SCIENCE NEWS of the week

Uranus: Strange Encounter Looming

On the surface, as an omen of things to come, it looks pretty dull. In less than 11 weeks, the Voyager 2 spacecraft will flash past Uranus, taking the first close-ups of a planet so distant that it is virtually invisible to the naked eye. Yet photos and other data from the rapidly approaching probe still reveal only a featureless fluffball, with no radio emissions (Jupiter's can be "heard" all the way to earth) and not even a trace of the planet's bizarre rings, which were discovered from earth eight years ago when they blocked the light of a star.

But the encounter will be anything but dull. And at last week's annual meeting of the American Astronomical Society's Division for Planetary Sciences in Baltimore, strange Uranus was looking more mysterious than ever.

"Let me give you a sense of our rising level of panic," quipped Michael Kaiser of the NASA Goddard Space Flight Center in Greenbelt, Md., as he reported that Voyager 2 was still detecting "absolutely no sign" of radio emissions from the planet. Such signals would indicate that Uranus has a magnetic field. And perhaps it has none—except that the brilliant ultraviolet glow that a group of scientists has been monitoring for four years with the earth-orbiting International Ultraviolet Explorer satellite would suggest otherwise. The glow, from the Lyman alpha emissions of molecular hydrogen, "is interpreted as an auroral emission from an active magnetosphere," according to John T. Clarke of the NASA Marshall Space Flight Center in Huntsville, Ala., and his colleagues. In fact, the group notes, "this magnetosphere may be comparable in strength to those of Jupiter and Saturn."

Such a magnetosphere, however, ought to be producing the radio signals that Voyager 2 has so far failed to find. Stephen A. Curtis of NASA Goddard suggests that they could be present but radiating only from the planet's nightside. On the other hand, according to Curtis and Goddard colleague Norman F. Ness, the *lack* of a magnetic field (though that would still leave the presumed aurora unexplained) could bear on another, very different problem: the planet's extremely dark rings. One thing a planetary magnetic field does is help keep out the solar wind; without such a field, the researchers note, the solar wind may be constantly eroding away the ices on the particles making up the rings, leaving the particles much less bright than those in the icy rings of Saturn.

Even so, the rings are so far completely absent to Voyager 2's cameras, leaving one of the encounter's major spectaculars yet to come. The earth-based measurements of occulted (blocked) starlight have suggested that there are nine principal rings. James L. Elliott of Massachusetts Institute of Technology and his colleagues report that two of the nine may be "double" rings, consisting of inner and outer components. Of course, the actual number may well be in the hundreds or thousands, given the myriad "ringlets" discovered by the Voyager spacecraft at Saturn. The Uranian rings, in fact, may well be more complex still. Some appear circular, others elliptical (or eccentric), all of them sharp-edged and narrow, and it has been suggested that many of them may be held in place by tiny satellites orbiting just inside and outside each ring.

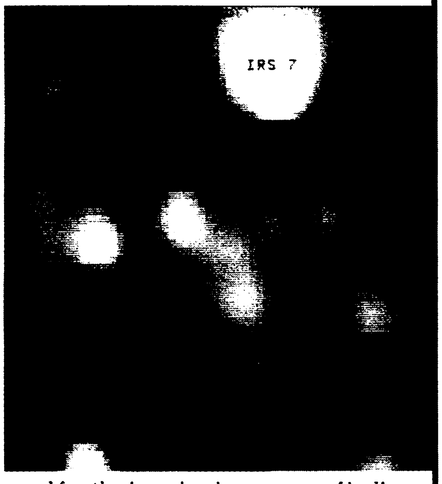
One of the most unusual Uranus findings presented at the meeting was an infrared spectrum of the planet, reported by Glenn S. Orton of Jet Propulsion Laboratory in Pasadena — and he was anything but relaxed about the seeming implication of his result. "If you get the feeling I'm trying to make you feel as uncomfortable as I do," he said as he introduced his brief talk, "you're right."

After having gone over and over the spectrum itself, looking also for possible instrumental errors in the observations, Orton found himself confronted with the possibility that the atmosphere of Uranus may contain about 40 percent helium — 5 to 7 times as much as Jupiter or Saturn. The solar system's four big, gassy planets (Neptune is the fourth) have been assumed to have at least similar ratios of helium to hydrogen, and 40 percent helium would require some explaining. It would seem to imply, for example, that the mass of Uranus is distributed more in the atmosphere and less toward its core. It could also radically affect models of how heat is produced in the planet's interior, and could throw off estimates of the planet's upper-atmospheric temperature based on stellar-occultation observations. There may be other explanations, says Orton, but "helium is the simplest thing which explains the shape of the spectrum."

Voyager 2 is on the way. —*J. Eberhart*

Galactic center: A bunch of IR sources

Astronomers like to observe an object in as many different wavelengths of radiation as they can. Usually each different range of the spectrum contributes its own piece of information to an overall picture of whatever the object is. Sometimes, however, such a multiplicity of observations engenders confusion rather than mutual support. Such is the case with some recent infrared (IR) observations of the center of our galaxy.



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Surrounded by dust clouds, the galactic center is virtually impossible to see in visible light. So it was not until recent years that radio and X-ray observations found evidence of highly energetic processes going on there. In the last couple of years certain radio astronomers, finding evidence of a single very bright object, concluded that a large black hole could be at the center of that object, supplying the push for the activities that produce such strong radio waves.

However, the infrared observations in question, by William Forrest and Judith Pipher of the University of Rochester (N.Y.) and Wayne Stein of the University of California at San Diego, show a jumble of sources, none of which seems bright enough to represent the immediate surroundings of such a large black hole. Therefore, says Forrest, "the subject is still being debated."

The photo shown here is one of the first attempts to make an infrared picture of an area of sky in the same way an optical telescope does, rather than scanning back and forth across the area with a single infrared sensor. The instrument used for the imaging is an array of indium antimonide elements, each of which serves as a "pixel" sensing a piece of the total picture and converting the infrared brightness it records into an electrical signal that it dumps into a computer memory.

A source, which these observers designate IRS 16NW — just below IRS 7 in the photo — is unusual enough, however, to deserve a further look to see whether it could relate to some of the things seen in radio and X-ray. In addition, the new imaging method also permits infrared spectroscopy, the study of emissions by particular substances or physical processes in the source. Forrest and coworkers plan observations of these kinds in the near future and expect that they will contribute significantly to the astrophysical discussion. —*D.E. Thomsen*