GEOPHYSICS

# Radiation Belts Vary

➤ A VERY DIFFERENT and more intense pattern of radiation intensity in the Van Allen belts that pose a hazard to manned space travel was found by Pioneer IV, now in orbit around the sun. (See SNL, Dec. 13, 1958, p. 371.)

Dr. James A. Van Allen of the State University of Iowa, who with his co-workers first discovered the potentially dangerous radiation regions, reported this "vastly different picture" at a symposium on problems in space exploration. The symposium was sponsored by the National Academy of Sciences-National Research Council, the National Aeronautics and Space Administration and the American Physical Society.

Dr. Van Allen blamed an enormous solar outburst six days before the launching of Pioneer IV on March 3 for the increased radiation intensity and changed pattern. The solar flare resulted in brilliant auroras on several succeeding nights. More than five times as much radiation was found by the March 3 Pioneer probe as by Pioneer III, aimed for the moon Dec. 6, 1958, with insufficient speed to escape the earth's gravitational pull.

The increased radiation means manned vehicles either would have to be launched from polar sites, since the Van Allen belts leave a 20-degree escape cone at each pole, or would have to stay earth-bound until the solar outburst effects had subsided.

A lead-shielded Geiger counter aboard Pioneer IV was planned by the Iowa physicists to measure the intensities and extent of the radiation belts, which are centered on the earth's magnetic equator and hang suspended like giant doughnuts in space.

The outer radiation zone, Dr. Van Allen reported, was found by Pioneer IV to extend to 52,250 miles from the earth's surface, 18,750 miles farther than shown by Pioneer III. The shielded counter showed that the inner radiation zone contained predominantly quite penetrating radiation, while that in the outer zone was virtually completely absorbed by the lead shielding.

Dr. Van Allen proposed that the inner zone radiation consists primarily of decay products of neutrons emerging from the earth's atmosphere. The outer radiation zone is believed due to solar gas and is of much lower average energy.

The inner belt begins at about 1,300 miles and extends to about 3,000 miles from the earth's surface; it is about 4,000 miles wide from north to south. The outer belt begins some 8,000 miles up and extends to about 52,250 miles; it is about 20,000 miles wide from north to south.

Science News Letter, May 9, 1959

PSYCHIATRY

# Isolation Poses Problem

**Space travel and long voyages in atomic-powered submarines will place unusual stresses upon crews with isolation perhaps the most important of these.**

➤ WITH NUCLEAR power the submarine service has become more than ever the "Silent Service," presenting a new challenge to the minds and emotional stability of the crew.

Since World War II, the job of the submarine has changed completely. Patrol times may be extended from the average 40 days of the last World War to 100 days or more, more than three months.

The effects that service on the nuclear submarine may have on the crew were described to the American Psychiatric Association at Philadelphia by the medical officer on the Seawolf, John E. Ebersole.

The submarine in future will no longer be a destroyer of merchant ships; it will be used to hunt and sink enemy submarines. This will mean hovering perhaps for weeks at great depths keeping on the alert listening for an enemy sub. Since noise must be avoided, most equipment will be shut down or operating at low power levels. This will include air conditioning and air revitalization equipment.

Sea noise may cause repeated false alarms that the enemy is near. This will cause a stress for the crew in addition to fatigue, monotony, the stress of bad air, and the natural fear caused by living and working within feet of a nuclear reactor.

The crew of 116 men stood up remarkably well under this sort of stress during the 60 days of continuous submergence in the Seawolf, Dr. Ebersole said.

No special selection procedure was used for this patrol and no particular psychological testing was carried out during the tour of duty.

But the officers noted no falling off in performance of the men. Although the men were somewhat anxious about their families during the long period without communication, they handled their worries well. Verbal badinage was common but it was not especially aggressive. Physical aggression was unknown. There was a marked susceptibility to rumor about lengthening or shortening the patrol period. The men were not depressed. Except for the separation from family they did not complain of feeling isolated.

## Psychiatry of Space

➤ THE MAN WHO can tolerate the barren loneliness of outer space the best is the withdrawn highbrow who lacks warm human relationships.

This conclusion was reported to the Association by Dr. Henry U. Grunebaum, Boston University School of Medicine, Dr. Sanford J. Freedman of the Isolation Laboratory, Massachusetts Mental Health Center, Boston, and Dr. Milton Greenblatt of Harvard Medical School.

Confined for eight hours in a small isolation chamber unable to see, hear anything but a hissing noise, or touch anything, these repressed, passive people found the experience actually pleasant and were not disturbed by it.

Those who found the isolation most disturbing, became increasingly anxious and had frightening fantasies were two borderline psychotics.

Most of the subjects had striking perceptual aberrations when tested after the experiment. Straight lines appeared to move, triangles seemed to change shape, haloes developed, and figures became larger or smaller.

They also experienced during the experiment a flow of hallucination-like images that were striking and colorful, similar to what sometimes occurs just before falling asleep. The extent of this imagery may be related to artistic talent, it was found.

Although the withdrawn "schizoid" individuals came through the experiment better than other types of personality, they may not be selected to go into space. It is not known whether they would be able to work in isolation; the space pilot will be required to.

## Space Research Dangers

➤ SERIOUS PLANS to send a man into outer space have brought on a rash of experiments dealing with the effects on the human mind of isolation and sensory deprivation such as might be faced by the man in a space capsule.

Such an experience, even when it is comparatively brief and "easy," brings on in the human subject an artificial temporary neurosis, Duke University experimenters reported to the Psychiatric Association.

What is the responsibility of the experimenter toward the subject whose mind or personality is thus damaged, even if briefly, the Duke scientists asked their colleagues.

The scientists urged that some of the research funds for such experiments be set aside for follow-up and therapy, if necessary, for the subjects thus exposed to artificial neuroses.

The Duke group reporting included Drs. Bernard Bressler, Albert J. Silverman, and Sanford I. Cohen of the Psychophysiology Laboratory.

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