Global Surveyor arrives at Mars

Last week, researchers who had spent a decade building detectors for the errant Mars Observer spacecraft finally scored a success. Duplicates of five of the seven instruments lost when that satellite vanished just 3 days before it was to have arrived at Mars in 1993 are revolving around the planet on the Mars Global Surveyor. On Sept. 11, Surveyor became the first U.S. craft to orbit the Red Planet in 21 years.

Designed to monitor the Martian climate and map the planet's surface at an unprecedented resolution of 1.4 meters, the craft faces a major hurdle before it even begins its 2-year mapping mission in mid-March. Surveyor must transform its initial, elliptical orbit, with a high point of 56,000 kilometers and a low point of 250 km, into a circle with an altitude of 378 km. To accomplish this feat, the craft is dipping into Mars' upper atmosphere, using air resistance to drop its height and speed over 4 months.

That maneuver, known as aerobraking, has been performed only once before, at the end of Magellan's mission to Venus, and it requires careful planning. If aerobraking occurs too rapidly, the craft could heat up dangerously. "Nobody really knows what to expect in terms of the actual [atmospheric] densities the craft will encounter," says Bruce M. Jakosky, a Surveyor researcher at the University of Colorado at Boulder. "These are things that have never been measured on Mars, so it's going to be a risky business."

Surveyor is the second in an armada of nine Mars-bound craft scheduled to be launched by NASA every 2 years through 2005. It will act as a scout for future landers, identifying sites whose mineral content or eroded terrain suggests that water once coursed through them.

The craft's thermal emission spectrometer is expected to examine the composition of the Martian surface; it is already providing data on the temperature of the atmosphere during aerobraking.

This week, Surveyor's magnetometer reported that Mars possesses a weak magnetic field, one eight-hundredth that of Earth's surface, says Mario H. Acuna of NASA's Goddard Space Flight Center in Greenbelt, Md. If the field were much stronger in the past, it could have shielded living material from the solar wind and cosmic rays, he adds.

In March, when Surveyor is slated to begin orbiting Mars once every 2 hours, its camera will record detailed black-and-white images as well as global color panoramas similar to weather maps of Earth. A laser altimeter will measure the heights of mountains and depths of canyons. —*R. Cowen*

Bright fish + dim light = diversity lost

Thirteen thousand years ago, Lake Victoria, now one of East Africa's great lakes, didn't exist. Since then, the basin has flooded first with water and then with an evolutionary flourish: the cichlids, a brightly colored family of perchlike fish that diversified to fill every nook in the Ireland-size pond.

As recently as 1978, researchers estimate, 500 cichlid species lived in Lake Victoria. About half are now extinct, the victims of overfishing, habitat loss, and annihilation by the Nile perch, an introduced fish whose numbers exploded in the 1980s.

A group of researchers from the University of Leiden in the Netherlands now has evidence of another toll on the cichlids' famed diversity. Turbidity in the lake is interfering with the ability of these strongly visual fish to find their preferred, bright mates. The result may be interbreeding of closely related species and loss of the more spectacularly colored forms.

The analysis by Ole Seehausen and his colleagues in the Sept. 19 SCIENCE is a "beautiful piece of work," says Les Kaufman of the Boston University Marine Program.

The study grew from the observation that even cichlids in protected, rocky areas of the lake were disappearing. "Species disappeared not only in habitats that were affected by the Nile perch but . . . also in areas where we knew that Nile perch has basically zero impact," says Seehausen.

He and his colleagues measured the light and other environmental features in these areas, along with the brightness of the cichlids. They found the strongest correlation between bright male colors and clear, well-lit water. In recent laboratory experiments, females of two closely related species chose males of their own species in strong light but mated indiscriminately in limited light.

Lake Victoria—which is slated for ecological restoration—has been clouding up since at least the turn of the century, when forests were cut, researchers say. As Nile perch have preyed on algae-eating cichlids, the cloudiness has increased even more, aggravating the cichlids' perilous state. "It's as if they were painted into the last corner, and then that corner gets painted," says Kaufman.

For biologists, these extinctions have flipped the evolutionary value of the lake, he adds. For vertebrate evolution, "it's the keystone model for both sides of the coin: the origin of new forms and the destruction of forms." —*C. Mlot*

G. Grail/National Aquarium in Baltimore

Male cichlids range in color from red to blue, like this peacock cichlid from Lake Malawi. The diversity of colors seems to be diminishing in the murky waters of Lake Victoria, where females of some species can't spot their preferred mates.

A surprising role for Alzheimer proteins?

One fact about Down's syndrome, which stems from inheriting an extra copy of chromosome 21, has intrigued Huntington Potter for years. If the person lives long enough, "every Down's syndrome individual gets Alzheimer's disease," notes Potter, a geneticist at the Harvard Medical School in Boston.

That morsel of information, along with several other clues, has prompted Potter to suggest that some, perhaps many cases of Alzheimer's disease result from an abnormal accumulation of chromosome 21 in cells.

While probing cells for the homes of two proteins implicated in inherited forms of Alzheimer's disease, Potter appears to have found more support for his heretical proposal. The proteins reside in centrosomes, kinetochores, and nuclear membranes—structures involved in the dispersal of chromosomes in dividing cells—he and his coworkers report in the Sept. 5 CELL. "It's the first clear data in favor of the chromosome mis-segregation model," says Potter.

"It's a really interesting hypothesis. It's going to be somewhat controversial," predicts Bruce T. Lamb of Case Western Reserve University in Cleveland.

Potter's group studied two proteins called presenilin-1 and presenilin-2. If a person inherits two mutant copies of either presenilin-encoding gene, the abnormal proteins cause Alzheimer's disease to strike early, often before age 50 (SN: 3/2/96, p. 134).

Since that discovery, investigators have struggled to learn the normal cell functions of presenilins. For example, their structure suggests that they are embedded in one or more of the cell's various membranes, but which ones?

Several studies with antibodies that bind to the presenilins have indicated that they reside in the endoplasmic reticulum (ER), where the cell synthesizes