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The Role of the Computer in Research

The role of the computer in taking medical case histories, monitoring critically ill patients, keeping hospital records and calculating bills is well-known.

A relatively unheralded, but increasingly important, role of computers is in the area of scientific research into the body's basic, normal physiological processes.

When these are adequately understood, clues may be found that point to the nature of various malfunctions in the human body.

In the Department of Physiology and Pharmacology, research scientists—both faculty and students—are using an unusual hybrid computer in seeking the answers to more and more complex questions.

The computer laboratory is directed by Dr. John W. Moore, a professor in the department, and was financed by a three-year, $250,000 grant from the National Institutes of Health. A renewal of the grant has been approved but is awaiting funding.

Under investigation are a variety of problems, ranging from studies of organs to molecular reactions. One study deals with how nerves are stimulated and send impulses down the length of their axons to signal muscles when to contract.

"The spread of excitation over muscle fibers, both heart and smooth muscle, is also being studied in great detail, as are the processes relating to the mechanism of contraction itself," Moore said.

Other studies involve the characteristics of red blood cells and a variety of chemical reactions carried on in the body.

Students also are instructed in the analysis of selected physiological systems, being taught to use the computer to make models of the systems in an effort to understand them more thoroughly.

COMPUTERS IN BASIC RESEARCH—This is part of the Department of Physiology and Pharmacology's computer laboratory in the Nanaline H. Duke Building, where a hybrid computer is being turned to look at some of the mysteries of the body's basic physiological processes. Standing at rear center wearing a tie is Dr. John W. Moore, a professor in the department and director of the laboratory. *(staff photo)*

As a part of the course, the students develop a term problem in which they design or program a model physiological system and test its performance on the computer. In at least one case, such a term problem has become the basis of a Ph. D. thesis and an eventual publication.

The hybrid computer consists of an analog computer for high-speed simulation of equations and a conventional digital computer which has a powerful but simple language for writing programs. These two computers may be run independently or together, where each is apportioned that part of the job for which it is best fitted.

"One additional important feature," Moore said, "is that the digital computer can be set up to operate and run to respond to conversational (written word) inputs from four or five users simultaneously seated at different teletype or graphic display terminals."

"The computer is fast enough that each scientist may feel he has the full computer capability at his beck and call and is not aware that the computer is serving others at the same time.

One high-speed oscilloscope terminal, unusually helpful in man-machine interaction, may display not only letters and numbers indicating the program and values for variables, but may also display the graph of the problem solution.

When the investigator is satisfied that the program is working satisfactorily and that he has a desired solution, he may call for a copy of the display on the oscilloscope and, in a few seconds, a paper copy of the full display is available.

The dual system of the hybrid

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