

Helium Spotted by Radio

Clues to the structure and composition of the Milky Way are found in measurements of helium radio waves now being picked up at three wavelengths

► RADIO WAVES broadcast by helium in the Milky Way galaxy have been detected using the 60-foot radio telescope at Harvard University, Cambridge, Mass., four U.S. astronomers reported in London.

The radio radiation has so far been picked up only at three wavelengths. However, detecting excited helium at any radio wave frequency opens up literally hundreds of channels for studying the matter between stars in the Milky Way.

The discovery confirms a prediction made several years ago by Russian astronomer N. S. Kardashev. The radio waves are made by neutral helium atoms changing from one highly excited state to another. Observations of light from the sun and other stars long ago showed the presence of helium in stars and interstellar space.

Such measurements give scientists valuable clues to the structure and composition of the Milky Way in which

the sun and its planets including earth are located.

By comparing the radio signals from helium to those from hydrogen in interstellar space, the relative abundance of the two elements can be determined. Hydrogen and helium are by far the two most abundant elements in the universe. They make up all but about one percent of the mass of the Milky Way and, presumably, the millions of other galaxies in the universe.

The relative abundance of hydrogen and helium is a quantity essential to determining how the universe as a whole is constructed and how stars are formed. The Harvard astronomers confirmed that the ratio of hydrogen to helium is 10 to one, as it was expected to be.

Until about three years ago, astronomers tuning in on radio waves broadcast by heavenly objects had been able to detect only one element—neutral hydrogen—in interstellar space. Since

then they have detected both the hydroxyl radical—a combination of hydrogen and oxygen atoms, which are the raw material of water molecules—and neutral hydrogen in an excited state.

Now the Harvard astronomers have added helium to the list and a search is being made for radio waves from deuterium, or heavy hydrogen, at many radio observatories.

Details on the radio astronomical detection of helium are reported in *Nature* 211:174, 1966, by Drs. A. E. Lilley, P. Palmer, H. Penfield and B. Zucherman of Harvard College Observatory.

• *Science News*, 90:54 July 23, 1966

PLANETOLOGY

Controversy Rages Over Martian Polar Caps

► A CONTROVERSY as ardent as that concerning what the moon consists of is now shaping up about what causes the polar caps on Mars.

The caps are carbon dioxide, not water as had previously been thought, two California Institute of Technology scientists reported in Washington, D.C. However, two other scientists reported that the "wave of darkening" observed creeping across the Martian surface is due to thawing and freezing of the ground resulting from water vapor in the atmosphere.

Another school of thought is that both views are wrong—the Martian atmosphere consists of oxides of nitrogen. The reason both the water vapor and carbon dioxide theories are wrong is said to be because the theories are based on doubtful measurements indicating certain lines in the light from Mars are due either to carbon dioxide or to water vapor. However, advocates of the nitrogen oxides school emphasize that these same lines are also present in the sun's spectrum.

The theory that the Martian polar caps consist of frozen carbon dioxide was advanced in *Science* 153:136, 1966, by Drs. Robert B. Leighton and Bruce C. Murray of California Institute of Technology. Their conclusion is based on studies of the planet's heat balance.

The two scientists arguing most recently for the presence of water vapor on Mars are Joseph Otterman and Finn E. Bronner of General Electric Company's missile and space division, King of Prussia, Pa. They believe that moisture vapor carried from melting polar caps causes frost-heaved surface features that result in the observed optical darkening.

One of the leading astronomers advocating nitrogen oxides in the Martian atmosphere is the Rev. Dr. Francis J. Heyden, S.J., director of Georgetown University Observatory, Washington, D.C. He notes that these nitrogen compounds are very elusive and difficult to study in the laboratory.

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