## Farthest quasar: Soon see edge of universe?

Quasars are generally believed to be far out objects—far out into the universe, that is. The farthest out quasar of all has now been reported in the April 6 NATURE by R. F. Carswell and P. A. Strittmatter of the University of Arizona's Steward Observatory. The record breaker is the radio source OH-471 located in the constellation Auriga. Its redshift is 3.40, corresponding to a distance of about 12 billion light-years if the redshift is entirely due to distance, a question still somewhat moot.

The previous record redshift was 2.887. Redshifts much above 2 have been rare, and astronomers were beginning to believe that perhaps 3 was the ultimate barrier, and that there were no quasars with higher redshifts. This was extremely disappointing to cosmologists because it is in the redshift range much above 2 that quasars were expected to show the effects of the geometry of the universe. Cosmologists looked forward to this range to tell whether the universe was curved or Euclidean and if curved, how it was curved.

The new discovery not only provides a quasar with a redshift more than 3, but also gives hope of finding more such distant quasars because it has shown that the methods of looking for quasars useful at low redshifts do not work above 3. The usual way to find quasars was to look for objects with excessively strong radiation in the ultraviolet and to correlate these objects with radio-source positions. Now it appears that for very high redshifts the ultraviolet excess is redshifted out of the ultraviolet. Without the ultraviolet excess, quasars are hard to detect by optical means, and therefore redshifts above 3 may not be rare but simply hard to detect.

Carswell and Strittmatter point out that with the very accurate positions now available for radio sources it will now be possible to settle the question of rarity vs. difficulty in detection by observation. If a goodly number of redshifts in excess of 3 are in fact found, cosmologists may soon be looking at the edge of the universe and be able to tell us how it is curved. □

## Bright comet may light the skies of Christmas

Comets come and go in the solar system. Several are reported each year, but a comet bright enough to be visible to the naked eye is rare. Later this year the inner solar system will be visited by a comet that may be bright enough to be seen in the daylight.

The new comet is called Comet Kohoutek after its discoverer, Lubos Kohoutek of the Hamburg Observatory in Bergedorf, West Germany. He first observed it on March 7. At present it is still in the outer reaches of the solar system. It appears as a small dot, 10,000 times too faint to see with the naked eye but visible with medium size (12-inch or bigger) telescopes, moving against the background of stars in the constellation Hydra.

A month of observation has enabled Brian Marsden of the Smithsonian Astrophysical Observatory to calculate an orbit for the comet. He expects it to reach perihelion on Dec. 27. For six weeks before and after that date it should be visible to the naked eye, and after Christmas it may even be bright enough to be seen in daylight.

The comet will remain a faint evening object until June, when, as viewed from the earth, it will pass behind the sun. It will emerge later as a morning object and should become visible to the naked eye sometime in November. It will increase in brightness daily until mid-December when it will reach a magnitude of minus 2. It will be brighter than Sirius, the brightest star. After its perihelion passage behind the sun, it will again emerge in the sunset and become an evening object. Its best visibility is expected about the middle of January.

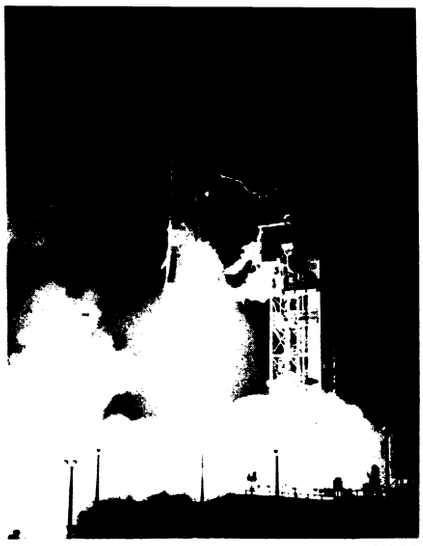
Marsden cautions, however, that the comet may fizzle: "Some very promising comets of the past have fizzled out," he says. □

## Pioneer 11 speeding toward Jupiter

"It's easier to get from earth to Jupiter than it is to get to Washington, D.C., from Albany, N.Y.," quipped Martha Hanner of Dudley Observatory recently. It may seem easier, but the Jupiter trip takes longer. Pioneer 11, the second Jupiter craft (SN: 3/31/73, p. 213), got on its way last week, April 5, at 9:11 p.m. EST. The trip will take 21 months or longer; Pioneer 11 should arrive at Jupiter in early 1975.

The new spacecraft follows on the heels of Pioneer 10—at least as far as Jupiter. Pioneer 11 is a back-up for its predecessor, taking measurements that will complement those of the first craft and finishing the swing past Jupiter should Pioneer 10 fail. Pioneer 10, launched in March 1972 (SN: 3/11/72, p. 167), will arrive at Jupiter in December 1973.

If all goes well with the first craft, NASA will try out the famous "gravity-assist" with the second. Instead of leaving the solar system, Pioneer 11 could use the gravitational force of Jupiter to swing by Saturn. NASA plans to launch several such two-planet missions later in this decade. □



NASA

*Two to Jupiter: Pioneer 11 gets off.*

## Soviet space station orbiting earth

When NASA officials agreed to cooperative efforts with the Soviet Union in space research two years ago, it was not then clear that both nations would be doing about the same things in space—at about the same times. Maybe it is a coincidence, but last week as the Soviet Union launched its second space station, Salyut II, NASA was going into its last month of countdown for the United States' first station, Skylab. (Mars 2 and 3 arrived at Mars about the same time as Mariner 9 did, too, but that had more to do with favorable launch windows—when Mars is close to the earth.)

Salyut II was placed into a 133-by-161-mile orbit, about 100 miles lower than Skylab's expected orbit. But the inclination to the equator, 51.6 degrees, is about the same. That means that both space stations will be orbiting over the same areas of earth. This could be fortunate in cases of weather monitoring. It would also be interesting to compare similarities in information about crop and water conditions, and other earth resources monitoring data.

Two years ago, three cosmonauts spent a record 24 days in Salyut I, but their mission ended in tragedy when their spacecraft developed a leak upon reentry. All three died (SN: 7/10/71, p. 22).

Speculation was mounting early this week that the Soviet Union would soon launch cosmonauts to link up with the station. □