Physical Sciences Notes

INFRARED SPECTROSCOPY

Chemicals on Venus

The first evidence that the atmosphere of Venus contains trace amounts of hydrogen chloride and hydrogen fluoride has been garnered using a new technique in infrared astronomy (see p. 384).

The observations, made in France during June and July last year, also confirm that carbon dioxide is the major constituent of the Venusian atmosphere.

The trace amounts of the two gaseous hydrogen halides were found with the system known as MIFS, short for multiplex interferometric Fourier spectroscopy. The technique showed that hydrogen chloride is present on Venus in less than one part per million and hydrogen fluoride has a concentration of less than a few parts per billion.

Such concentrations suggest that the acids are weak solutions in clouds of water ice, or possibly clouds of some other composition, four scientists report in the current ASTROPHYSICAL JOURNAL (March).

Implications of these findings concerning the surface and the atmosphere below the clouds are now being studied, according to Dr. Pierre Connes of the National Center for Scientific Research, Bellevue, France, and his three co-workers.

. . . And Young Galaxies

Galaxies in the process of formation could be observed, two scientists suggest in the March ASTROPHYSICAL JOURNAL. They estimate that a young galaxy resembling the Milky Way billions of years ago would be about 700 times as bright as our galaxy today.

The bright phase would occur when the galaxy was only about 150 million years old and would last some 30 million years, Drs. R. B. Partridge and P. J. E. Peebles of Princeton University calculate.

They believe young galaxies are numerous, but that detecting them would be hard because most of the radiation would be at wavelengths in the infrared region —one to three microns—which is difficult to observe. They therefore suggest detecting radiation from young galaxies by Lyman-alpha hydrogen lines.

Infrared radiation of one to three microns is the range in which MIFS has shown great promise.

ASTROPHYSICS

Light Source for Quasars

The main light source of quasars—the brightest and possibly the most distant known objects in the universe—is now believed to have only a one-hundredth the previously estimated diameter.

The new estimate is based on observations by Dr. J. B. Oke, staff member of Mt. Wilson and Palomar Observatories, who has found rapid fluctuations in light from these puzzling objects in less than 24 hours.

A fluctuation occurring in as short a period as one day means that the light source cannot be much more than a few light days in diameter. One light day is the distance light, traveling at 186,000 miles a second, traverses in 24 hours, or 16 billion miles.

Dr. Oke estimates that the diameters of the nuclei of the quasars known as 3C-279 and 3C-446 are only 20 to 30 times the diameter of the solar system.

Confirmation of rapid variations in the light from 3C-446 in less than a day is reported in the April 7 SCIENCE by Drs. A. J. Wesselink and J. Hunter Jr. of Yale University Observatory, who note that Dr. T. D. Kinman of Lick Observatory has also measured short-period light fluctuations.

Changes in the brightness of 3C-446 were reported earlier by Dr. Allan R. Sandage, also of Mt. Wilson and Palomar Observatories (SN: 8/20/66 and 2/4/67).

OPTICS

Large Quadrant Phototube

The best way of doing space photometry—measuring the very faint glow of different colors—is with photomultipliers, which convert light into electrical signals. In long-lived satellites, however, the performance of these sensitive detectors change independently of each other, with variations in temperature and voltage.

Quadrant tubes overcome these difficulties. Drs. Martin Rome and O. H. Sackerlotsky of Electro-Mechanical Research, Inc., Princeton, N.J., reported to the Optical Society of America meeting in Columbus, Ohio. The large quadrant tube is a single device with a common sensitive element in which the various colors are detected and amplified through a common channel.

Three of the cathode quadrants are turned off and one left on several times a second in succession. The essential feature is that only one multiplier section, the variable component in the device, is used; any changes due to uncontrolled conditions in the satellite affect the response to all four colors identically, maintaining signal balance.

The tube, which is some six inches long and two inches in diameter, has high sensitivity from 3,000 to 8,000 angstroms, offering a choice of detection ranges from the near ultraviolet through the visible. The device is reported capable of surviving even severe rocket launches.

SOLAR SYSTEM ASTRONOMY

Moon-Based Telescopes Doubted

Doubt concerning the value of placing optical telescopes on the moon has been cast by Dr. Ira S. Bowen, retired director of Mt. Wilson and Palomar Observatories.

Most earth-based observing programs are now limited by signal-to-noise ratio, Dr. Bowen told the Royal Astronomical Society meeting, as reported in the current OBSERVATORY (Feb.), a British astronomical journal.

Dr. Bowen noted that the zodiacal light in space is about as intense as the night sky glow, which limits the length of earth-based photographic exposures. Outside the earth's atmosphere, whether in orbit or on the moon, background illumination from zodiacal light is only a factor of two less than the night glow.

There will be a gain in image size on the moon, Dr. Bowen said, but it will be difficult to attain because of mirror changes due to temperature fluctuations. As an example, he cited variations in determinations of the exact shape of the 200-inch mirror on Mt. Palomar when the measurements were made on nights with slightly different temperatures—there was no way to tell which result was correct.