

# Many Problems Face Explorers of Moon

The first explorers of the Moon will be faced with problems of softening bones, weakening muscles and diminishing blood supply because the pull of gravity is only one-sixth that on Earth.

To survive, they probably will have to undergo a rigorous program of daily exercise.

These and other problems of space travel and survival were outlined by Dr. James G. Gaume, chief of space technology for the Denver Martin Co.

Dr. Gaume is one of America's leading scientists in the effects of space conditions on the human body.

He spoke in the Brown Palace Hotel at the Colorado Medical Society's 91st annual banquet, held in conjunction with the 21st Congress of Occupational Health of the American Medical Assn.

Moon explorers will have special occupational health problems, Dr. Gaume said.

## At Med Meet

In fact, so special that not all the research tools needed for their solution are yet available, even though the Martin Co. scientist expressed confidence man will visit the Moon within 10 years.

One of the major problems, Dr. Gaume said, is weightlessness at zero gravity and the greatly diminished gravity on the Moon's surface.

Flights in rockets and supersonic aircraft have proved that man can survive short periods of zero gravity, but how the human body will function in a state of weightlessness or one-sixth gravity for extended periods of time is still under intensive study.

## Daily Requirement

It is known that intensive exercise will be needed daily to maintain bone, muscle and blood volume, Dr. Gaume said. Bone demineralizes, nitrogen is lost from muscles, leaving bone soft and easily broken and muscle tissue weak and flabby.

"The same thing occurs when a patient is in bed in a hospital over a long period," Dr. Gaume said. "Moreover, such a patient loses as much as a pint of blood volume after a month of inactivity.

"The same sort of hazards can be expected to face men on the Moon.



Dr. Gaume

"Regular, consistent, daily exercise can counteract such effects. But how much daily exercise? We will have to find out."

Dr. Gaume said scientists considering the problems are thinking in terms of Moon visits of six months or longer, and the life-saving daily exercises undoubtedly will have to be more rigorous than mere passive calisthenics.

Probably, resistive exercises with weights will be necessary, "perhaps with a load or by pulling on hand holds fixed to the floor" of the lunar shelter.

## Special Requirement

For full and specific answers to such problems of human physiology and anatomy, science needs a way to hold an animal or man in the weightless state over longer periods. A minimum period of two weeks is needed, Dr. Gaume said.

Dr. Gaume and his colleagues also are working, he reported, on problems of life support with oxygen and foods in sealed Moon houses.

Development of a "regenerative life support system" is essential.

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