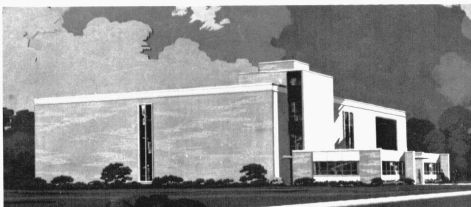
Researching
THE SPACE AGE

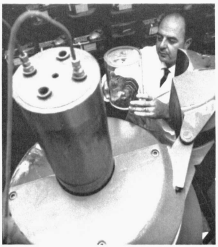
It may well be that a hibernating hamster has nothing whatsoever to do with space travel. But, then, again it might. And if it were possible to depress an astronaut's metabolism to the same extent, several exciting possibilities immediately become apparent.

The heart beats at only 10 per cent of its normal rate—for a man that would be seven or eight times a minute. The food requirements become proportionately less. There would be no boredom on a five- or six-month jaunt, no tensions between two or more space travelers. Damage to unused muscles and bones is diminished. And University of Missouri scientists have discovered that radiation damage is significantly less in a hibernating animal than in an active one—whether that hibernation is natural or induced by artificially lowering the body temperature. The Van Allen Radiation Belt may not be so terrifying after all.

Today, of course, such "iffy" talk falls within the realm of science fiction. But few persons doubt that man will travel to Mars and Venus, that he someday will colonize the moon and nearby planets. And when he does, the Columbia campus likely will be involved because it is a leader in this nation's environmental space research program.

Back lighted by a bright sun, Dr. Grant Darkow tests his device which will economically measure net solar radiation. At right is architect's drawing of $1.5 million Space Sciences Reseach building, which is now under construction at Columbia.





Using cobalt irradiator, Dr. X. J. Masacchia investigates the characteristics of hibernation and hypothermia that make the animals in those conditions resistant to radiation.

Established in 1964, the University's Space Sciences Research Center has the unique distinction of being the only such facility originated by a state legislature and supported initially by state funds. This has given the Missouri program a flexibility and freedom not available to those institutions which depend solely on grants from the National Aeronautics and Space Administration. NASA money is important, of course, and the Missouri center at Columbia has received almost one million dollars from NASA in project and inter-disciplinary grants since it began. Counting both the Columbia and Rolla campuses, state supplied funds now total about $800,000 a year and outside support about $500,000.

"The University does not intend for the Center ever to become completely dependent on federal grants," says Ward Haas, director of the research center. "Our presently accepted goal is a 1:1 ratio of outside to University financial support."

With local support being a primary factor, the center is free to plan and organize its activity to meet the University's own requirements in higher education, rather than having some branch of the federal government guide its operations.

Briefly the Center's objectives are these:

•To attain pre-eminence in selected areas of space related research. At Columbia the emphasis, as was indicated, is on adapting living organisms to space environment, although there are many other important areas of activity. At Rolla the thrust is in materials science, which concentrates on basic chemistry and physics in the broad materials area.

•To train and develop independent scientific investigators.

•To stimulate faculty and student interests in research.

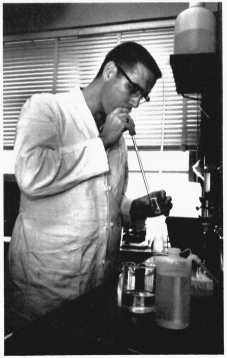
•To attract creative new faculty and students to the University.

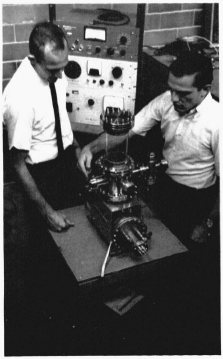
In the Missouri program, the responsibility for graduate training is not overlooked. All the space center's professional staff are appointed first in academic departments and second as researchers. Graduate students engaged in research on Space Center projects at Columbia include 36 M.S. and 30 Ph.D. candidates. During the past year 12 additional students completed their advanced degree requirements.

Of the 39 current studies on the Columbia campus, a third of them have to do with depressed metabolism, whether it has to do with natural hibernation or hypothermia (sub-normal body temperature).

"This emphasis was chosen," explains Dr. Haas, "because very little is known about de-

Tom Pento, a graduate student working toward a Ph. D., takes blood sample from an anesthetized white rat in order to measure its blood calcium in device shown in background. On long space flights, density of traveler's bones could be changed because of long period of inactivity.





In Zoology, Dr. John Twente, left, studies physiological changes during the hibernation periods of ground squirrels. In the biochemistry laboratory of Dr. Robert L. Wixom, a graduate student, center, helps with research on hydrogenomonas bacteria, possible source of food on space flights. In mechanical engineering Dr. Donald Creighton and assistant, Bob Benedetti, check vacuum chamber for testing probable performance of metals in space.

pressed metabolism and because the studies offer considerable promise in several areas other than space. Medicine, of course, uses hypothermia techniques now in some sophisticated surgical procedures."

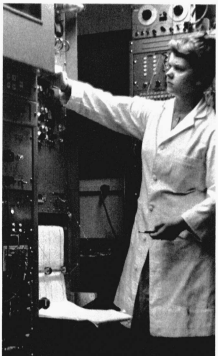
In the laboratory, Dr. F. E. South has lowered the body temperature of white rats to the freezing mark, slowing their body processes dramatically. Not a natural hibernator, the rat is revived after four or five hours by heating its heart, artificial respiration, and a warm water bath. This is an example of pure research, where the scientist is seeking new knowledge solely for the sake of new knowledge. Historically, it has been such research that has formed the basis for later practical applications. Dr. South, incidentally, spent the last week in September discussing his findings on rat hypothermia at a meeting of the International Astronautic Congress in Belgrad, Yugoslavia.

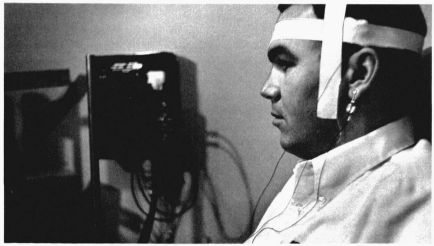
As the pictures illustrating this story indicate, however, much of the important research on the Columbia campus does not deal with depressed metabolism. For example, Dr. C. W. Gehrke, of the Agricultural Chemistry Department, has been selected as one of seven investigators to collaborate with NASA in analyzing the first lunar return sample, utilizing the gas-liquid chromatographic techniques which he helped develop. Dr. G. L. Darkow, of Atmospheric Science, has developed an economical device for measuring solar radiation—his device costing under $20, the existing hardware, more than $1000.

Altogether some 53 faculty members in 21 separate disciplines are involved in space-related activities. Scientists in Zoology, Physiology, Ag Chemistry, Veterinary Anatomy, Dairy Husbandry, Microbiology, Radiology, Chemistry, Biochemistry, Pharmacology, Chemistry, Horticulture, Veterinary Microbiology, Veterinary Pathology, Electrical Engineering, Medicine, Psychology, Mechanical Engineering, Physics, Chemical Engineering, and Atmospheric Science all participate in the Space Sciences Research projects.

Why all this emphasis on space in the United States? The responses range from, "It's there," to new product spin-off and "Beat Russia."

Dr. Haas thinks there may be another answer. "Essentially, space exploration is one more step in the evolution of man as a biological species. Throughout history, man successfully has sought to expand his ecological range. The space effort is simply a continuation of this inner drive." □





How alert will an astronaut be during long periods in space when there is little to do? Using a brain wave machine to test vigilence are two graduate students, Mrs. Diane Draper, left, and William Storm, the experiment's subject. This research is being conducted by a psychologist, Dr. Robert S. Daniel.