Van Flandern, then, envisions a series of small satellites around Uranus, each giving off gas molecules that concentrate in its own orbit. The individual molecules, however, would follow slightly different paths, so that the ones coming from satellites in elliptical orbits would travel in a variety of ellipses; these ellipses would precess (turn) at slightly different rates, and in time cause the gas ring's overall elliptical shape to smear out into something more like a circle. Since some of the rings are still measurably elliptical, Van Flandern suggests that the gas molecules must be sent into the ring, removed from it and replaced with new ones at a relatively rapid rate. This would mean that each molecule would spend only a short time in the ring, so that it would not have time to rotate far out of alignment with the ring's orientation.

All in all, it is an unconventional hypothesis, and there are frustratingly few data even about other solar-system objects to indicate whether it could work. A 1971 stellar occultation by Io and others by planetary atmospheres such as Jupiter's, says Van Flandern, have produced anomalies that one might interpret as defocusing effects, but it is difficult to be sure, or even confident. So the answer may depend on Voyager 2 (Voyager 1 will miss Uranus by 27° in 1984, Pioneer 11 by 9° in longitude and 16.6° in elevation the following year), unless refined earth-based techniques or the shuttle-launched, earth-orbiting space telescope shed new light on what has come to be seen as one of the solar system's most unusual members. □

Cocaine: The dangerous snort

Cocaine, the trendy means of getting high among those who can afford the costly white powder, is considered relatively safe by many — primarily because little is known about the drug's effects on the human body. But now, perhaps one of the strongest indictments to date against coke is reported by two physicians in the Dade County (Fla.) medical examiner's office.

Contrary to what much of the public and some doctors believe, cocaine can cause death, Ronald K. Wright and Charles V. Wetli report in the June 8 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. The physicians analyzed the case records of 24 persons who died between 1969 and 1978 after using cocaine *alone* (another 29 died after using cocaine in combination with other drugs).

The investigation indicates that cocaine can kill when injected (11 persons), swallowed (seven persons) *and* snorted (five persons) (the method of administration was undetermined in one case). Death due to snorting cocaine is particularly surprising, since many have felt that snorting is the safest way to take the illegal drug.

But, Wright and Wetli report, most of those who snorted coke before dying suffered terminal convulsions, without warning, between a few minutes and one hour after inhaling the powder. The same type of delayed seizure was seen among those who swallowed the drug — many of these people, however, had swallowed massive amounts in order to avoid detection by the police. Those who died after injecting coke usually collapsed within a few minutes after injection and died after one to three hours of coma.

Persons who died after snorting had snorted the drug at least twice during the preceding hour, report the researchers, and had average blood concentrations of cocaine somewhat higher than those who injected it; the highest levels were seen among those who swallowed large amounts. The researchers suggest, however, that there is no absolute level known to be lethal; previous studies reflect a wide range of dosages and blood levels among victims, and all those in the Dade County study fell within that range. The injectors actually had lower cocaine blood levels than the others, but they died faster — suggesting "that a relatively rapid increase in blood level may be as important in determining fatal reaction as the peak blood concentration attained," say Wright and Wetli.

"In evaluating the individual case, factors other than blood concentration of cocaine must be considered," they note. "These include tolerance and reverse tolerance, previous history of cocaine use, individual susceptibility and presence of other drugs." In addition, they point out that street cocaine is usually cut with various sugars or lidocaine; but they determined that "lidocaine plays little if any role in deaths resulting from recreational use of cocaine."

They also note that unlike other drugs, cocaine rarely seems to trigger serious nonfatal reactions — it appears as though there is little middle ground between no adverse reaction and death in coke use.

"The toxic and potentially fatal consequences of cocaine were well-known to pharmacologists and physicians during the first quarter of the century," say the researchers. "This report again demonstrates that cocaine cannot be regarded as a safe recreational drug despite current belief and legal controversy." □

Argonne makes 'heavy' move

For those missing the excitement of the space race, there's another competition to place your wagers on — the fusion race.

For the last several years, laboratories across the United States have been vying with one another to either contain a plasma or implode a fuel pellet with lasers or charged-particle beams. All are in search of the most commercially feasible method of bringing the sun's own private energy source down to earth.

The latest move toward this goal has been made by the Department of Energy's Argonne National Laboratory. Its heavy-ion fusion group recently accelerated a well-collimated beam of xenon ions to an energy of 1 MeV at a current in the tens of milliamps. Argonne researchers believe it is the most powerful beam of its kind.

Production of the beam demonstrated that Argonne now has an adequate source of ions for its fusion reactor concept called HEARTHFIRE (High Energy Accelerator and Reactor for Thermonuclear Fusion with Ion Beams of Relativistic Energy), which is designed to shoot heavy ions at tiny pellets containing deuterium and tritium. This should release immense amounts of energy as the heavy hydrogen implodes to 1,000 times its normal density.

Argonne physicist Richard C. Arnold, one of the originators of the HEARTHFIRE project, says, "The next stage in our design concept is to inject this 1 MeV beam from the pre-accelerator into a radio frequency linear accelerator where the ions will be boosted to even higher energies." Before hitting the pellets, the ions must reach an energy of 10 GeV.

With DOE funding, Argonne will be constructing the linear accelerator and two storage rings during the next three years. After various stages of testing through the early 1980s, the heavy-ion group hopes to demonstrate workable fusion (more energy out than is being put in) by 1986 or 1987.

Heavy-ion fusion is the latest entry in DOE's effort to find the most appropriate design for a commercial fusion reactor. Other concepts include magnetic confinement of a plasma and the development of powerful lasers to implode fuel pellets. But Arnold is not worried that they're the newcomers. "Over the last year, DOE has reorganized its priorities. In the future, we'll be getting much more emphasis. One main reason is that we don't have to design our equipment from scratch. Almost all of it is based on the accelerator and storage ring technology which has come out of particle physics research."

In the June 7 NATURE, Arnold commented on the question of light-ion versus heavy-ion fusion. To Arnold, light-ion use has the edge in time, whereas heavy-ion fusion will be more feasible in the long run. "The pulsed-power technology used in these light-ion experiments is relatively inexpensive. ... As a consequence, fusion target experiments with light-ions will probably be done much earlier than in the U.S. heavy-ion programme. The latter technology, however, has many potential advantages for commercial reactor design." □