PHYSICS

Control Fusion Reaction

Controlled fusion may have been achieved for a tiny fraction of a second. The gas or plasma is believed to have been stable for about 10 microseconds.

See Front Cover

A CONTROLLED THERMONUCLEAR reaction in the laboratory is believed to have been obtained for a tiny fraction of a second by scientists at the Naval Research Laboratory in Washington.

They hope to verify their harnessing of the forces released in nuclear fusion within a year, using a larger device they estimate will cost some $20,000,000 to build. With the present small device—the heart of the apparatus is only 12 inches long—they report a major step toward using thermonuclear processes for controlled production of power.

While Dr. Alan C. Kolb of NRL reported his research findings with the "high density magnetic mirror machine" at the Fourth International Conference on Ionization Phenomena in Gases at Uppsala, Sweden, his colleague, Dr. W. R. Faust explained implications of the research in Washington.

Dr. Faust said the experiments had shown three important new developments:

1. The gas, known as a plasma, was contained for a long time relative to the time required for normal thermal distribution to occur.

2. The length of time during which neutrons, neutral particles produced during thermonuclear fusion, are emitted is in agreement with theoretical calculations of plasma physics.

3. The plasma is observed to be stable during approximately ten microseconds (millionths of a second) in which neutrons are observed.

In the photograph shown on the cover of this week's SCIENCE NEWS LETTER, the correlation of neutron emission with plasma radius and magnetic field strength is shown. Neutrons are emitted for a period of two microseconds.

Dr. Robert Page, director of research at NRL, estimated it would take 20 to 40 years to reach the point where power from thermonuclear reactions would be economically practical. He said scientists were just beginning to learn about plasma physics, and likened the step taken by the NRL scientists to that of a piece of paper turning brown when a match is held to it—burning would require its turning red hot before bursting into flame.

Dr. Kolb's approach is to compress deuterium preheated by a shock wave using an extremely high magnetic field. Energy released from an internal magnetic field and further magnetic compression bring the temperature up to its final value. Comparison between magnetic pressure and gas pressure indicates that the temperature is the order of 20,000,000 degrees absolute. This temperature is consistent with that necessary to produce the observed neutron yield by thermonuclear reactions.

The experiments were part of a high temperature physics program jointly financed by the Navy and the Atomic Energy Commission to the tune of about $1,500,000 during the past three years. If present findings are confirmed, an important milestone has been reached in the process of obtaining useful power from the virtually unlimited supply of energy locked in the nuclei of deuterium.

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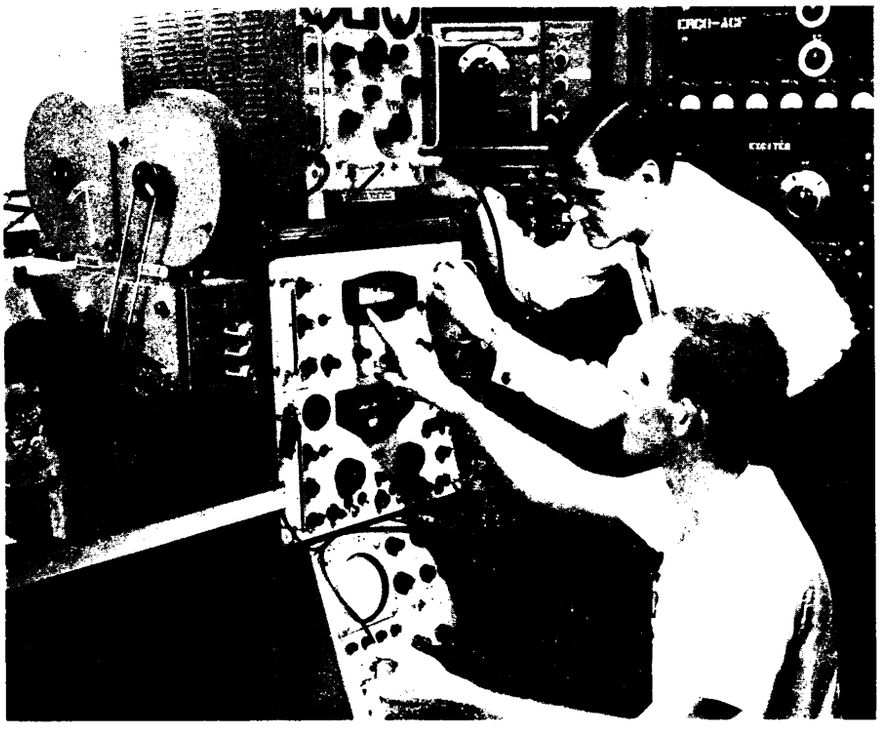

TEPEE—Dr. William J. Thaler (right) and Edwin Lyon operate the radar system which is capable of detecting missiles at 5,000-mile ranges seconds after being launched.

PHYSICS

Radar Detects Missile Launchings

AN EXPERIMENTAL RADAR that detects ballistic missiles launched thousands of miles away has been developed by Navy scientists.

The new method could also be used to detect nuclear explosions at faraway points. It depends on the spotting of large volumes of ionized gas generated when missiles or satellites are launched or nuclear weapons exploded.

The detection is based on a new kind of radar — high frequency ionospheric back-scatter radar. Conventional radar is limited in range in the same way and for the same reason that television is, because the waves travel in a straight line.

Ionospheric back-scatter radar resembles radio. The waves sent out by the transmitter are reflected by the ionosphere. When a large rocket is fired or a nuclear bomb detonated, the hot exhaust gases are ionized and reflect the radar waves in much the same way as the ionosphere.

Putting these facts together led Dr. William J. Thaler of the Office of Naval Research to conceive of the possibility of warning of a missile attack by this means. The project to develop the new radar method is called Tepee.

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PSYCHOLOGY

Scientists to Study Brainwashing Immunity

THE "SHOTS" that the American serviceman receives in future may include a psychological shot against propaganda and brainwashing as well as the familiar typhoid, tetanus or diphtheria inoculations. Psychologists under the direction of Prof. William McGuire of the University of Illinois are attempting to develop a method of immunizing against persuasion by gradually building up a resistance to propaganda as hayfever victims are given defense against pollen. The study is being made possible by a grant from the National Science Foundation.

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