BIOTECHNOLOGY

Model Organs Live Faster

The workings of body systems are being examined by scientists using computer models that operate many times faster than functions in the living human body

➤ COMPUTER MODELS of body systems, such as the heart, kidney and lungs are "living" more rapidly than life itself.

Mathematical descriptions of various body systems are fed into analog and digital computers at the University of Mississippi School of Medicine. The machines compute the complex relationships between the systems components and analyze the ways in which their functions are controlled.

The studies by Dr. Arthur C. Guyton, Dr. Howard T. Milhorn Jr. and Thomas Coleman of the University's medical center were described by Dr. Guyton at a scientific computing symposium in Yorktown Heights, N.Y., sponsored by the International Business Machines Corporation.

Dr. Guyton is chairman of the Medical School's department of physiology and biophysics.

"The body is the most beautifully engineered and probably the most complicated system there is," said Dr. Guyton. "It works by means of several hundred patterns of control, each affecting the others. A complete understanding of it can hardly be gained without the help of computers, with their ability to handle vast amounts of data in a short time."

Dr. Guyton is using IBM 1620 and 7090 computers to help simulate "real-life" models of bodily mechanisms. These models operate many times faster than do the actual functions in life, in order to speed results.

One series of studies by Dr. Guyton's group deals with control functions in the kidneys. Physiologists have not yet learned exactly how the kidneys control the rates at which substances are eliminated or reabsorbed into the body, but there are several theories.

The scientists are building mathematical working models representing various theoretical ideas. Using the computer, they will determine which of the models best simulates the actual function. In this way, they will be able to design new experiments from which they hope to choose the best of the theories.

Another mathematical model represents the entire circulatory system, including kidneys, heart and lungs. Doctors have long wanted to know the exact nature of the relationship between such factors as arterial blood pressure, blood flow, the intake of salt and water into the body, and the chemical composition of the blood.

Dr. Guyton's group has already achieved a better understanding of the relationship between kidney damage and high blood pressure. This new knowledge will enable doctors to refine their present treatment of the disease and perhaps develop improved treatments in the future.

The computer simulation technique, which has also been used in such diverse fields as chemistry and space flight, usually begins with a series of mathematical formulas or statements about the system to be modeled—for example, the human circulatory system. Data gathered from observations of living humans and animals form the background for the statements, which are then translated into a symbolic language that a digital computer can understand. The more complex the statements, the more realistic the model.

• Science News, 90:5 July 2, 1966

PHYSICS

Superconducting Magnet Able to Operate in Space

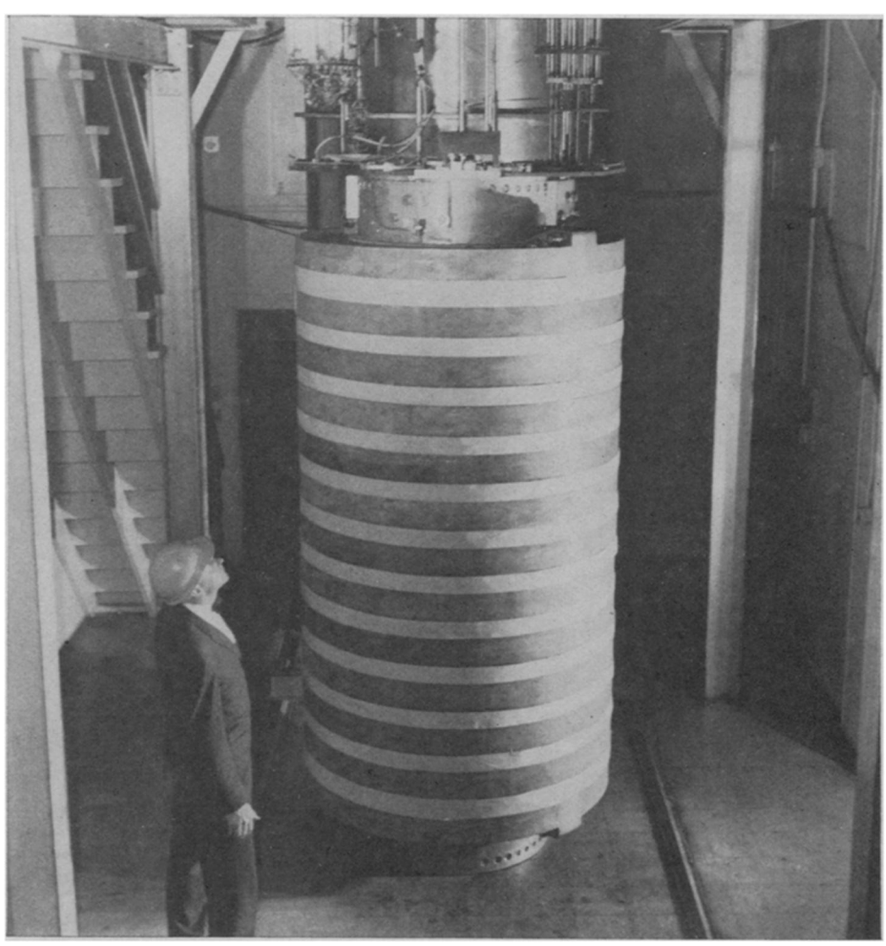
➤ SUPERCONDUCTING magnets that could serve as an efficient radiation shield for men in space can operate even under atomic bombardment much heavier than that encountered far from the earth's protective atmosphere.

The American Nuclear Society meeting in Denver was told that superconducting materials had been tested in the high vacuum and ultracold conditions they would meet in space, then sprayed with massive doses of radiation. No effects were found that would create problems for use of the superconductors in space.

The conclusions apply not only to the natural radiation of the Van Allen belts or from a solar flare but also to the man-made neutrons and gamma rays associated with nuclear propulsion systems and power supplies.

The radiation experiments were done by E. L. Keller, H. T. Coffey, Adolphus Patterson and S. H. Autler of Westinghouse Electric Corporation, Pittsburgh.

• Science News, 90:5 July 2, 1966



Avco Everett Research Laboratory

GIANT MAGNET—The world's largest known superconducting magnet, weighing 15,675 pounds and standing 10 feet high, was designed at Avco Everett Research Laboratories, Everett, Mass., for use in a magnetohydrodynamic power generator.