



Ohio State Univ.

From an array, a universal map.

logued at any one frequency." Many of the 8,100 sources are fairly close to the earth, but the ones relevant to the curvature of the universe are the most distant, some of which are about 10 billion light years away.

The estimates of distance are based on the faintness of the sources. Any particular faint source could be intrinsically faint and nearby, but in a large number the probability is that most of the sources that appear faint are relatively bright, but far away.

Dr. Kraus refers to the most distant sources as being "on the edge of the universe." At the moment they happen to be the most distant objects identified, although he concedes that a future survey with more sensitive receivers might find some more distant ones.

Nevertheless the statistics of the faint sources now seen indicate that something analogous to a horizon or universal limit of vision is being approached—a limit that implies that the space of the universe, like the earth, is curved.

The evidence is in the number of sources of different brightnesses catalogued in the survey. As the sources get fainter their numbers drop off. The drop-off is consistent with a curved space; in such a case there will ultimately be some limiting distance analogous to a horizon. If the universe were flat and uniform, sources should be present at greater and greater distances in roughly equal numbers. The drop-off can be taken as indicating that some sort of limit is being approached.

The Ohio survey evidence, says Dr. Kraus, goes to confirm a trend that has been suspected from counts of visible galaxies and that shows up also in a radio survey at 408 megahertz recently done at Cambridge, England.

Dr. Kraus will not speculate as to which of the several models of a curved universe the data fit. "I leave that to the theorists," he says, "the model makers are clever." □

SCIENCE NEWSBRIEFS

ABM test

The Army's 400-mile range Spartan antiballistic missile was reported on target by the Defense Department in its first test intercept against an Air Force Minuteman I dummy warhead. Launched from the Kwajalein Atoll test facility in the Pacific on Aug. 28, the Spartan achieved a satisfactory near-miss at a point above the atmosphere and some 4,000 miles downrange from the Minuteman launch site at Vandenberg Air Force Base, Calif.

The 55-foot long, supersonic ABM was guided by the still experimental missile site radar at Kwajalein, which also tracked the incoming nosecone. Future targets may include maneuverable warheads and penetration aids. □

Mercury

Since mercury was first discovered by Canadian officials in fish from Lake St. Clair near Detroit earlier this year, United States agencies have begun an all-out effort to identify mercury contamination where it exists, and legal action has been started against some of the polluters (SN: 8/1, p. 96).

But the mercury keeps turning up; the Interior Department's Fish and

Wildlife Service now reports that high levels have been found in 26 ducks taken as samples in North Dakota and Michigan.

Officials speculate the source of the mercury may be seeds treated with mercurial fungicides and eaten by the ducks. □

Spy satellite

An Air Force secret surveillance satellite, launched from the Eastern Test Range in Florida on Aug. 31, is believed the fourth of a series developed for the early detection and warning of long-range ballistic missiles. Reportedly, onboard infrared sensors are employed to detect the exhaust plume of a missile during its initial thrust phase and thus provide up to a 30-minute alert to a possible nuclear attack.

Fired atop an Atlas booster, the upper stage is believed to consist of the instrumented payload and an Agena rocket. The latter has a restartable engine that assures the necessary maneuverability to place the satellite in a precise, slightly elliptical, synchronous orbit. Two such spacecraft with proper spacing can provide nearly continuous coverage of both Soviet and Red Chinese missile sites. □

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