

## PHYSICS

# Key to H-Bomb Reactions

► THE METHOD by which the sun produces flares may help scientists learn how to control the tremendous energies of H-bomb reactions for peaceful purposes, Dr. Herbert Friedman of the U.S. Naval Research Laboratory reported in Washington, D. C.

A solar flare is the most catastrophic phenomenon available for frequent observation in the universe. An average flare involves the expenditure of energy equivalent to millions of hydrogen bombs, Dr. Friedman said, yet the huge explosions are only a "small ripple in the steady flow of energy from the sun."

By comparison, certain stars repeatedly flare up to tens of times their normal brightness, he reported in an overseas broadcast by the Voice of America. The exploding stars known as supernovae can reach the brightness of a hundred million suns within minutes.

Dr. Friedman suggested that these three kinds of events all may involve similar basic mechanisms for the acceleration of charged particles to great energies, despite the tremendous differences in their scale. He said that almost every visible form of solar ac-

tivity is accompanied by invisible X-rays or ultraviolet radiations, which are followed by magnetic storms and auroral displays in the ionosphere.

Whether long-range variations in weather near the earth's surface are related in any way to small fluctuations in the sun's output or to some triggering effect of these invisible solar ultraviolet or X-rays is not now known, Dr. Friedman said. However, variations in X-ray intensities are clearly related to the 11-year sunspot cycle.

As an example, Dr. Friedman noted that in 1957, when the number of sunspots was near the peak of the 11-year cycle, X-ray intensities were seven times as great as during the year 1954, when the sun was near the lowest point in its activity cycle.

"Observed relationships between X-ray emission and the quality of shortwave radio and television reception," he said, have led solar physicists to try to find the sources of invisible ionizing radiations and relate them to visible features of the solar disk. If found, the visible features could be used to help predict long-distance radio and TV reception conditions.

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**NUCLEAR SATELLITE MODEL—**Dr. Elmer W. Engstrom, president of Radio Corporation of America, New York (right), explains a communications satellite model to Senator Robert S. Kerr (D-Okla.) at the Senate Aeronautics and Space Sciences Committee hearings. The satellite would be 51 feet long and weigh about 6,000 pounds.

At the present time there is no way of predicting solar flares, but a warning-and-surveillance device kept on the alert for flares could tell moon voyagers of an oncoming flare so they might reach safety in a moon cave or spaceship in time.

Norman Belasco of General Electric's missile and space vehicle department, Philadelphia, told SCIENCE SERVICE that a form-fitting suit similar to those now worn by astronauts, but adapted to the environment, would give sufficient radiation protection for man working on the moon.

Studies made by G.E. and Air Force scientists show that the rigid moon suits heavily padded with shielding to protect against radiation and meteoroids can be replaced by suits which are flexible and allow the astronaut to walk and work freely, he said.

Meteoroid hazards do not appear to be very great, he said, and problems of lunar dust can also be met. The greatest problem with such a suit is eliminating heat from the astronaut's body constantly so he does not become overheated. A thermobalance system to take care of this problem and to maintain an even internal temperature in spite of great changes in the outside temperatures is necessary, the G.E. supervising engineer for advanced life support systems said. His company is now busy developing such a suit.

He said the requirements are generally the same for an earth-orbit and moon suit. Astronauts could also wear this suit up to 500 miles above the earth. Satellite data have shown that up to this altitude no radiation danger exists. However, at 540 miles and above, going through the Van Allen radiation belts of trapped particles from the sun, radiation shielding is believed necessary.

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## SPACE

# U.S. Favors Cooperation

► PRESIDENT John F. Kennedy, in response to an invitation by Soviet Premier Nikita Khrushchev to cooperate in space exploration, declared that the United States, now as in the past, is in favor of full cooperation with the Soviet Union in the peaceful exploration of space. He emphasized that such cooperation must be "wholly bilateral" in information and investment.

The President observed that the previous administration as well as his own had invited international cooperation in space and that such cooperation already is taking shape. In this regard, he paid special tribute to the 18 nations whose governments permitted the location of tracking stations for Project Mercury on their soil. These stations made possible the constant monitoring of Astronaut John H. Glenn's orbital flight. Nigeria, Australia, Canada and Great Britain are among the countries that have U.S. tracking stations.

The President said that he had seen no evidence in the past year that the Russians were prepared to get down to particulars on space cooperation. He added that they now may be more ready to do so since we "now have more chips on the table."

The tremendous step forward in U.S. space capabilities underscored by the orbital flight of Astronaut Glenn was made with the whole world watching. This may have made the delays and failures harder to bear, but they added a new dimension to the final success of the project whose impact, President Kennedy said, "goes far beyond

our own time and our own country."

Should the prestige gained from Project Mercury lead to international cooperation with all the nations and special bilateral arrangements with the Soviet Union, the economic savings that could be directed to projects on earth would be tremendous. Both the United States and the U.S.S.R. are spending billions annually on the space effort.

Combining the technological and scientific know-how of both great powers would make the possibility of success of lunar exploration and also interplanetary exploration much more immediate.

However, if we are to work with the Russians in space, President Kennedy emphasized, we must have every assurance that such work will be done for peaceful purposes to benefit all of mankind.

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## SPACE

## Soft Suit Seen Safe For Lunar Surface Work

► NO RADIATION SHIELDING in space suits will be necessary for astronauts working on the moon's surface, a scientist has reported.

Radiation on the moon's surface would not present a hazard to man unless a solar flare was in progress on the sun. These flares shoot flames and dangerous radiation millions of miles into space.