NASA to build 'Small Explorer' satellites

Less than a year ago, NASA announced it would start working on a series of small, relatively inexpensive scientific satellites that it could develop in a far shorter time than the decade or more sometimes needed for elaborate projects such as interplanetary missions. This week, NASA's Goddard Space Flight Center in Greenbelt, Md., hosted a group of scientists just selected to work with the first four satellites in the series.

Each satellite should cost only about $30 million and weigh barely 400 pounds so that it can be launched on an inexpensive Scout rocket. Time is also a key factor: NASA started right out telling potentially interested scientists that there would be "less than three years elapsing from the start of the detailed design and hardware development phases until launch of the mission."

A primary reason for the rapid development: "So it will be possible to address a topic while it's hot," says David A. Gilman of NASA in Washington, D.C. Another factor, says Small Explorer program manager Nickolus O. Rasch, is to "allow critical training opportunities for the next generation of scientists and engineers."

First on the list is the Solar, Anomalous and Magnetospheric Particle Explorer, scheduled for orbit in mid-1992 to study "anomalous" cosmic rays and timed to work during the current solar-cycle maximum. Next comes a Submillimeter Wave Astronomy Satellite in mid-1993, aimed at helping decipher how molecular clouds collapse to form stars and planetary systems. This "survey" mission will take the first overall look at the sky in submillimeter wavelengths. "We could never have done this before," says Gilman, "because there weren't enough opportunities to fly it."

The Fast Auroral Snapshot Explorer should fly late in 1993, followed by the Total Ozone Mapping Spectrometer (TOMS), addressing concerns about Earth's ozone layer. NASA wants TOMS in orbit so badly that it may fly the satellite either as a Small Explorer or in another series of satellites called Earth Probes. The agency is even negotiating about a possible ride for TOMS on a Soviet weather satellite. *— J. Eberhart*

Neanderthals get an evolutionary face-lift

Recent genetic and archaeological studies have fueled the view that anatomically modern humans emerged in Africa around 250,000 years ago and spread through the world, replacing the species popularly known as Neanderthals (SN: 2/27/88, p.138). But proponents of an opposing theory arguing for at least some interbreeding between Neanderthals and modern humans — as well as for classifying Neanderthals as a closely related subspecies of *Homo sapiens* — are standing their ground.

At last week's annual meeting of the American Association of Physical Anthropologists held in San Diego, scientists presented evidence for an early stage of Neanderthal evolution in the Near East roughly between 145,000 and 100,000 years ago, during which Neanderthals displayed facial features similar to *Homo erectus*, a direct ancestor of modern humans.

It appears Neanderthals were native to the Near East, not migrants from Europe, says David Arter of the University of New Mexico in Albuquerque. The anatomical characteristics in early specimens point to "reasonably close genetic ties" to modern humans who also inhabited the region, he contends.

Arter and colleague Erik Trinkaus reconstructed a fragmented Neanderthal skull from the Shanidar cave in Iraq. The cave contains two layers of sediment with Neanderthal remains. Exact dating of the layers is uncertain, but radiocarbon tests suggest they are more than 45,000 years old. The reconstructed skull is from the older layer.

The Shanidar cranium has a relatively narrow nasal opening and flat face, Arter says. In contrast, later "classic" Neanderthals in the Near East and Europe have sloping foreheads, receding cheekbones, large noses and protruding jaws.

A facial pattern similar to the early Shanidar skull is apparent on another Near Eastern Neanderthal fossil dating to between 97,000 and 145,000 years old, according to Tal Simmons, Anthony B. Falsetti and Fred H. Smith of the University of Tennessee in Knoxville. The skull, from the Israeli site of Zuttiyeh, is considered an ancestor of modern humans by some anthropologists, particularly because its face is flatter than the classic Neanderthal profile.

According to Simmons and her colleagues, the flat face of the Zuttiyeh skull projects from the brain case at an angle similar to that observed in *H. erectus* specimens, but not in modern humans.

Smith agrees, saying, "The early Shanidar group and the Zuttiyeh skull are reasonable ancestors to later Near Eastern Neanderthals."

This interpretation is consistent with the view that Neanderthals and anatomically modern humans developed side-by-side in several regions of the world and interbred to some extent before Neanderthals became extinct.

Further evidence for this "regional continuity" in the evolution of modern humans comes from Mladec in Czechoslovakia, Smith adds. The 35,000-year-old site contains probably the oldest known sample of modern Europeans. However, Smith contends, the skeletal remains, particularly the crania, contain some Neanderthal-like features that suggest a genetic blending of populations.

The evolutionary place of the Neanderthals is still debatable, though. The only complete Neanderthal pelvis, recently found in an Israeli cave, differs markedly in shape from that of modern humans, says Yoel Rak of Tel Aviv (Israel) University. The find dates to about 60,000 years ago (SN: 4/9/88, p.232).

Other fossils discovered in Israel and placed at between 90,000 and 150,000 years old have more in common with modern humans than with Neanderthals, Rak asserts. He remains convinced the Neanderthals were a separate species that came to an evolutionary dead-end without interbreeding with modern humans. *— B. Bower*

Cold fusion getting hotter

Using a simple laboratory setup at room temperature, more scientists report evidence for what could emerge as an unknown form of nuclear fusion. Last month, two independent research groups based in Utah separately unveiled evidence of a possible "cold fusion" process (SN: 4/1/89, p.196; 4/8/89, p.212). Dozens of other scientists quickly began their own tests aimed at confirming or debunking those announcements.

Last week chemists Charles R. Martin, Kenneth N. Marsh and Bruce E. Gammon of Texas A&M University in College Station announced that their efforts may indirectly support work at the University of Utah in Salt Lake City, the more remarkable of the earlier claims. They used calorimetry to precisely measure heat flowing into and out of their electrochemical fusion reactor, which supposedly splits heavy water into deuterium and oxygen and causes deuterium nuclei to fuse inside a palladium rod.

The Texas researchers say they measure up to 80 percent more energy in the form of heat than they put into the system as electricity. Known chemical reactions can account for at most about 63 percent of the heat observed, and fusion reactions may yield the rest, they say. Also last week, nuclear chemist James Mahaffey and his colleagues at Georgia Institute of Technology in Atlanta reported observing an excess of neutrons sputtering from their fusion experiment — a more direct sign of electrochemically induced deuterium fusions. □

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