

## Ganymede may have an aurora of its own

Auroras aren't just for planets anymore.

Typically generated when a magnetic field sends charged particles crashing into a planet's atmosphere, the shimmering lights of an aurora grace the north and south polar skies of Earth, Jupiter, Saturn, Uranus, and Neptune.

It now seems that Jupiter's moon Ganymede joins the ranks of the big guys. Ultraviolet emissions recorded by the Hubble Space Telescope suggest that this satellite has its own polar light show.

If the finding is confirmed, Ganymede would be the first moon known to possess an aurora.

Hubble has tracked Jupiter and its moons for over a year, first as a scout for the Galileo spacecraft, then as an occasional collaborator during the craft's 2-year Jovian tour, which began last December. In June, just before Galileo's first rendezvous with Ganymede, Hubble's Goddard high-resolution spectrograph measured ultraviolet light emitted by the moon. The spectra revealed that Ganymede, like the Jovian moon Europa, has a thin atmosphere rich in oxygen.

Ganymede's spectra show two distinct peaks caused by oxygen, indicating that such emissions do not arise uniformly throughout the moon's atmosphere. Judging from the orientation of

Ganymede as it passed across the aperture of the spectrograph, Doyle T. Hall of Johns Hopkins University in Baltimore and his colleagues find that the peaks come from Ganymede's north and south poles.

That pattern is just what an aurora would produce, says study collaborator Melissa McGrath of the Space Telescope Science Institute in Baltimore. She reported the details last week at a workshop on the Goddard spectrograph at NASA's Goddard Space Flight Center in Greenbelt, Md.

The findings are all the more intriguing, notes Hall, because during its June rendezvous, Galileo found evidence that Ganymede has its own magnetic field and charged particles nearby—prerequisites for generating an aurora (SN: 7/20/96, p. 37). A Sept. 6 flyby has now confirmed the magnetic field, says Margaret G. Kivelson of the University of California, Los Angeles.

Ganymede lies within the vast region dominated by Jupiter's huge magnetic field. Jupiter may supply the charged particles needed to create Ganymede's aurora, says John T. Clarke of the University of Michigan in Ann Arbor, much as

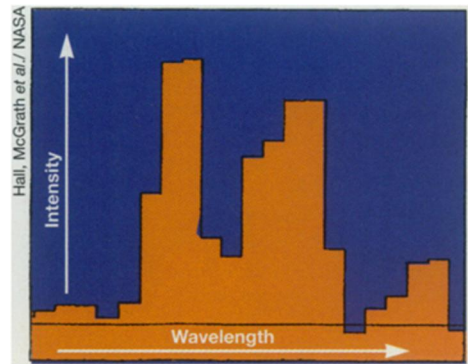
*The two high peaks of this oxygen spectrum suggest that Ganymede has an aurora.*



*Ganymede as seen by the Voyager craft.*

the sun's wind supplies the charged particles that generate Earth's auroras.

Astronauts are scheduled to replace Hubble's spectrographs next February with a device that can simultaneously record images and spectra. If Ganymede has an aurora, this device should detect it directly, McGrath says. — R. Cowen



## Gene pair may incite obesity, depression

Genetic influences on human obesity remain poorly understood, but a provocative new study cites two genetic variations as contributing to that condition, as well as to depression and anxiety.

Young adult women who have certain chemical alterations in regions that lie near and may control the so-called human obesity (OB) gene appear substantially more likely to be obese than women with the more common form of this DNA, according to a report in the September MOLECULAR PSYCHIATRY. Moreover, it asserts, the same DNA configurations contribute to depression and anxiety in obese young women.

When these changes near the OB gene occur in combination with a version of the D2 dopamine receptor gene known as the A1 allele, the likelihood of obesity in young women rises even further, they argue. Controversial studies have linked the A1 allele to a broad spectrum of substance abuse and related disorders, such as pathological gambling, that may be mediated by reward centers in the brain (SN: 11/14/92, p. 332).

"These results indicate that obesity involves more than one gene, that genetic factors more often affect younger women, and that variants near the OB gene also play a role in the emotional

makeup of obese women," contends study director David E. Comings, a geneticist at City of Hope National Medical Center in Duarte, Calif.

When leptin, the protein made by the OB gene, binds to its receptor on cells, it may activate any of several brain pathways involving substances that boost appetite as well as feelings of anxiety and depression, Comings theorizes. His group has yet to measure leptin concentrations in obese women bearing the critical DNA alterations.

Scientists have identified and made copies of mouse and human obesity genes (SN: 12/3/94, p. 372). A pair of defective obesity genes renders mice corpulent, and administration of leptin results in rapid weight loss. However, investigations have found that obese humans have too much leptin, not too little, and display no OB gene defects.

Comings and his coworkers therefore focused on the molecular structure of a DNA segment just outside the OB gene. Study participants, 98 men and 113 women, ranged in age from 16 to 70.

The inheritance of a specific version of this gene region showed a statistically significant relationship to obesity in 16- to 40-year-old women, the researchers maintain. The strongest link appeared among

those age 26 to 30. The same DNA segment was even more likely to be found in obese young women who cited at least moderate levels of depression and anxiety, suggesting that these psychiatric symptoms were not simply reactions to being overweight, Comings holds.

Inheritance of the A1 allele was also linked to excess body weight in both sexes, but particularly in young women. Women who possessed both the OB-gene-related alteration and an A1 allele had more obesity and depression than those with just one of the gene traits.

"This significant report not only demonstrates for the first time an association between variants of the OB gene and measures of obesity and mood in humans, it also exemplifies the importance of examining the interactive effects of distinct, seemingly disparate genes on complex behavioral traits," writes psychobiologist Gerald J. LaHoste of the University of California, Irvine in an accompanying comment.

Scientists who have criticized past efforts to connect the A1 allele to a variety of behavior problems approach the new study cautiously.

Comings' findings regarding both gene variations may hold up but require confirmation by independent researchers, asserts psychiatrist Joel Gelernter of the Veterans Affairs Medical Center in West Haven, Conn. — B. Bower