SPACE SCIENCES

The rings of Uranus: Moon-mixed?

Given a choice between the spectacular, wide rings of Saturn and the dark, skinny hoops believed to encircle Uranus, one might well assume that Saturn's rings are the oddity — the exception to conventional expectations. Yet it is the Uranian rings that seem to be the stranger case (even allowing for the far longer time over which the Saturnian rings have been under study). The rings of Uranus are narrow and apparently relatively sharp-edged where interparticle collisions and radiation drag ought to be spreading them out. In addition, of the nine rings identified from existing data, four are measurably elliptical, while the others are more nearly circular.

A possible explanation (in the Jan. 11 NATURE) for both oddities, according to Peter Goldreich of California Institute of Technology and Scott Tremaine of the Institute of Astronomy in Cambridge, could involve the presence of several tiny, yet-unidentified satellites orbiting the planet among the rings. Satellite effects have been suggested before (resonant interactions with satellites out at the distance of the large, known moons, or a satellite actually within one of the rings), but, says Goldreich, the proposed effects have raised substantial dynamical problems.

Goldreich and Tremaine suggest several small satellites, perhaps 10 kilometers across, arrayed in a fashion of which one example would be satellite-ring-satellite-ring-etc., all the way through the system. The gravitational torque of a satellite just inside a given ring, Goldreich says, would tend to keep the ring material from spreading inward, while another satellite just outside of the same ring would confine the outer edge. Certain satellite alignments, he adds, could also account for the differing ring eccentricities.

Report: Seasat short-circuited

Seasat-A, the experimental ocean-monitoring satellite that went dead in orbit last Oct. 9, apparently suffered a "massive and progressive" electrical short circuit, according to a report last week by a NASA review board. Although the specific short was not identified, the board traced it to the vicinity of the "slip-ring" assembly where the satellite's solar panels rotated to track the sun.

The board also cited several misgivings about Seasat's design procedures, including failure of project engineers to "consider shorts as a failure mode" and to provide appropriate "safing command sequences" for use by ground controllers operating the satellite. Perhaps because Seasat was built onto an Agena spacecraft, a type that has been in use for years, the board found that "a test was waived without proper approval, important component failures were not reported to project management, compliance with specifications was weak, and flight controllers were inadequately prepared for their task." There had even been short circuits on previous Agenas, the board said, but Seasat engineers were uninformed of this because of "a breakdown in communications within the contractor's organization."

A NASA announcement of the board's report, however, though mentioning the availability of the document itself, described only the technical conclusion about the failure. Regarding the board's harsh comments on the management of the project, NASA noted only that the report contained "useful management observations" on "the need for monitoring of hardware considered standard, close technical communication in a project, adequate preliminary design, and the review of project management assumptions during implementation." Seasat-A, launched last June 26, had been the subject of a variety of unconfirmed rumors regarding its capabilities (and attempts to conceal them), military concerns with a civilian satellite, and even the cause of the device's demise.

BIOLOGY

Milk the ant's venom

Scarcity of material is not going to stand in the way of scientists working to develop an immunization against the imported red fire ant's sting. Texas A and M University researchers have grabbed the problem by the horns, or rather the ant just behind the abdomen, and have begun "milking" venom. Brad Vinson and co-workers cool the ants to slow them down, grasp each ant with tweezers and collect venom from its stinger into a capillary tube. They milk thousands of ants for a few microliters of venom.

The stings of a fire ant (and they will sting several times given the chance) are painful enough to the average person. However, the gravest problem is that some people are hypersensitive to the venom; a sting can send an allergic person into anaphalactic shock and lead to death.

Vinson, working with physician Barry Paull, wants to learn which component of the venom is responsible for the fatal shock. Vinson and Paull are mixing the venom with blood samples from volunteers to determine which proteins in the venom bind to blood antibodies. Vinson says, "Essentially, what we want to do is isolate and identify these proteins and hopefully produce an anti-venom to reduce the severity of reaction."

Bioluminescence octopus-style

The first glow of octopus has been reported: Two deep-sea species display moderate luminescent activity in their digestive glands. Clyde F. E. Roper of the Smithsonian Institution, working with Richard E. Young of the University of Hawaii and Katharina Mangold of the Arago Laboratory in Banyuls, France, discovered the luminescence while surveying a variety of squids and octopuses. They also documented different patterns of light-producing organs beneath the skin of the squids.

The scientists speculate that the function of the octopus's digestive brillance may be to eject clouds of luminous material to confuse and distract enemies. This behavior would be a flashy adaptation of the same strategy that leads the octopuses' shallower water relatives to expel clouds of dark ink.

Antibiotics suppress nonsense in yeast

The genetic approach to dissecting an organism always presents a dilemma. If investigators successfully destroy an important function by gene mutation, how can they keep the organism alive and reproducing for their studies? Sometimes the researchers can provide the missing product with a nutrient. In bacterial genetics the problem is often overcome by finding a specific environment in which the mutated gene will function.

Two research groups now report a condition that can allow survival of yeast strains containing "nonsense" mutations, changes that insert a stop signal within a protein's gene, thereby preventing production of the complete protein. Several antibiotics of the aminoglycoside type have been found to suppress the yeast mutations. The investigators report that mutant yeasts that normally require an extra nutrient can grow without that supplement in the presence of the antibiotic. Somehow the aminoglycosides allow the organism to insert an amino acid instead of obeying the misplaced stop signal. Edward Palmer, James M. Wilhelm and Fred Sherman at the University of Rochester School of Medicine suggest in the Jan. 11 NATURE that the antibiotics affect the ribosomes, the cellular machinery for protein synthesis. Along with University of Wisconsin researchers Arjun Singh, Doris Ursic and Julian Davies, they see the findings as a basis for learning in higher organisms about translation of genetic information to protein, as well as a way of identifying nonsense mutations and examining consequences of protein synthesis errors.