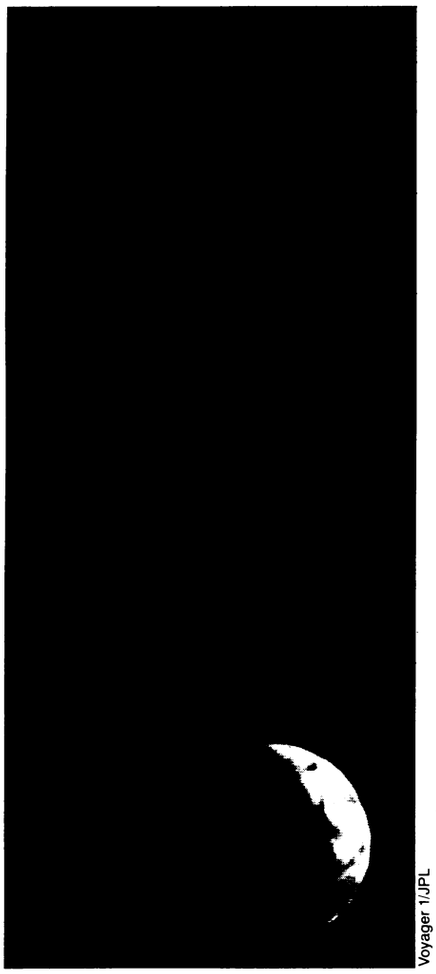
Voyager looks back



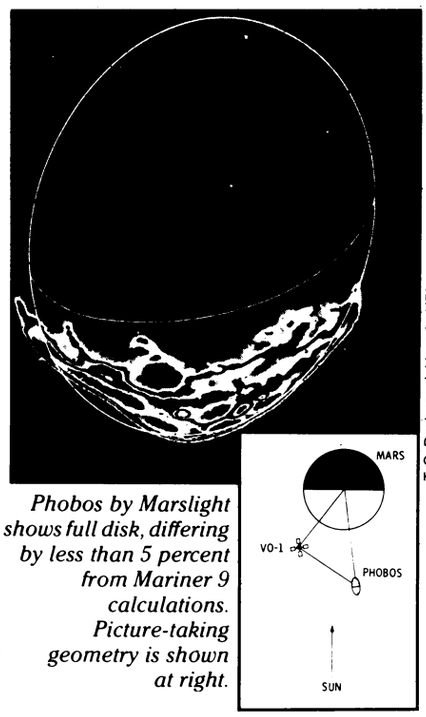
Voyager 1/JPL

The earth and moon were photographed together in crescent for the first time by the Voyager 1 spacecraft, which looked back "over its shoulder" from about 11.66 million kilometers away on its way to a March 5, 1979, rendezvous with Jupiter. Picture was taken September 18, 1977, and stored aboard spacecraft for weeks before processing, which included three-fold brightening of the moon relative to earth. View was taken from directly over Mt. Everest (in darkness) and shows eastern Asia, the western Pacific and part of the Arctic.

Whither the rings?

The rings of Uranus, discovered last March by their blockage of light from a star, have been observed in another stellar occultation by Robert L. Millis of Lowell Observatory in Arizona — or at least some of the rings. The near-dawn timing of the Dec. 23 event made it impossible to observe the occultation by the planet itself or by the rings on the outbound side, says Millis, but the inbound occultation by all five rings — known, from the planet outward, as Alpha, Beta, Gamma, Delta and Epsilon — should have been visible. Instead, he says, "If Alpha and Beta were present, they were much shallower than they were in March," and did not show up even at a time resolution of 0.05 second. Some researchers have suggested that "density waves" could be distributing the ring particles in varying concentrations, which might explain the situation — if one could explain the density waves. □

A Viking vote for Mariner 9



T. C. Duxbury, J. Veverka/JPL

Phobos by Marslight shows full disk, differing by less than 5 percent from Mariner 9 calculations. Picture-taking geometry is shown at right.

Unusual photos of Phobos, in which its night side is rendered faintly visible by sunlight reflected from Mars (see cover blurb), have enabled Project Viking scientists to confirm the accuracy of measurements made years ago using data from the 1971 Mariner 9 spacecraft. Although Mariner 9 photographed only about half of Phobos at "reasonable" resolution, says Thomas C. Duxbury of Jet Propulsion Laboratory in Pasadena, researchers calculated an approximate "mean surface" for the highly non-spherical moon, based on measurements that also yielded its shape and volume. The full-disk Viking photos, taken from different angles, show cross-sectional areas only a few percent different from those of the Mariner 9 calculations, adding up to volume and shape differences of only 10 to 20 percent. Mariner's accuracy, says Duxbury, was possible because "fortunately, the major topographic variations were in the region we could see." More accurate calculations will be completed in a few months, based on Viking's detailed photo-coverage and on gravity data from its several close Phobos flybys. □

Splicing genes into yeast

Gene-splicing is no longer a one-way technique. In the past year, biologists made headlines by transferring genes of higher organisms, such as yeast, rats and humans into bacteria (SN: 3/12/77, p. 165; 5/28/77, p. 340; 11/12/77, p. 310). Last week Gerald Fink of Cornell University announced that he and colleagues have done the opposite. They inserted bacterial DNA into a higher organism. Baker's yeast took up hybrid molecules of bacterial and yeast DNA and incorporated the new genes into functioning chromosomes.

The transferred yeast genes are not just excess baggage. The yeast cells use the extra genetic information to overcome a deficiency. Fink and co-workers Albert Hinnen and James Hicks began with a yeast strain missing a gene for making the amino acid leucine. Yeast accepting recombinant DNA containing the leucine gene were then able to make their own leucine. Genes have never before been easily transferred among yeast in laboratory experiments, except by the standard sexual cycle, Fink says.

Fink and colleagues do not yet know whether transplanted bacterial genes, as well as the yeast genes, function in yeast. The genes do splice into a yeast chromosome and act like yeast genes when the yeast mates and reproduces. The presence of bacterial genes does not interfere with expression of yeast genes. However, in the piece of recombinant DNA used in these experiments, none of the bacterial genes make a product that could be easily detected, even in bacteria. Fink is currently working to transfer bacterial genes more amenable to study.

The hybrid DNA transferred into yeast was provided by John Carbon of the University of California at Santa Barbara. The yeast leucine gene was incorporated into a ring of bacterial DNA and the ring was allowed to reproduce in bacteria. To encourage the baker's yeast to take up exogenous DNA, Fink used an enzyme from snail gut. Snail enzyme is frequently used by botanists to dissolve cell walls. Once the yeast had picked up hybrid DNA molecules, the cell walls were allowed to rebuild.

Fink suggests that baker's yeast might be more appropriate for recombinant DNA experiments than the popular bacteria *Escherichia coli*. Yeasts, which are higher organisms with true nuclei, have genetic mechanisms more like those of animal cells than do bacteria. Also, widespread industrial experience with baker's yeast could provide better methods for culturing large amounts. Finally, these yeasts do not inhabit the human gut or cause disease. "People have eaten baker's yeast for centuries, and it is not a pathogen," Fink says. □