

ASTRONOMY

Radio Waves From Space

► THE "RECENT birth and rapid growth" in studies of radio waves from space top the highlights in astronomical research as outlined in Washington by Dr. Harlow Shapley, former director of Harvard College Observatory.

He told a meeting at the National Academy of Sciences that there are now a dozen great radio telescopes, all larger than the giant 200-inch reflector atop Mt. Palomar, listening to the radio noise broadcast from the planets, exploding stars and the Milky Way galaxy. Ten years ago, Dr. Shapley said, "we were barely aware" of these signals at radio wavelengths.

The largest radio telescope in the United States, with a 140-foot antenna, will be built by the Government at a special site in West Virginia.

Dr. Shapley called the International Geophysical Year, a world-wide look at the earth and its atmosphere that starts next July 1, "the most important cooperation in the history of science," and said it included several astronomical items.

1. Studies on the artificial satellites will advance knowledge of celestial mechanics.

2. Probing of the ionosphere will yield new facts on earth-sun relationships, perhaps leading to more reliable intercontinental communications.

3. Charting the movements of glaciers will give information on the Ice Ages and on how constant the sun's radiation is.

4. Observations of meteors, or "shooting stars," appearing over Antarctica may settle a 20-year controversy concerning their frequency and brightness, once reported unusually high.

Another important step in international cooperation is the establishment in South Africa of an international observatory incorporating Harvard's Boyden Station.

Among other recent astronomical high-lights, Dr. Shapley cited:

1. Construction of several large reflecting telescopes and of two great coronagraphs in Colorado and New Mexico for the study of the sun.

2. Production of the anti-proton in the Berkeley atom smasher and its implication of stars or even galaxies made of "anti-matter."

3. Discovery of star clusters that can properly be called "intergalactic tramps." They are found in the space between galaxies, the great pinwheels of millions of stars of which the Milky Way where the earth and sun are located is only one among unnumbered millions. The "intergalactic tramps" are too far away from the Milky Way, about half a million light years, to be considered part of our star system.

4. Demonstration of the essential constancy of the sun's radiation over an interval of nearly two billion years through the finding of blue-green algae in ancient rocks.

5. Determination of the rate of expansion of the universe from the measures of the motions of 800 galaxies.

6. Development of convincing theories of the origin of the planetary system.

7. Proposal of "continuous creation" with an infinite past as a competitor with the "big bang" hypothesis of the creation of the universe with a finite past of only five to ten billion years.

8. Emergence of varied evidence showing that the earth's early atmosphere was free of oxygen, and that the origin of organisms had a natural beginning through the synthesis of amino acids and many other organic compounds as a by-play of lightning and ultraviolet light in an atmosphere of hydrogen gas, water, ammonia and methane.

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AERONAUTICS

Crews Must Be Born On Space Ship to Stars

► IT WOULD take 13 generations of space explorers, born and raised on board a space ship, to make the first trip from earth to the nearest star.

This is part of the picture of interstellar space travel, based on what is now known, drawn by John Gustavson of Convair in *Jet Propulsion* (Jan.), journal of the American Rocket Society.

Interstellar flight, Mr. Gustavson says, will be made in vehicles like ion and photon rockets; velocities must be kept low to avoid hazardous proton impact in outer space; and travel time must exceed the lifetime of human beings.

The biggest problem, as Mr. Gustavson sees it, will be the crew. He thinks that preserving a crew by suspended animation, either by freezing or drug injection might work.

"Suspended animation is not impossible, but certainly beyond our present knowledge of medicine," Mr. Gustavson concludes.

If an ion rocket were used for the trip to the nearest star, the astronaut says, it would take 400 years. One generation is 30 years, he figures, "consequently, 13 generations will be born in space."

He likens the birth of the crew over 400 years to the great number of children born to immigrant parents en route to the United States.

"Yet," he states, "it takes imagination to envision the explorers who will give birth and die on their way to another star."

The expedition has to be large enough, Mr. Gustavson says, to insure genetical safety. However, the space ship's over-all weight has to be low.

In addition, he points out, "the first generation starting out from the earth will have the knowledge of never returning, while their children will be brought up

within the confines of the space ship, hearing only of the earth as the home planet of their parents."

This will lead to the inhabitants of the space ship developing independently of any influence from earth, Mr. Gustavson thinks.

The space scientist concludes on both a pessimistic and optimistic note, by saying that he thinks "interstellar flight is well beyond our present knowledge and technology. The theoretical possibility prevails, and men will eventually travel to other solar systems."

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ENTOMOLOGY

Sound Protects Keepers From Stinging by Bees

► BEEKEEPERS can keep themselves from being stung by honey bees with a new use of an old weapon, sound.

Honey bees are lulled into inactivity by sound waves, Dr. Herbert Frings and Franklin Little of the University of Pennsylvania report in *Science* (Jan. 18).

Suggesting that inexpensive vibrators might be made to replace the use of smoke in protecting beekeepers, the scientists also pointed out that with sound, ventilation of hives is not necessary.

In experiments to determine how honey bees in the hive react to simple sounds, it was found that sound at a frequency of 600 cycles per second at about 120 decibels, stops honey bees in their tracks. They remain frozen for as long as the sound continues. When the sound is stopped, the hive becomes once again as "busy as a bee."

The high intensities of the sound, the researchers point out, make some form of ear protection necessary, but free use of both hands in working in the hive is achieved.

Speakers, used in the experiments, were placed both right next to the hive and from about 20 to 40 inches away.

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PUBLIC HEALTH

New Device Cheapens Water Fluoridation

► CHEAPER water fluoridation is now possible with a new device for dissolving fluorspar.

Fluorspar, the cheapest form of fluoride, has not been used before because it did not dissolve readily. In the new equipment, the fluorspar is dissolved in a solution of alum, a chemical used in many water plants to clarify water. This solution is then fed into the water source.

The dissolver will cut the yearly cost of water fluoridation from ten cents to three cents per person, the U. S. Public Health Service said.

It was developed by F. J. Maier and E. Bellack, Division of Dental Public Health, U. S. Public Health Service.

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