

sliding. In the suburb of Turnagain Heights a bluff subsided as much as 70 feet, carrying houses with it.

After the earthquake officials declared some of these areas ineligible for federally supported reconstruction aid because of the danger of rebuilding on the unstable clay.

But the people went right back.

**Businessmen complained** that plans to move the main business district to a safer area south of where it had been would be too disruptive of the economy. Federal officials relented part way and made funds available to rebuild existing structures in the Fourth Avenue area, but not to construct new ones. An earth buttress costing \$4 million was built to stabilize part of the Fourth Avenue slide.

Even where the Government kept the brakes on, in the area of the L Street slide, the people insisted on coming back. New buildings have been built on the slide and an apartment house and a luxury hotel have been built nearby, all with private financing.

On the whole, whether during or after the disaster, people changed their accustomed habits very little, the report, conducted for the National Academy of Sciences by the National Research Council, notes. People did what they were trained or used to do and responded slowly if at all to extraordinary situations.

There was a great need to look for persons trapped in fallen-down buildings, but in Anchorage systematic search and rescue operations were delayed until the morning, 12 hours after the quake, although some volunteers had searched in certain parts of the town during the night.

Instead of rescue work, the fire department did what it had always done: It looked for fires to put out. This was a most necessary activity, but, the report complains, "no effort was made to take on novel tasks" such as search and rescue.

One of the report's recommendations is that communities prepare for possible disaster by forming organizations whose primary functions would be to take up unusual tasks such as search and rescue and leave regular public agencies to continue with their usual activities.

**Experiments** involving simulated disasters have indicated that such preparation could be effective (SN: 8/1, p. 103).

Another area of concern was the unwillingness of many to take part in aiding the stricken. People who might have contributed their energies to rescue work bent their efforts instead to protecting damaged property. The report complains that fear of looters was "a misplaced concern." It cites the example of Kodiak, where there were widespread reports of thefts, but only

one instance where investigation resulted in charges being brought. Many things that people first thought had been stolen were washed out to sea.

Financially the earthquake may have been a disaster that was not a disaster at all. The report says flatly, "Alaskans bore little in the way of losses."

About \$300 million worth of property was destroyed, but, says the report, Federal relief funds exceeded some categories of loss. Private property damage, for example, amounted to \$77 million, but by September 1966 the Federal Government had spent \$114 million to repair it. Some businessmen, says the report, may have found themselves better off than they had been before the quake. Reconstruction provided a spur to the economy and population rose.

In sum, the earthquake, one of the most significant geophysical events to happen in the United States, had very little effect on the land or the people. Even though urban renewal funds were available, there was very little reloca-

tion of homes or businesses away from dangerous spots except for the town of Valdez and some of the villages. In fact, the Anchorage experience shows a strong desire to return to dangerous locations.

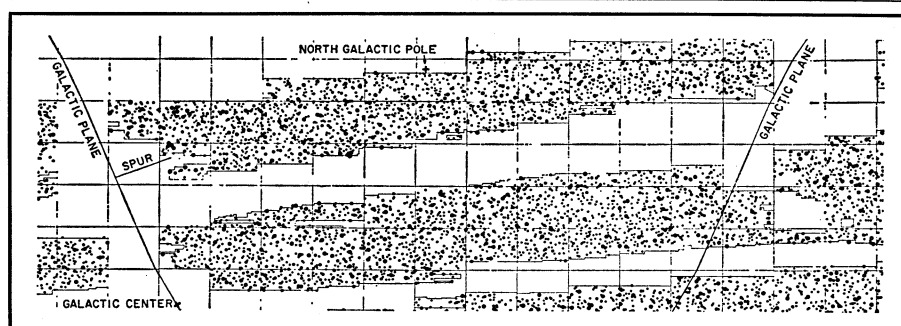
**The report recommends** a national policy to reduce losses in future earthquakes, which might not be convenient enough to happen in sparsely populated areas at times when office buildings are mostly empty, as the Alaska one did. Environmentalists frequently warn, for instance, that Californians building along the San Andreas fault (SN: 6/10/67, p. 550) are courting disaster.

Agencies that govern where people build, the report says, should discourage building on risky land and stimulate safe construction practices as a normal part of their function.

"The dispersal of population and human works into areas of high seismic potential is accelerating," the report says. "We will have to labor mightily merely to keep future losses at present levels." □

## RADIO SKY SURVEY

### The curving universe



Nature

*Some of the 8,100 radio sources: As the sources get fainter, they are fewer.*

In past centuries astronomers believed in a universe in which space was flat and extended in all directions to an infinite distance. This was the simplest and most reasonable assumption. Modern cosmologists have been forced to give it up, however, by modern theories of the nature of space and the behavior of gravitational forces. Twentieth century considerations lead to belief in curved space and a universe that is perhaps not infinite.

So strong are the theoretical reasons for believing in a curved universe that few cosmologists today would argue for a flat one. Yet it is important to have observational confirmation of a curved one.

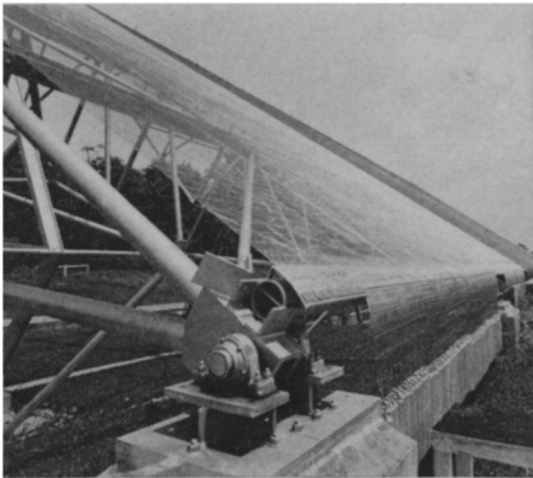
**Evidence** to that effect is now provided by a survey of radio sources that has been made at the Ohio State University Radio Observatory in Delaware, Ohio, by Drs. Beverley June Harris and John D. Kraus.

Astronomers periodically make surveys of the sky, locating and cata-

loguing different classes of objects. The surveys are useful not only for locating individual sources of radiation that may be of interest for one reason or another, but also for their contribution to astronomical statistics. From such statistics conclusions can be drawn about the shape and gross properties of the universe.

Radio surveys are especially useful for drawing cosmological conclusions, since they record sources that are much farther away than any that are recorded in visible light. In five years of observing Drs. Harris and Kraus located more than 8,100 radio sources that radiate at 1,415 megahertz. The survey covered most of the sky between plus 37 degrees and minus 36 degrees declination and 0 hours and 24 hours right ascension.

The Ohio State survey provides, in the words of Drs. Harris and Kraus, "the deepest and most extensive survey at frequencies above 408 megahertz and the largest number of sources cata-



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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