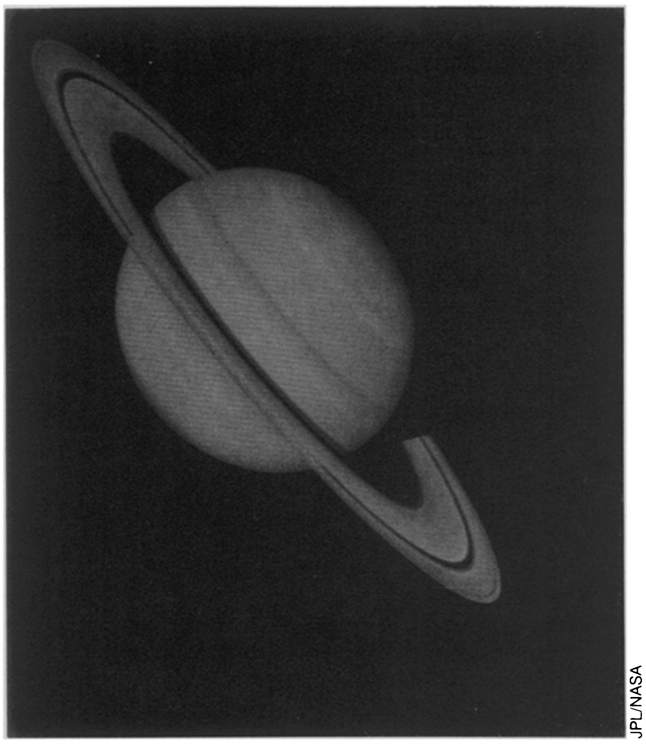
Voyager 2: Saturn in sight



JPL/NASA

Saturn, photographed June 28 by Voyager 2 from 56 million kilometers away, with satellites Mimas (upper left) and Dione.

It was last November that the Voyager 1 spacecraft flashed past Saturn, giving the first sharply detailed view of the planet's startlingly complex rings and diverse satellites. Now Voyager 2 is closing in for another look, climaxing in an Aug. 25 flyby that could be the last U.S. interplanetary visit for more than half a decade. The mission's most intense activity will be concentrated in the few days before and after the closest approach, but Voyager 2 has already been staring at Saturn for weeks, and with a far better view of the spectacular rings than Voyager 1 had at comparable distances.

In the months leading up to last fall's encounter, the rings were almost edge-on to the sun, leaving them relatively poorly illuminated. Now they are tilted by several degrees, making them appear nearly as bright as Saturn itself. One result, says Richard J. Terrile of Jet Propulsion Laboratory, is that there is twice as long a time span of pictures in which one can study the strange, radial, spoke-like features (discovered by Voyager 1 and still poorly understood) that cross the wide B-ring.

Also tantalizing is the possibility, suggested by Frederick L. Scarf of TRW, that Voyager 2 may fly by just when Saturn is inside an extended "filament" of the magnetic tail of Jupiter, perhaps causing significant changes in the Saturnian magnetosphere and radiation belts (SN: 5/23/81, p. 324). On three separate occasions (most recently May 24 through 29), the craft's plasma-wave sensor has detected radio emissions that Scarf believes may represent passage through such a filament. Another instrument shows corresponding signs of a reduced density of a solar-wind plasma, as though a magnetic field were blocking it out, and magnetometer data show anomalies at the same times.

Then there are the seemingly "braided" rings, unusual satellites yet to be seen in closeup, and more. The Voyager 2 countdown clock is running. □

Cretaceous catastrophe: Crystalline clues

A long-standing and literally global mystery has existed around evidence from microfossils in deep-sea sediment samples, indicating that more than half of the living species on earth abruptly became extinct about 65 million years ago, the time of the boundary between the Cretaceous and Tertiary periods. In recent years, unusual abundances of iridium and other elements at sites in Denmark, Spain and elsewhere have prompted researchers such as the University of California's Walter Alvarez to suggest that the mass extinctions may have been due to the impact of a huge meteorite or other extraterrestrial body, whose dust might have blocked out enough of the sun's light to inhibit photosynthesis and doom the fragile life forms.

Now the idea has received support of another kind, cited by two Dutch scientists in the July 2 NATURE. In Cretaceous-Tertiary boundary clays from Caravaca, Spain, according to J. Smit and G. Klaver of the Geological Institute in Amsterdam, studies have revealed numerous tiny pieces of finely crystallized feldspar in a form known as sanidine. Sanidine is a form produced by high temperatures such as can result from volcanism—or an impact.

Analysis indicates the globular, dumbbell-shaped and disklike bits to have a number of elemental differences (such as a higher level of nickel, possibly hinting at an iridium excess) from the clay in which they were found. A preliminary potassium-argon dating suggests an age of only about 44 million years, 21 million years less than the extinction "event," but the authors attribute this to loss of argon or to impurities within the bits.

A volcanic origin seems unlikely, they say, because of the lack of other volcanic products at the boundary layer, and because of the bits' high potassium-to-sodium ratio. Furthermore, if the bits had formed of local material that crystallized in place, they would show a very different crystal structure than they do.

Instead, Smit and Klaver suggest, the bits seem likelier to represent crystallized droplets from the surface of a "projectile." They are enriched in "chalcophile" elements such as arsenic, selenium and antimony, which the authors say could seem to point to their having come from a comet, but the case is far from open-and-shut. The bits consist of almost pure potassium-feldspar, a differentiated mineral "which probably does not occur in undifferentiated solar-system material, as comets are supposed to."

Another researcher has reported Danish Cretaceous-Tertiary boundary clays to contain several elemental abundances closely paralleling those of meteoritic material (SN: 8/30/80, p. 134). Further chemical analysis of the Spanish-clay crystals, the Dutch authors note, "may shed some light on the terminal Cretaceous impact event and on the composition of the impacting body." □

Arthritis: Sabotage by immune system?

Genetic commands are responsible for a wide variety of diseases that involve the immune system turning against the body. One type of evidence for such sabotage is the appearance, among victims of a disease, of a particular gene type in the chromosomal region that directs rejection of foreign tissues. In rheumatoid arthritis, for example, a gene named HLA-DRw4 has been associated with immune system attack on collagen, a protein important in holding bone joints together. Now research at the University of California indicates the HLA-DRw4 gene, or a close neighbor, is responsible for the reaction to collagen. But according to the researchers the genetic command to attack collagen does not completely explain the disease. Both the gene and the associated immune system response to collagen appear in a number of healthy subjects, say Alan M. Solinger, Rajendra Bhatnagar and John D. Stobo in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. While these results do not explain the relationship between the immune system response and rheumatoid arthritis, the researchers say they do provide a useful model for exploring the association and for investigating the mechanisms by which genes control the human immune response. □