

Solar system search from space station

President Reagan's order of a year ago that NASA develop a permanently manned U.S. space station (SN: 2/4/84, p. 69) came only four months after a National Academy of Sciences panel had reported finding "no scientific need" for such a station "during the next 20 years" (SN: 9/24/83, p. 199). Some space researchers have feared that visible support might result in their field's being saddled with a disproportionate share of the station's multibillion-dollar cost, and proposals for scientific studies to be conducted from the facility have been relatively slow to emerge.

Last week, however, NASA and the University of Arizona signed a memorandum of understanding to pursue what Eugene Levy, director of the university's Lunar and Planetary Laboratory in Tucson, calls "the most exciting scientific project that one could think of doing from this space station."

Its goal: the detection and study of planetary systems around other stars.

The plan calls for the development of an

extremely accurate astrometric telescope, designed to detect the presence of planets it cannot actually see but which would make their presence known by their gravitational effects on the motions of the stars they circle. The instrument, to be based on the design of one now in operation at the University of Pittsburgh's Allegheny Observatory, would be carried up by the space shuttle and installed on the station to operate for as long as 20 years. Above earth's atmosphere, says Levy, it could be capable of detecting planet-caused stellar "wobbles" as small as 0.00001 second of arc, and the long lifetime is needed because even a massive planet may have to circle its star completely to produce an observable effect. (Jupiter takes about 12 years to orbit the sun.) Such an instrument could be flown as an independent satellite, Levy admits, but it would then be necessary to provide all of a satellite's "house-keeping" functions, whereas the space station might already have them available. The station could also be a far easier way to deal with whatever servicing needs might show up during two decades in space.

Furthermore, Levy says, locating individual planets is not really the point. "The real question of intellectual substance," he

says, is to find out whether planetary systems are a "general, natural consequence" of star formation.

The plan (if it gets funded) calls for the NASA Ames Research Center at Moffett Field, Calif., to manage the design, construction and deployment of the telescope, while the University of Arizona establishes control facilities on the ground and manages the observing program.

— J. Eberhart

Planet X and the killer comets

Another entry has just been added in the contest to devise an astronomical theory explaining the periodic showers of comets that are thought by many to wipe out life forms on earth every 26 million years or so (SN: 10/11/83, p. 212). Astrophysicists Daniel P. Whitmire and John J. Matese at the University of Southwestern Louisiana in Lafayette created the new theory by merging two ideas that were proposed in the past for reasons totally unrelated to periodic comet impacts and mass extinctions: a tenth planet, dubbed Planet X and envisioned to reside beyond the orbit of Pluto; and a disk or belt of comets thought to lie in the plane of the solar system beyond Neptune.

By fashioning a complex motion for Planet X, the theorists designed a model in which the planet periodically crosses near the belt of comets, disrupting their orbits and sending them to rain on the solar system.

So far their paper, published in the Jan. 3 NATURE and presented Jan. 11 at a symposium on the Galaxy and the Solar System (held just before the annual meeting of the American Astronomical Society) in Tucson, Ariz., has received limited scrutiny. Other scientists, including proponents of rival theories, call the Planet X concept imaginative, even ingenious, but say that it is too hard to judge the model without more detailed calculations.

In the scenario developed by Whitmire and Matese, Planet X would move at an average distance from the sun of 100 astronomical units (AU), or 100 times the distance between the earth and the sun, in a moderately elliptical orbit that is inclined from the plane of the solar system at an angle of about 45 degrees. Planet X is envisioned to complete one orbit every 1,000 years. But the orbit itself, like the orbits of other planets, would revolve, or precess, around the sun in this model because of the gravitational tugs from the other planets. Comet showers would be triggered every 28 million years — whenever the orbit moves close to the comet belt.

Whitmire and Matese propose that the belt, which was originally hypothesized in

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Survival: Sizing up the sexes

Among mammals, more males than females die as juveniles, especially when food is scarce. A widely accepted explanation holds the mother responsible, arguing that under certain circumstances she will make a larger investment in her daughter than in her son. Now zoologists at the University of Cambridge in England propose an alternative explanation that does not insist on parental bias. They suggest in the Jan. 10 NATURE that male juveniles, because they grow faster and for a longer period than do females, are more susceptible to food deprivation.

Red deer on an island off Scotland were observed by T. H. Clutton-Brock, S. D. Albon and F. E. Guinness. They report as much as 20 percent greater mortality in male deer than in females during the first two years of life. The scientists also surveyed published reports on the sex ratio among juvenile birds and mammals. They found that the discrepancy between male and female survival is greatest in species in which there is the greatest difference between male and female adult size.

Several lines of evidence support the new theory of differential survival, say Clutton-Brock and colleagues. Sex differences in mortality extend throughout an animal's period of growth, long after weaning — for instance, among many hoofed animals the greatest sex differences in mortality occur during the first



and second winters. In addition, experiments with young rats and pigs on inadequate diets show that, even in the absence of parents, males are more likely to die than are females.

Some aspects of the sex ratio remain unexplained by the nutrition theory, the scientists admit. These include the greater tendency of males to die during the early stages of gestation and at birth or hatching, even in species with little size difference between male and female adults. Furthermore, when the adult female is larger than the male, as in the European sparrowhawk, there is no evidence that the juvenile female has a lower survival rate than the male.

Whichever theory is correct, the scientists suggest an "evolutionary explanation": that sexual selection favoring large adult size in males has increased the male growth rate to the point at which this growth is balanced by its cost to juveniles.

— J. A. Miller