctorate much sooner than is customary. The idea that will now be tested is set forth in his doctoral thesis. He left M.I.T. this fall to become an instructor in the Air Force Graduate School at Wright Field.

Preliminary research inspired by Captain Wingerson's discovery already is under way in the Atomic Energy Commission's Los Alamos Scientific Laboratory, and was described in September at an international conference on plasma physics and controlled nuclear fusion research in Salzburg, Austria. M.I.T. was represented at that conference by Professors William P. Allis, '23, Sanborn C. Brown, '44, and George Bekefi.

The eight-foot scale model now under construction will be only one step in the development of an eventual thermonuclear power plant. Professor Rose envisions the ultimate creation of a machine in which for reasons of economy huge magnetic fields will be created by superconducting coils operating at temperatures near absolute zero. Captain Wingerson's configuration would be incorporated in the superconducting field structure.

These fields would confine a plasma whose temperature much exceeds that in the middle of the sun, and the resulting thermonuclear reaction would be harnessed to yield hundreds of millions of watts of electrical power. It is the temperature difference of a billion degrees within a single piece of apparatus that requires the use of magnetic walls instead of material ones to confine the plasma.

The use of corkscrew magnetic fields for winding or unwinding beams of particles is not limited to thermonuclear devices. Professor Rose believes, for example, that it could lead to improvements in the apparatus now used to inject particles into the great accelerators with which subnuclear matter is examined. Many other applications will undoubtedly be found, Professor Rose believes.

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