SENATOR REPORTS—

# Washington Is Leader In Medical Research

By SENATOR WARREN G. MAGNUSON

WASHINGTON'S national standing in medical research is almost as phenomenally high as the new techniques, equipment and findings which have been produced to advance medicine.

Physicians throughout the world know of the tiny snipper which Dr. Cyrus Rubin developed at the University of Washington to take tissue samples from the lining of the digestive tract, saving exploratory surgery. The pump-oxygenator refinements developed by Dr. K. Alvin Merendino permit almost impossible heart operations because this device can substitute for the heart while an operation is in progress.

Dr. H. S. Bennett, formerly of Seattle, developed electron microscope techniques which Dr. John Luft extended and now puts to good use in studying the structure of viruses, bacteria and body cells at the University of Washington's medical-school laboratories. Dr. Luft has one of the best electron microscope laboratories anywhere.

Blood-flow studies have been advanced greatly by the device Dr. Robert F. Rushmer developed. The medical profession calls it the "pulsed ultrasonic flowmeter."

Offhand, it might seem strange that Washington, with its two state universities, should rank 17th nationally among distribution of research dollars by the National Institutes of Health. This is especially significant since Washington has but one medical school, and contains only about 1.6 per cent of the biomedical manpower of the country.

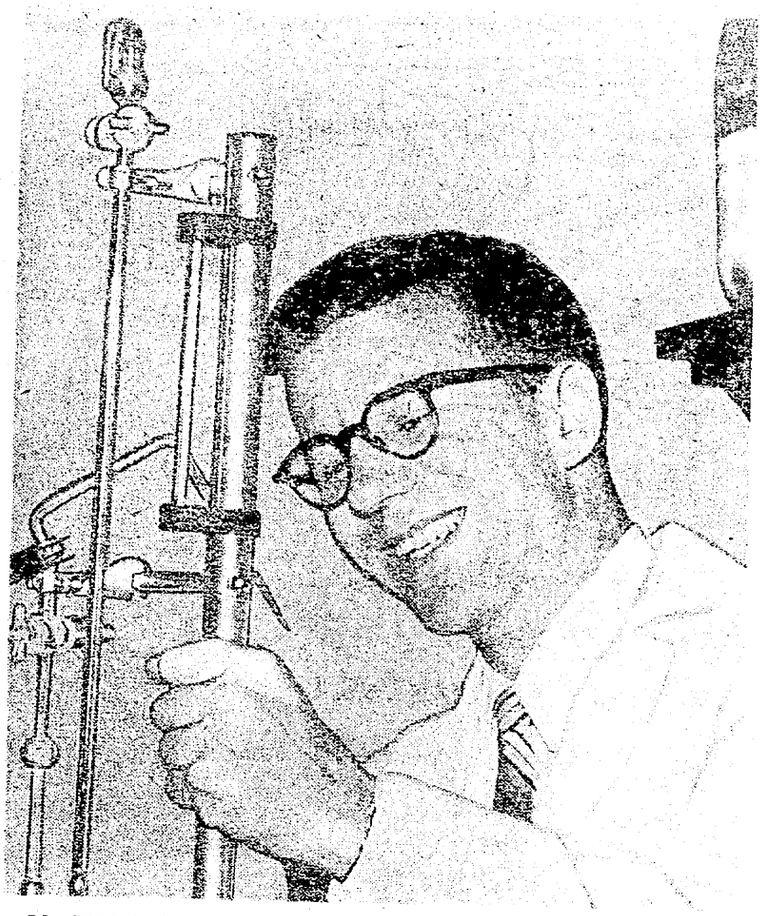
Dr. James Shannon, director of the National Institutes of Health, no doubt was impressed by these facts one day when we were walking down the hall in the national capitol.

"Strange thing about the word 'Washington,'" he said. "Seems to attract medical researchers. Some of our most productive research comes at the University of Washington and Washington University (Missouri). Researchers seem to like these institutions."

Checking later, I found that the University of Washington had 179 grants totaling $2,816,987 during the fiscal year 1960. Washington State University had 27 grants totaling $329,510. These two institutions are the focal points for biomedical research in Washington.

What has been produced with these grants?

I asked Shannon if he could pick the ten most successful research projects to show what has been produced in the way of new medical techniques and knowledge.



DR. FRED PLUM, an associate professor of medicine (Neurology) at the University of Washington Medical School, adjusted laboratory equipment.

To limit it to ten would be difficult, Shannon said. This would "do injustice to the biomedical scientists of Washington. Even with mention of double the number, many other researches of equal or greater significance might be excluded," he maintained.

As an example, take the cancer research being done by Dr. Richmond T. Prehn. An associate professor in the Department of Pathology at the university, Dr. Prehn has been working on one of the most important issues in cancer research — whether or not spontaneous or experimentally-induced tumors differ in body reaction produced from their hosts.

Although there have been many studies concerned with this subject, Dr. Prehn's evidence that resistance can be evoked in the strain of origin by grafts is most widely accepted. Dr. Prehn now is receiving long-term support to investigate other important questions concerning the resistance that certain types of tumors appear to get in hosts of the same genetic constitution.

Or consider the work which Dr. Edwin C. Krebs and Dr. Edmond H. Fischer are doing in studying some of the enzymes of muscle tissues. These scientists in the Biochemistry Department of the University Medical School are finding how the tiny protein molecules work in causing chemical reactions.

Research is difficult because it has been estimated that any living cell may contain up to 10,000 different enzymes. Each presides over one of the necessary chemical reactions in this tiny, but exceedingly complex, chemical factory. It is known that muscle, which is made of muscle cells, can contract only by the action of certain of the enzymes in these cells.

Dr. Krebs and Dr. Fischer have been attempting to extract from muscle tissues certain of these enzymes, and to crystallize the sugar from them just as we might extract and crystallize sugar from a pitcher of syrup. This is necessary so that tests can be run in order to understand really the part played by any one of these enzymes.

The enzymes attracting the concentration of these two biochemists are called the phosphorylases. N. I. H. officials believe the work of the two doctors will "aid in unraveling the still unsolved mystery of just how it is that muscle is able to contract."

THEN there are the protein chemistry studies being made under the direction of Dr. Hans Neurath. He heads one of the foremost laboratories in the world in this field. Particular emphasis is being placed on the chemistry of enzymes, especially those controlling the digestion of proteins. Significant progress is being made on the extremely difficult problem of how enzymes can work so quickly and efficiently in their amazing control of thousands of vital cellular activities.

Certain protein enzymes are being taken apart bit by bit in order to determine their exact structure. Once the

SENATOR Warren Magnuson and Dr. James A. Shannon, director of the National Institutes of Health, discussed medical research in State of Washington.

DR. LEO M. SREEBNY

DR. ROBERT F. RUSHMER

DR. HANS NEURATH

DR. BERTRAM S. KRAUS

structure is known, then the function can be determined. Other studies emphasize that tiny amounts of metals are necessary for the enzymes to function properly.

Some of the University of Washington scientists are using the most precise tool known for determining the exact architectural structure of molecules, the X-ray crystallography. With this painstaking method, they are progressing in their efforts to find the detailed composition of critically important proteins.

In the Department of Surgery at the university, Dr. T. Lloyd Fletcher has improved existing synthetic methods and has developed new ways to prepare for testing large numbers of compounds containing organic fluorine derivatives: These are organic chemicals which have fluorine in the molecule.

His efforts are especially important since some fluorine derivatives are known to be cancer causing. Dr. Fletcher is testing each of the new compounds to see whether it will produce cancer. Availability of a large series of closely related new substances has made possible studies of the biological effects of compounds as their chemical structure is systematically altered.

Many already know of the "pulsed ultrasonic flowmeter" developed by Dr. Robert F. Rushmer and his group in the cardiovascular field at the university. This consists of two tiny metal buttons embedded in a plastic sleeve, placed in turn around a blood vessel. A double wired connection sends and receives high-frequency sound waves which are picked up and recorded by a machine. By using this University of Washington development, scientists one day may learn how the blood flow is automatically adjusted to the portions of the body needing it most.

For example, when a man is running, his legs receive most of the excess blood circulated. Blood flow to his arms, neck and back may be near normal. Cardiovascular experts need to know more about the bodily mechanisms that determine the speed and direction of blood flow. Dr. Rushmer's "pulsed ultrasonic flowmeter" is helping to provide this knowledge.

ANOTHER amazing project is that of Dr. Vance Tarter, who works in his own laboratory and carries the title of research associate professor, Department of Zoology at the university. He's one of the best-known exponents of biological research on the simplest forms of life.

Dr. Tarter has developed methods for grafting pieces of the microscopic animal, just as the surgeon grafts skin. His grafts, done under the microscope on organisms a few hundredths of an inch long, produce strange animals with odd numbers of heads and other organs which, under certain conditions, undergo complex reorganization to produce normal animals.

The development of the grafted animals permits Dr. Tarter to determine the roles played by different parts of the cell in its growth, reproduction and day-to-day life. By analogy, the scientist can relate these findings to the behavior of cells in the human body.

Dr. Richard Blandau, an associate dean and professor, Department of Anatomy, University of Washington Medical School, has succeeded in keeping heart muscle alive outside of the body—in cell structure—and has observed the growth and development. This research is termed most significant by scientists because, following a virus infection or a heart attack, damage to muscles of the heart is not repaired by regeneration of the muscle but by formation of scar tissue.

Researchers have never understood why heart muscle in the body lacks the ability to grow and repair damage. So Dr. Blandau is using light and electron microscopy to continue studies which are providing considerable information about the growth mechanism of muscle. The conditions also permit studies of the electrical behavior of individual heart muscle cells. These have been carried out in collaboration with Dr. Walter Woodbury of the Department of Physiology.

In dental research, Dr. Bertram S. Kraus, a physical anthropologist, heads a university group producing basic data on prenatal development of the human face. The aim is to provide an understanding of how such defects as cleft palate occur.

Dr. Leo M. Sreebny, an oral pathologist, is making fundamental contributions to knowledge of the activity of the salivary glands and other "paraoral" structures, as well as the relationship between metabolic factors and oral wound healing. Although salivary glands are best known for their digestive enzymes, salivary glandular secretions are extremely important to oral health.

It is known that there is an antiseptic substance in saliva which keeps teeth from decay. Only last June, the National Advisory Dental Council recommended that National Institutes of Health support be granted to an "International Conference on Salivary Glands and Their Secretions."

It will be held August 27-29 at the University of Washington. Dr. Sreebny is in charge. About 50 experts from various scientific specialties will attend for presentation, discussion and evaluation of recent advances in the biology of salivary glands.

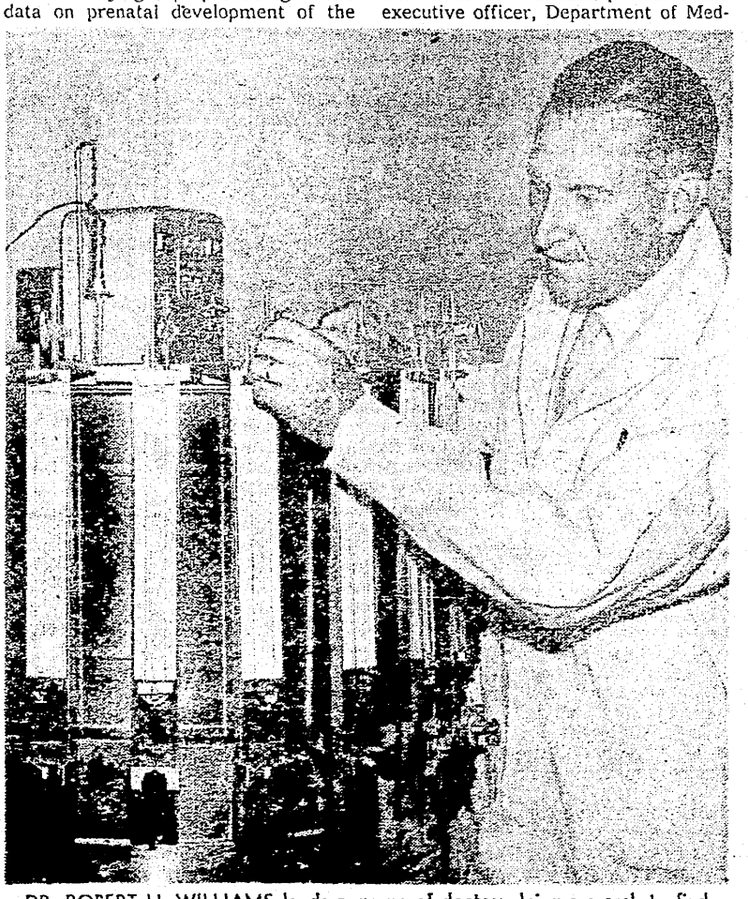
The National Institute of Arthritis and Metabolic Diseases is most interested in the work being directed by Dr. Robert H. Williams, professor and executive officer, Department of Medicine. He and his co-workers are making a team approach to find more about diabetes, including how the concentration of plasma anti-insulin factor is regulated in normal and diabetic persons.

Insulin, a hormone, acts to promote the burning of sugar and thus promotes utilization of sugar as food. It accomplishes this partly by pushing sugar through the cell wall and into the cell from the blood. If insulin is not present in sufficient quantities to do such "pushing," sugar accumulates in the blood in unduly large quantities. A high blood sugar results.

A complication of diabetes is hardening of the arteries. Back of this is fat metabolism, the tearing down of fat. The factors important in promoting synthesis and breakdown of fats are being investigated by Dr. Williams at the present time.

Dr. Fred Plum, an associate professor of medicine (neurology) at the university, has conducted a series of studies attempting to find the reasons or causes for excessive loss of calcium in the urine of patients following illnesses associated with immobilization. In particular, patients with various degrees of paralysis were studied to help explain the excessive urinary calcium loss which is associated with loss of calcium from the bones.

This in turn causes weakness and tendency to fracture, formation of kidney stones with consequent kidney damage, and even high blood pressure with its attendant risks and damages. A better understanding of the cause of calcium loss in paralyzed patients will help avoid these complications and promote the patient's recovery from his original illness.



DR. ROBERT H. WILLIAMS leads a group of doctors doing research to find out more about diabetes. He was shown examining laboratory apparatus.

ACTUALLY, these are only a few of the research projects underway at the University of Washington. Some of these will lead to others, because once a new fact is gained or a new theory developed, scientists are determined to pursue it until more is known about the human body and how it works.

As Dr. Shannon told me during hearings before Senate Appropriations Committee while the National Institutes of Health budget was being determined, much of the new knowledge will be on display at our Seattle World's Fair.

As Doctor Shannon put it:

"The intellectual acumen of the scientists of Washington will be illustrated by scientific aspects at the Century 21 Exposition. Local scientists are cooperating whole-heartedly, some actually participating in the exhibits."

Regardless of how this is displayed and how much is shown, the important thing is having these new facts known so they can be used to lengthen life and make it more productive and enjoyable.

Without the support which the National Institutes of Health grant-in-aid program has furnished, it is extremely doubtful that we could have come this far this fast.