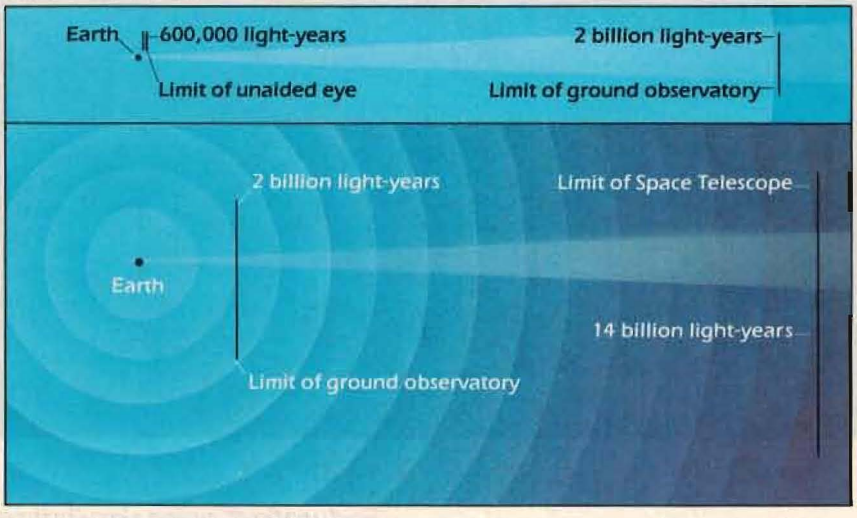
Three Hundred Miles Up

The Hubble Space Telescope will revolutionize astronomy.

When the Hubble Space Telescope rides into orbit aboard the shuttle late next year, it will revolutionize optical astronomy. Three hundred miles up, free of the constant shimmering of Earth's atmosphere, its 2.7-meter mirror will be able to see objects 50 times fainter and resolve objects 10 times smaller than any optical telescope has been able to.

The magnitude of the revolution is evident from the interest among astronomers. Based on preliminary surveys, officials at the Space Telescope Science Institute (STScI) in Baltimore predict 2,000 applications each year for the approximately 3,000 hours of available time. Since every observer will want a minimum of several hours, this amounts to a 10-fold oversubscription.



The launching of the Hubble Space Telescope will be the most significant event in the history of optical astronomy since Galileo pointed the first crude spyglass at the sky.

Because every astronomer thinks his or her project is particularly deserving, STScI has set up working groups to make a general list of observing priorities; the list, which was presented for astronomers' reactions at the last meeting of the American Astronomical Society, includes the following:

- Accurate determination of the Hubble constant, the number that describes the universe's expansion rate and, therefore, its size and age: Current estimates vary by a factor of two; the universe is somewhere between 10 and 20 billion years old. The telescope could resolve the dilemma by focusing on the classical Cepheids, variable stars whose periods are dependent on their inherent brightness; the ratio of inherent brightness to observed brightness is a direct measure of distance. At present, astrophysicists can only see Cepheids in a few nearby galaxies. With the Space Telescope, they should be able to pick them out all the way to the Virgo cluster, 50 million light-years away.

The Planets of Other Stars

- The search for extrasolar planets: This should be a major priority for the Space Telescope, given recent discoveries of protoplanetary disks around the stars Beta Pictoris and Vega and the direct observation of a dark object around star VB 8.
- The study of galactic evolution: By looking at more-and-more-distant objects, the telescope will look deeper into cosmic history, perhaps even to the epoch when galaxies were born. Astronomers can only guess at how these massive structures aggregated and evolved into their present shapes.
- Imaging the centers of quasars and active galaxies: Astronomers have known for two decades that some powerful mechanism is responsible for generating the equivalent of several galaxies' worth of energy from an area only a light-year or so across. Current theory says it happens when gas heats up as it tries to crowd into the gravitational well surrounding a massive black hole. The telescope could prove—or disprove—the hypothesis.
- Mapping the distribution and composition of intergalactic gas: The gas absorbs light from faraway galaxies selectively, and the absorption pattern will reveal the makeup of stuff left over when galaxies formed.
- A wide-angle survey of the entire sky: This will determine the overall statistical distribution of different classes of celestial objects and may lead to surprises: "Be prepared to find some unexpected objects when this is done," said University of Chicago astronomer Richard Kron.

The list doesn't satisfy everyone. Some astronomers would like to see other programs added—a search for supernovas in nearby and distant galaxies, for one. Others are wary of assigning scarce telescope time to any restricted set of objectives. "Exclusion in science is a dangerous thing," said Vera Rubin, of the Carnegie Institution of Washington, D.C. ■

–Marcia F. Bartusiak

Russian Probes Reach Venus

United States to receive data

This month we'll be treated to new views of Venus' surface that may produce evidence of an active volcano. Two Russian probes, the Vegas, will fly by our neighbor on June 14 and 18, each launching a lander and a balloon.

The landers will head for a region on the east side of the continent Aphrodite because all signs—lightning activity, gravity readings, radar data—indicate a volcano is erupting there. Scientists hope their instruments will detect fresh basalt, often ejected by volcanoes.

The helium-filled balloons will drift for about two days in the three-layer cloud system. In an unusual Russian move, an international group that includes NASA has been invited to receive the balloons' data directly from Venus. New information on wind speed, turbulence and wave-like motions in the clouds may clear up why the cloud tops travel at 250 miles an hour, while surface winds are almost nonexistent.

Next Vega stop: Halley's comet in '86. ■

DIAGRAM BY BOB CONRAD