

ASTRONAUTICS

Of Men and Mice in Space

Radiation hazards in space include vision damage and muscle feebleness. Mice have flown almost 700 miles into space. Food problems for man are great out there, Lillian Levy reports.

➤ **VISION DAMAGE**, even blindness, as well as radiation sickness, muscle feebleness and general weakness, may be some of the effects of extended confinement in a space environment on man.

These dangers of interplanetary manned space flights were outlined by Dr. Hubertus Strughold, professor of space medicine at the School of Aviation Medicine, Brooks Air Force Base, San Antonio, Tex.

"As long as the sun appears as a disc, or as far out as Saturn, there is the risk of retinal burns if the astronaut looks into the sun," Dr. Strughold reported at a symposium on the Medical and Biological Aspects of Energies of Space at Brooks Air Force Base. (Saturn is nine times farther from the sun than the earth.) Such damage can be incurred by sungazing on earth, he said, but there is greater danger as man speeds through space.

Solar energy needs within a space cabin probably will require an orbit or position exposing the cabin interior to the sun's light. Under such conditions of solar exposure, Dr. Strughold said, vision damage will result unless the space traveler wears automatically functioning light-absorbing glasses.

As man travels farther into space, to Pluto (40 times farther from the sun than earth) and beyond, the danger of eye damage from sunlight decreases. But the absence of sunlight in extended space flight would affect crops grown on board, seriously cutting down oxygen supply.

Photosynthesis, by which sunlight and carbon dioxide are changed into food, water and oxygen, would not be possible. Long term manned space exploration requires a functioning photosynthetic system, Dr. Strughold said.

Light production by a nuclear power plant could, however, be used to support the life-sustaining process of photosynthesis. The artificially produced light would make the space cabin independent of the sun, but the nuclear reactor would increase the danger of radiation exposure within the cabin.

Just traveling through space, without a nuclear power system, exposes ship and occupants to extremely high levels of radiation. An accumulation of more than 50 roentgens over a period of months could lead to radiation sickness and seriously decrease efficiency of a space crew, Dr. Strughold said.

Weightlessness, the absence of gravity in space, is expected to "lead to muscle feebleness and general weakness," Dr. Strughold said. This could be counteracted with gymnastics performed "with special space gymnastic equipment." Such equipment might include muscle vibrators.

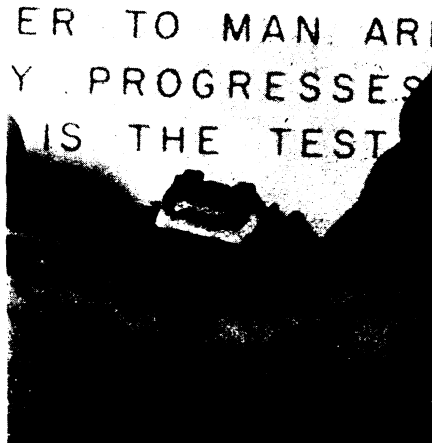
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Mice Pave Way for Men

➤ **THE FUTURE** in space looks very good—at least, for mice.

Sally, Amy and Moe, the Air Force moustronauts, have flown almost 700 miles into space at a speed of 17,000 miles an hour and lived to squeak about it at home base. "Home" for the mousy space pioneers is the Space Research Institute at the School of Aviation Medicine, Brooks Air Force Base, Texas.

Radiation data recorded in the high-flying mice were reported to *SCIENCE SERVICE* in an exclusive interview with Dr. Hans Clamman, the Space Institute's chief of space medicine. The animals' exposure to the dangerous radiation in the lower Van Allen belt, one of the known hazards of space flight for man and animals, has been evaluated.



MOUSTRONAUT WIRED FOR SPACE

"It is below ten roentgens for sure," Dr. Clamman said. Four hundred roentgens is the exposure dose fatal to 50% of men and animals.

The mice were in the area of intense cosmic radiation for two minutes only. Space scientists have suggested that the danger of exposure to high levels of radiation in the Van Allen belts could be reduced by swift passage through them. The three mice have now proved that this is so.

The radiation story was recorded on miniature instruments, tiny specially prepared glass rod "dosimeters," each one-quarter of an inch long and one-tenth of an inch in diameter, and sensitive to radiation from one roentgen to 10,000 roentgens.

None of the mice has so far shown any of the graying effects on their black fur that would indicate severe radiation ex-

posure. All physical responses, heart beat, respiration, appetite, blood pressure, appear normal. They behave just like any other normal, healthy, frisky mice.

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Space Ship Farms

➤ **CROP FAILURES** may be expected in interplanetary farming in the confines of a space ship just as on earth, but farm failure in space is irrevocable, Dr. Daniel I. Arnon, professor of cell physiology at the University of California, Berkeley, reported.

Dr. Arnon spoke at a symposium on the Medical and Biological Aspects of Energies of Space at the School of Aviation Medicine, Brooks Air Force Base, San Antonio, Tex.

Although Dr. Arnon stressed the possibility of crop failure of algae used in photosynthesis, he said that this did not indicate that he was pessimistic about the ultimate success and value of such farming to the man in space.

"I merely want to emphasize," he said, "that at the present stage of our knowledge, we cannot afford to take chances on complete dependence on such a system in space."

A photosynthetic system, theoretically, could supply man in space with the main essentials of life: food, water and oxygen.

Dr. Arnon pointed out that a crop failure would mean the death of the system and possibly the death of the astronauts that might be dependent upon it.

"Until inherent biological uncertainties are removed, man must take reserve supplies of his life needs with him in space," Dr. Arnon said. Dr. Arnon, and his associates at Berkeley, Drs. Mitsuhiro Nozaki and Manuel Losada, are trying to "unravel the mechanics of photosynthesis, to break the process down to its component parts to eliminate present biological uncertainties." Their research, still a long distance from the goal, he said, has revealed important evidence on the process of evolution of primitive plant and bacterial life as it existed hundreds of millions of years ago on earth, and the advances to more complicated plant and bacteria structure and behavior.

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Method Devised to End Telltale Vapor Trails

➤ **A DEVICE** has been developed that prevents high-altitude jet aircraft from leaving smoke-like trails that friendly and enemy observers can follow easily.

Air Research and Development Command engineers developed the method for reducing the size of water vapor particles so they are no longer visible from the ground. In the method, the size of the water droplets forming the trail are reduced by mixing dust-like particles in the engine exhaust.

The smaller droplets cannot be seen from the ground. The method has been proved effective in tests at L. G. Hanscom Field in Bedford, Mass., Air Force reported.

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