pared with that of the inert U-238, The original enrichment technology was developed by the government during World War II as part of the atomic bomb project. Reactors are now commonly licensed to private concerns, but enrichment remains in government hands.

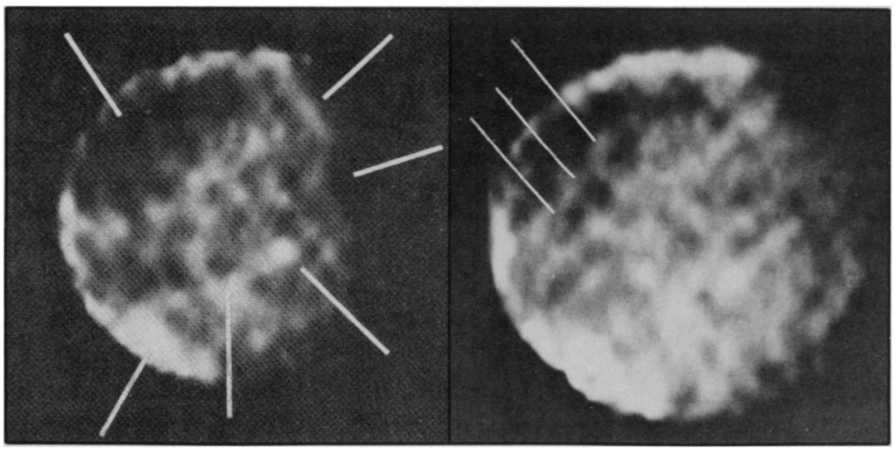
The sudden increase in private interest appears to be due to the development or potential development of new methods of enrichment that promise greater profit and efficiency than the original one. It is momentarily opportune because the congressional Joint Committee on Atomic Energy is considering the Nuclear Fuel Assurance Act, which would facilitate entry of private organizations into the business.

Enrichment depends on separating the two isotopes so that more U-235 can be introduced into or retained within the batch under process. The oldest method, gaseous diffusion, is based on the tendency of light atoms in a gas to rise higher than heavy ones. It is, as economists would say, capital intensive, and slow, requiring repeated processing of each batch. In recent years the gaseous centrifuge, a less expensive and quicker method, based on the idea that the heavier isotope will fly farther than the light one, has developed.

The latest method, still under experiment and not production ready, uses laser light and the fact that the wavelengths preferentially absorbed by one isotope differ slightly from those absorbed by the other. With the proper laser, one isotope can be energetically excited while the other is left alone. If the excited isotope is ionized, it can be collected electrically; if not ionized, it can be swept up by a chemical reaction. A study done at Los Alamos Scientific Laboratory, where experimentation on the laser methods is in progress, compares costs of plants of similar capacity. A gaseous diffusion plant would require $4.5 billion; a centrifuge plant $2.8 billion, and a laser one, if it works (and its proponents are optimistic), would come to only $140 million. Others see substantial savings in laser methods, but not as much as this.

Centar proposes a centrifuge plant. Their announcement says they have done feasibility studies with the Tennessee Valley Authority and have already interested utilities in buying fuel. Exxon proposes a kind of pilot laboratory, an Experimental Test Facility to work on laser methods. They would build it in Richland, Wash., spending about $15 million. If they can break ground in early 1977, they expect operations to start in 1978 or 1979. Garrett is also considering a laser technique. At the same time both Exxon and Garrett have proposed centrifuge plants.

Surface features seen on Ganymede


B. Roy Frieden

Computer-restored images of Ganymede, Jupiter's largest satellite, reveal for the first time some interesting surface details. Both were taken by the Pioneer 10 spacecraft, left with red filter, right with blue. According to the scientists who digitally restored the images, B. Roy Frieden and William Swindell, professors of optical sciences at the University of Arizona, the dark caplike region at the upper righthand edge is consistent with the way a crater, or other large hole, would appear on the dark limb side. Beneath it is a darkened elliptical region that resembles a large, shallow crater. Nearby are other features with a craterlike appearance. The small bright feature in the lower right quadrant appears as the center of a large, scallop-shaped bright arc. The righthand image shows three round details (see pointers) that Frieden and Swindell say very much resemble maria. If so, they add, the maria are very large. Some structure appears evident within the topmost round feature, "which makes it reminiscent of certain lunar maria." The images show a few rather large, bright rings, but whether they are ice or reflections from smooth surface features is unknown. Earlier radar evidence has led to the belief that Ganymede's surface is very rough, largely composed of rocky or metallic material embedded in ice. Ganymede's diameter is about 5,200 kilometers, half again as great as earth's moon. Images and details of restoration techniques appear in the March 26 SCIENCE. □

Comet West's scientific show

As Comet West (1975n) swung around the sun to rise in the east (SN: 2/14/76, p. 104), it provoked a flurry of observations around the world. Comets are not particularly rare phenomena. They run to a dozen or more a year—in the midst of the Comet West activity the first of 1976, Comet Bradfield (1976a) was discovered on Feb. 19 by William A. Bradfield of Dernancourt, near Adelaide, Australia. But comets are fleeting phenomena, so that every piece of data gathered during quick looks helps to build the total picture of what they are. One of the firsts with Comet West was an ultraviolet spectrum.

The comet got progressively brighter as it approached the sun (perihelion came on Feb. 25) reaching a top visual magnitude of −3.65 on Feb. 26 as measured by daylight observations by D. Elmore and S. Koutchmy of the Sacramento Peak Observatory in New Mexico. By Feb. 23, when at the same distance from the sun as Comet Kohoutek, the belle of 1973, it was already intrinsically 1.4 magnitude brighter, according to astronomers E. P. Ney and J. Stoddart of the University of Minnesota.

While it was passing the sun, the comet's nucleus broke into four parts. The exact sequence of events is a bit hard to put together from piecemeal reports, but the recension given by Zdenek Sekanina of the Center for Astrophysics in Cambridge, Mass., goes as follows: On Feb. 22 nucleus B separated from the original nucleus (A) because of the attraction of the sun. Nucleus D probably separated from B on Feb. 25, and nucleus C, which may be short lived, separated from A on March 5.

After perihelion the comet's tail showed a typical growth. According to J. Young of the Table Mountain Observatory in South Africa, the tail was less than 10° long on March 2 and increased by stages to 30° by March 8. Superimposed on the tail of plasma particles was a dust tail composed of so-called synchronic bands (up to 20 in number), which moved laterally and rotated with respect to the fainter plasma tail.

Spectroscopic observations to determine chemical composition were taken in visible light, infrared, radio and (for the first time) ultraviolet. The ultraviolet work was done by Charles A. Barth and C. Lawrence of the University of Colorado using an Aerobee rocket launched March 5. They report evidence for oxygen, carbon and carbon monoxide.

Radio detection of hydroxyl radical emission is reported by J. C. Webber, L. E. Snyder, R. M. Crutcher and G. W. Swenson of the University of Illinois. Visible spectra were taken by various observatories from the University of Minne-