

Astronomy

From a meeting in Toronto of the American Astronomical Society

Gamma glow from the moon

Viewed at wavelengths from visible light to X rays, the sun is our solar system's star performer. Observed in the light of gamma rays, however, the moon outdazzles the sun. Images taken recently by a telescope aboard the Compton Gamma Ray Observatory (GRO) provide graphic evidence of this phenomenon. "As far as we know, no other branch of astronomy sees the moon brighter than the sun," says GRO investigator David J. Thompson of NASA's Goddard Space Flight Center in Greenbelt, Md.

The gamma glow occurs when high-energy cosmic rays—the charged particles streaming in from distant regions of the galaxy at nearly the speed of light—smash into the nuclei of atoms on the lunar surface, which then emit gamma radiation.

Unlike the moon, the sun possesses a magnetic field. This field acts as a shield, deflecting cosmic rays and other incoming charged particles.

White spot shows gamma-ray emissions from the moon. The red background in this false-color image, a composite of eight pictures taken by the GRO, shows the gamma-ray glow from surrounding sky sources.

Gamma radiation from the sun is thus too faint to be detected by the GRO telescope, except when turbulent activity triggers a solar flare. —R.C.

Another reservoir for comets?

Debris left over from the formation of Uranus and Neptune may have created a comet belt in the outer solar system just as massive as the belt of asteroids between Mars and Jupiter. The proposed belt would serve as a storehouse of short-period comets, supplementing the larger and more distant Kuiper belt, a reservoir that lies beyond the orbits of Neptune and Pluto.

To date, no one has even looked for residents of a storehouse between the orbits of Uranus and Neptune. However, calculations by Matthew J. Holman of the University of Toronto's Canadian Institute for Theoretical Astrophysics indicate that a relatively stable, narrow ring of comets could lie 24 to 26 times Earth's distance from the sun. According to Holman's computer simulations, about 0.5 percent of the small, icy bodies in this region could have survived there since the birth of the solar system.

The belt is leaky, and many of its residents may have been ejected either by the powerful gravitational tug of a planet or a chance collision. Most would have left the solar system, but some could have traveled inward. The belt is a possible source both of centaurs—large cometlike objects found at great distances from Earth—and of comets that visit the terrestrial planets at least once every 200 years.

Although Harold F. Levison of the Southwest Research Institute's office in Boulder, Colo., says he finds Holman's idea intriguing, he's "dubious as to whether this belt could be long-lived." The decided tilt of Uranus, as if something had knocked the planet on its side, and the unusual, retrograde motion of Neptune's moon Triton suggest that these two planets formed during a violent process, which could have destroyed the fragile comet belt. However, if the violent epoch ended quickly or if the belt were replenished soon afterwards, it might have survived. It's important to search for this storehouse, says Holman, because its presence—or absence—may speak volumes about the process of planet formation. —R.C.

Biology

Does leptin trigger puberty?

A recently discovered hormone may provide the connection between the slightly delayed puberty experienced by many lean girl ballet dancers and the early puberty that often hits obese girls. A 30-year-old hypothesis argues that a girl must develop a critical abundance of fat, which stores energy, before her body can mature into that of a fertile woman.

The marker defining this critical abundance may be leptin. This hormone, which is secreted by fat cells, has earned fame as a possible antiobesity drug (SN: 7/29/95, p. 68). Drawing on a study of young female mice injected with the hormone, a research group proposes that leptin helps trigger the onset of puberty in these animals. "It could be one of several signals or the one that initiates the cascade," says Farid F. Chehab of the University of California, San Francisco.

Chehab and his UCSF colleagues have been studying leptin since the powerful hormone's discovery in 1994. Leptin is commonly thought to help regulate weight by telling the brain how much fat the body holds. Last year, noting sterility among females of a mouse strain bereft of leptin, Chehab and his colleagues found that injections of leptin could make those animals fertile (SN: 3/16/96, p. 171).

Chehab's group recently injected leptin into normal female mice about 3 weeks old. The opening of the vagina, the initiation of estrus, and the maturation of reproductive tissues all came earlier in the leptin-treated mice than in those not given the hormone, the researchers report in the Jan. 3 SCIENCE. Leptin-treated mice reproduced up to 9 days earlier than other mice. The amount of the hormone in the blood of normal female mice generally rises more than 60 percent as they go through puberty, reports Chehab's team. His group is now examining whether leptin-targeted antibodies can delay or block puberty. —J.T.

Debunking a myth about sperm's DNA

Friderun Ankel-Simons and Jim M. Cummins have a biology lesson they think evolutionary biologists should learn. The pair recently chastised fellow scientists for what they contend is a widespread misconception—that one kind of paternal DNA, mitochondrial DNA (mtDNA), does not get into the egg when the sperm fertilizes it.

"How this assumption has spread is startling. It's a scandal because it misrepresents a biological fact," says Ankel-Simons of the Duke University Primate Center in Durham, N.C.

Mitochondrial DNA, which sits inside the energy-producing organelles called mitochondria that roam outside a cell's nucleus, has been a useful tool for evolutionary biologists because many studies have shown that it is inherited only from the mother. For example, mtDNA analysis is at the heart of the controversial African Eve hypothesis, which traces human origins to a single woman in Africa (SN: 9/25/93, p. 196).

In the Nov. 26 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Ankel-Simons and Cummins, a researcher at Murdoch University in Australia, point out that evolutionary biologists almost invariably claim in their research articles and popular books that the paternal mtDNA is not inherited because the sperm's midpiece and tail, where the DNA is located, do not enter the egg. That's false, say the two researchers: Microscopy and DNA analysis show that mtDNA from the sperm's midpiece does appear in the fertilized mammalian egg.

Andrew Merriwether, an evolutionary biologist at the University of Michigan in Ann Arbor, notes that the reasons for maternal-only mtDNA inheritance are unclear and concedes that some of his colleagues may not explain this accurately. Nevertheless, studies have established that paternal mtDNA is so rarely transmitted to offspring that mtDNA analyses remain valid, he says. "It may get in the egg but it doesn't stay there." —J.T.