

Smoking cocaine: A dangerous switch

"Snorting" cocaine — breathing crystals into the nostrils — has become an increasingly popular form of recreational drug use among those who can afford it. And now some "head" shops have begun to stock kits to convert the crystals into a form convenient for smoking. But if recent studies in South America offer any indication, such a switch in method of administration could be dangerous indeed.

Craig Van Dyke, a psychiatrist at the University of California at San Francisco, told a group of science writers recently that smoking cocaine "almost always leads to severe abuse." In work he conducted with F. R. Jeri and the University of San Marcos in Lima, Peru, cocaine smokers were found to suffer a far higher incidence of toxic effects than those who ingest the drug by snorting or by swallowing gelatin capsules containing it.

Apparently the "bad trips" result from the speed with which cocaine is absorbed into the blood when smoked. Snorting coke can be self-limiting, since the drug is a potent vasoconstrictor that slows down absorption in the nose even as it is being

ingested. Maximum blood levels of the active ingredients thus reach a peak only after 20 minutes to one hour following snorting or swallowing. When smoked, cocaine reaches maximum blood levels in two to five minutes.

Following this "rush," the user quickly starts to "crash." Within 10 to 15 minutes he or she may begin to become depressed and require another "hit" to maintain equilibrium. Compulsive smoking may follow to the point of severe toxicity if enough of the drug is available. Toxic effects include depression, paranoia, extreme agitation and dramatic increases in heart rate and blood pressure. Some users have suffered psychotic episodes that persist and require psychiatric hospitalization.

Van Dyke calls this experience "as clear-cut an example as one can find in pharmacology" of the different effects that can be obtained just by changing the route of administration of similar doses of the same drug. He calls smoking "the most dangerous route of all" for taking cocaine.

The smoking of coca paste already represents "a serious health hazard" in South America, where it has become an "epidemic" in some urban centers, Van Dyke says. And he adds that unless nipped in the bud, it could become a serious problem in the United States as well. □

Melatonin: A puberty switch

Medical scientists have long been baffled by one of the most universal of human changes — why boys and girls suddenly blossom into sexually mature men and women. Now a mechanism that helps set human puberty into motion may have been found. There is an abrupt drop in the concentration of melatonin, a pineal gland hormone also known to be involved in skin pigmentation, reports a team of London scientists — R. E. Silman, R. M. Leone and R. J. L. Hooper of St. Bartholomew's Hospital Medical College and M. A. Preece of the Institute of Child Health.

In 1899 it was reported that tumors of the pineal gland in young boys were associated with precocious puberty, suggesting that the human pineal gland might produce some hormone that retards sexual maturation. Similar findings were reported in 1954, and during the 1960s and 1970s researchers noted that two pineal hormones — melatonin and methoxytryptophol — were able, in animals, to suppress the production of gonadotropins (master sex hormones) in the pituitary gland. So Silman and his team decided to see whether melatonin and methoxytryptophol might drop in concentration in healthy adolescents around the time of puberty. If so, the hormones might well play a role in triggering puberty.

Silman and his co-workers assigned 51 healthy boys and girls to one of five maturity stages according to genitalia or breast development. Then they took blood sam-

ples from the children and analyzed the samples for concentrations of melatonin and methoxytryptophol and also for concentrations of various gonadotropins and sex hormones, since an increase in gonadotropins and sex hormones accompanies puberty. As the investigators report in the Nov. 15 *NATURE*, there was a highly significant fall in melatonin in the blood of boys undergoing stage one to stage two of puberty, but not in the blood of boys in later stages of puberty. This drastic fall also correlated with an increase in two gonadotropins, luteinizing hormone and follicle stimulating hormone, and with an increase in the sex hormone testosterone. In contrast, levels of methoxytryptophol did not fall off in the boys as sexual development occurred. So the researchers conclude that melatonin plays a crucial role in the control of male puberty.

As for the girls in the study, neither melatonin nor methoxytryptophol was observed to fall in their blood with the advance of puberty. So the researchers conclude that melatonin might not play a role in the control of female puberty, or, if it does, that the girls in their study had experienced their drop in melatonin before the study took place.

In the view of Salvatore Raiti, director of the National Pituitary Agency in Baltimore and an international child growth and development authority, this finding "is not the final answer [to puberty] but an interesting development." □

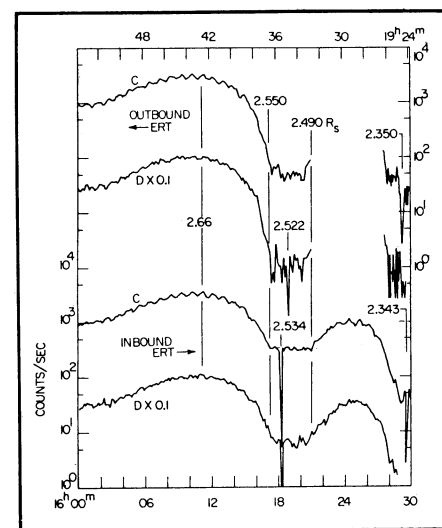
Sorting Saturn's rings and satellites

Now that scientists have had some time to study the flood of data from the Pioneer 11 spacecraft's early September encounter with Saturn, a coherent picture is beginning to emerge from the confusion about just what previously unknown rings and satellites the probe actually detected. The key information has come not from the vehicle's "camera" (an imaging photopolarimeter, limited in both resolution and sensitivity), but from an array of detectors that monitored charged particles trapped on the lines of the planet's magnetic field. The rings and satellites absorb the particles that strike them, producing wakes or "shadows" that showed up to the detectors as precisely locatable "dips" in the particle counts.

The particle data, according to James A. Van Allen of the University of Iowa, confirm the previously unknown presence of at least one additional ring and two satellites, along with signs that may represent yet more satellites, additional ring material, or both.

The new ring, known as the "F" ring, was first spotted in one of Pioneer 11's pictures (SN: 11/3/79, p. 308), though it seems to be considerably wider than the photo suggested. The outermost of the rings clearly visible from earth extends out to about 77,520 km from Saturn's cloud tops (137,520 km, or 2.292 times Saturn's radius, from the planet's center), after which there is a clearly defined, absorption-free gap — informally dubbed the Pioneer Division — some 2,640 km wide. Then comes the F ring, whose most readily detectable portion spans 2,100 km, ending about 82,260 km from the clouds (2.371 R_s , or Saturn radii, from the center).

Beyond that, reaching to 93,000 km from the clouds (2.550 R_s from the center), lies what the particle scientists first called the G ring, but subsequently, Van Allen says,



Particle-count "dips" mark moons, rings.

J. A. Van Allen et al., Univ. of Iowa

they've dropped that term. Variations in the charged particles' pitch-angle distribution, he says, indicate that it could be a diffuse extension of the F ring—or it may not be a ring at all. The data show signs of what could be taken as a number of larger objects, perhaps tens of kilometers across, suggesting that the region might be better described as a collection of little moonlets. (Missing, however, are any signs of a much wider "E ring," hinted at by past earth-based data.)

Of the two clearly defined new satellites, says Van Allen, one—an object at least 100 km across—lies actually within the distinct portion of the F ring, some 80,580 km from the clouds (2.343 R_s from the center). The other, a 170-km object loosely known as Pioneer Rock and visible in one Pioneer

photo, lies 92,040 km from the clouds (2.534 R_s from the center). A particle "dip" 91,320 km out (2.522 R_s from center) may be another satellite, or part of an eccentric wake of Pioneer Rock.

Conspicuously absent, Van Allen says, is any sign of Janus, Saturn's controversial "tenth satellite," expected by the astronomer who first reported it to be at about 2.65 R_s . Other researchers, however, have calculated that it could be at about 2.82 R_s , points out Van Allen, and there is a slight particle dip at that distance, some 109,200 km from the clouds.

Cameras on the Voyager 1 and 2 spacecraft, due at Saturn in 1980 and 1981, should help, though their paths will pass too far from Saturn for relevant particle data. □

Inbreeding harmful, even in the zoo

The last hope for the preservation of an increasing number of animal species involves breeding them in zoos or in small protected herds. More and more hoofed animals, for example, exist only in relatively small populations. But researchers at the Smithsonian Institution's National Zoo warn that inbreeding, which is generally permitted among hoofed animals in zoos and conservation parks, is detrimental to the offspring. After analyzing detailed breeding records covering more than 10 years, they conclude that inbred animals have a significantly higher death rate in the first 6 months of life than do non-inbred animals.

"The study has major implications, not only for the management of zoo breeding programs, but also for conservation and wildlife specialists who are responsible for managing small populations of hoofed species in reserves and in areas where species have been introduced back into their natural habitats," says Katherine Ralls, who directed the study. She points out, for example, that among the 25 roan antelope in a Kenya reserve, all young born since 1970 have the same father.

Many workers in conservation and wildlife management have been skeptical of the research on laboratory and domestic animals indicating that inbreeding leads to increased mortality in young animals. But Ralls and colleagues Kristin Brugger and Jonathan Ballou say in the Nov. 30 *SCIENCE* that the effects of inbreeding have not been previously recognized in exotic animals because most zoos have not maintained detailed breeding records.

Ralls and co-workers examined records of 16 species—the Indian elephant, zebra, pygmy hippopotamus, giraffe, four species of deer and eight species of antelope. Approximately 25 percent of the 559 young of non-related animals died before the age of six months; 50 percent of the 380 young of related animals died.



Inbreeding of such hoofed animals as sable antelope (above) and horned oryx (below) produces high juvenile mortality.



National Zoo, Smithsonian

A striking difference in the pattern of deaths was discovered for one species well represented in the sample. Among the Dorcas gazelles, non-inbred calves seldom died after the age of four days. Inbred calves continued to succumb to a variety of later medical problems.

The zoologists say that "the time has come to institute sound genetic management of small ungulate [hoofed] populations." They recommend that zoos exchange non-related animals for breeding and suggest maintenance and analysis of mating, birth and death records. □

Leg 68: Victory at a crossroads

A complete sedimentary record of the past 8 million years has been recovered by Leg 68 of the Deep Sea Drilling Project, marking a "new era in oceanography," according to co-chief scientist James V. Gardner of the U.S. Geological Survey in Menlo Park, Calif. The recent achievement also signifies another triumph for the newly developed Hydraulic Piston Corer (SN: 2/10/79, p. 85) as well as a crucial crossroads for the futures of the DSDP and the *Glomar Challenger*.

The Hydraulic Piston Corer (HPC), developed earlier this year by three engineers at Scripps Institution of Oceanography, enables ocean-going geologists to get undisturbed sediment samples from the sea floor (SN: 9/18/79, p. 118). Rotary drilling, routinely used by the *Challenger*, jumbles up soft sediments so badly that they are virtually useless to scientists who require a layer-by-layer record. And the HPC, because of its hydraulic design, can punch significantly farther into sediments than can other piston corers.

Devoting Leg 68 entirely to the HPC, co-chief scientists Gardner and Warren L. Prell of Brown University and co-workers drilled in the Caribbean Sea 100 miles north of Panama and in the Pacific Ocean about 200 miles west of Galapagos. The relatively short voyage (35 days from August to September) was the first DSDP leg to obtain a continuous record of magnetic and biological events in a single column. According to Prell and Gardner, the 200-meter long, 8-million-year record (which goes back about 7.5 million years further than the previous record piston core) contains every known magnetic field reversal and has a resolution two times better than any other such core. Now, the researchers suggest, scientists may be able to distinguish oceanographic events that occurred as little as 1,000 years apart.

The record-breaking core is a scientific windfall for a variety of disciplines. For climatologists, the 8-million-year core will provide the longest record yet of climate changes. The best core samples available to climatologists have been only 200,000 to 400,000 years long; longer piston cores could not be obtained or were pieced together with substantial gaps. For biologists, the core will be a continuous evolutionary scale—more complete than any land or sea fossil record—and will allow precise dating of fossils. For geologists, the sample may help solve problems such as nuclear waste disposal. Previously, no piston core was long enough to assess the permeability and seismic history of the ocean bottom.

By its ability to reach such depths, the HPC has created "not just an extension, but a whole new area" of very precise, "quantitative" paleoceanography, say re-