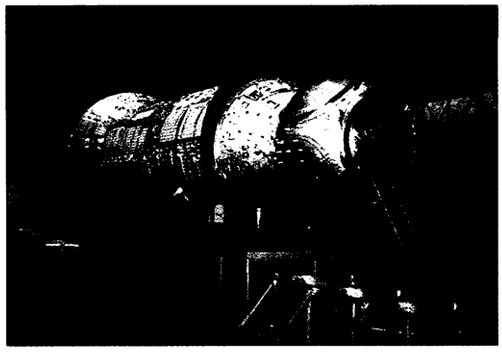
NASA

Firmer Footing for Delayed Station

Only in the international space station program could an 8-month delay be considered good news. But NASA's assurances last week that the first components would be launched in June 1998 and that Russia would remain an important partner appear to have shored up congressional support for the $30 billion orbiting lab.

The rubles necessary to build Russian parts of the station are finally flowing, says NASA station chief Randy Brinkley. Although some of those parts will be late, House and Senate appropriators gave NASA the green light last week to use $130 million in space shuttle funding to cover the costs resulting from the Russian-induced delays. Another $70 million that NASA requested will likely be granted soon, despite opposition from one key lawmaker, according to agency managers.

The launch delay will drive up costs, however, including an additional $150 million to $200 million primarily for modifications to the Functional Cargo Block, a small control module, which will be launched first. That structure will be redesigned to include some features that are part of the Russian-built service module. The launch of the service module—which will provide important command and control functions for the station—has been delayed until the end of 1998.



NASA

In control. This control module, to be launched next summer, will be the first piece of the space station.

Despite that delay, NASA officials are buoyed by recent events in Russia. "That funding problem is behind us," Brinkley says. The Russian government has already released one-third of the total needed this year for the hardware to the Russian Space Agency, he says, with another payment due next week and the rest coming this summer. Russian managers "essentially opened their books to us" during a recent visit by NASA officials to Moscow, says Brinkley. "We opened boxes at [the industry contractor] and put our hands on components that cost money."

However, not everyone is convinced that the crisis is over. Representative James Sensenbrenner (R–WI), who chairs the Science Committee which oversees NASA, remains skeptical that Russia will meet its obligations, and he sees the transfer of funds from the space shuttle as a threat to its safety (*Science*, 18 April, p. 347). "I don't think we can trust the Russians for anything," Sensenbrenner told *Science*.

But his chances of blocking the transfer are dimmed by the fact that control over NASA's purse strings rests with those who appropriate the agency's budget, not those who authorize its programs. That political reality was clear in his 16 May letter to NASA Administrator Dan Goldin, which outlines his objections but makes no specific threat to halt the transfer. And despite his concerns and the continuing arguments of longtime station critics about the program's value, it seems assured of receiving the president's request of $2.1 billion in 1998, according to Administration and congressional sources. That amount would put the station on more solid ground as it heads toward orbit.

–Andrew Lawler

PLANETARY SCIENCE

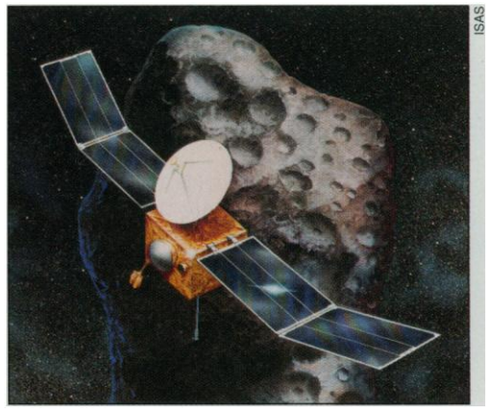
Japanese Mission to Explore Asteroid

TOKYO—Japan's Institute of Space and Astronautical Science (ISAS) has earned a reputation for collecting big scientific and engineering payoffs from modest budgets. It hopes to continue that tradition with a $200 million mission that will attempt to collect samples from a small asteroid and bring them back to Earth for study. The mission, scheduled for launch in January 2002, got a boost last week when NASA announced that it would contribute a 1-kilogram instrumented robotic rover.

"It will be a world first," says Akira Fujiwara, an ISAS planetary scientist in charge of the scientific aspects of the asteroid mission, called MUSES-C. Fujiwara expects the samples to provide insights into the materials and conditions that formed the rocky inner planets in the very early days of the solar system. "These are the fossils of the solar system," he says.

The 350-kilogram, $104 million spacecraft will take 20 months to reach Nereus, a near-Earth asteroid, 1 kilometer in diameter, that was first spotted in 1982. MUSES-C will stay near the asteroid for 2 months, making three landings to let NASA's rover out and to collect samples. "The rover will be the smallest ever flown in space," says Jürgen Rahe, head of NASA's solar system exploration program. A reentry capsule carrying the samples will parachute to Earth in January 2006.

Along with the challenge of landing on such a small target, engineers also face the problem of gathering samples when there is insufficient gravity to drill or pick at the surface. MUSES-C will fire a small metal projectile into the asteroid's surface, breaking away fragments with enough force that some of them are expected to bounce up through a funnellike device and into a receptacle on the spacecraft.



ISAS

Rocky welcome. MUSES-C satellite hopes to collect samples from Nereus in 2003.

That technique may yield only 1 to 5 grams of material. But Fujiwara says that the amount should be enough to help resolve such questions as the mismatch between the relative abundance of materials in asteroids based on studies of meteorites—tiny pieces of asteroids that have landed on Earth—and spectrographic studies of asteroids. "It's not entirely clear just how well meteorites are representative of the material in the solar system," he says. Studying materials from a known source that has been spectrographically observed, he adds, could also help refine spectrographic studies.

Collecting the samples is just one of many engineering challenges. The mission's primary objective is to develop technologies "for planetary exploration in the 21st century and beyond," says Junichiro Kawaguchi, a design engineer for the spacecraft, and there will be several such elements on board.

The craft will be powered by an ion thruster, in which xenon ionized by micro-

waves is accelerated by high-voltage electrodes to generate the thrust. This technology, which replaces the much heavier solid or liquid fuel used in present propulsion systems, has been used before in stabilizer thrusters but not in the primary spacecraft engine. NASA is planning an ion-thruster demonstration flight in 1998 as part of its New Millennium program. MUSES-C also will rely on a host of new sensors and controls to guide its asteroid landings, and its reentry capsule will require a new type of heat shield to protect it from the much hotter temperatures generated by a higher reentry speed, a result of its trajectory from interplanetary orbit.

In addition to contributing the rover, NASA will also cooperate on the operational aspects of the mission. Although details of the agreement must still be worked out, NASA expects its contribution to be worth about $20 million. Next month, NASA Administrator Dan Goldin will meet with ISAS officials at institute headquarters in the Tokyo suburb of Sagamihara to discuss other ways in which the two countries can pool their resources and technology in space.

–Dennis Normile

With additional reporting by Andrew Lawler.

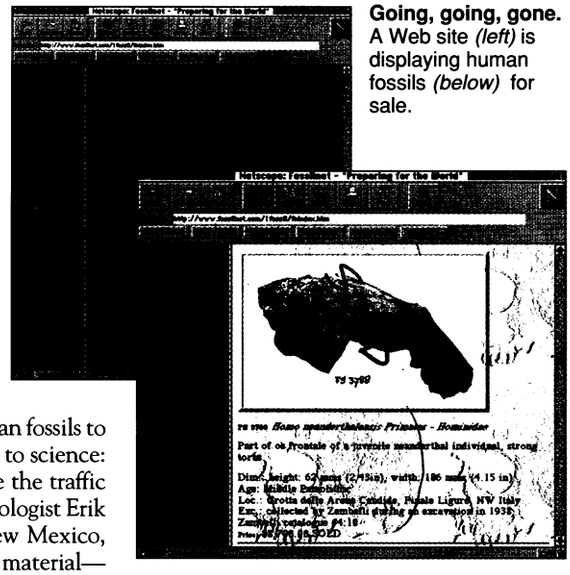
FOSSIL TRADE

For Sale: A Piece of Human History

Paleoanthropologists trolling the Internet last week got an unpleasant surprise: A site called Fossilnet is advertising 20,000-year-old human skulls and even older human jaws for sale online. For $28,000, buyers can pick up a Cro-Magnon skull, complete with 11 teeth, for their living room; a jaw labeled Neandertal has already sold for $5700.

Paleontologists are well aware of the brisk trade in fossils, as they watch collectors snap up well-preserved specimens of everything from mollusks to dinosaurs. Indeed, Fossilnet itself is hawking a *Tyrannosaurus rex* for $10 million (see www.fossilnet.com/1fossil/fnindex.htm).

But researchers and dealers alike say that this is one of the most visible instances to date of the sale of such ancient human bones. And even though there is some question about the authenticity of all the bones—and the dealers insist that all transactions have been perfectly legal—paleoanthropologists such as Rick Potts of the Smithsonian Institution in Washington, D.C., call the sale "outrageous."



Going, going, gone. A Web site *(left)* is displaying human fossils *(below)* for sale.

Potts says that selling rare human fossils to private collectors represents a loss to science: "Ventures like this can only cause the traffic to increase." Agrees paleoanthropologist Erik Trinkaus of the University of New Mexico, Albuquerque, "This is scientific material—not works of art to be distributed like Renoirs. It should be in reputable institutions of learning, available to the scientific community."

For his part, the dealer who runs Fossilnet, Jim Wyatt of Garland, Texas, says, "I would be very happy to see a museum buy this material" but that museums are increasingly finicky about the credentials of the fossils they do buy—and they tend to be short on cash. As for authenticity, Wyatt relies on information supplied by his wholesaler; he identified that dealer only on the condition that *Science* not publish his name. "We take everything on the word of the seller," he says.

Wyatt, a former magnetic resonance imaging technician and recent entrant into the fossil trade, says he purchased the fossils in February from a European dealer at the world's biggest fossil mart, the Tucson Gem and Mineral Fossil Show in Arizona. That dealer told *Science* that the bones were among those excavated in the 1920s and '30s by an Italian named Frederic Zambelli Hosmer, from caves in the Balzi Rossi (red earth) region in Liguria, Italy, near the French border. Zambelli sold them to finance further research. According to the European dealer, they ended up in the hands of an Italian archaeologist who recently did the same thing, divesting himself of a quarter of a million dollars' worth of fossils in order to finance excavations in Tunisia.

Because Zambelli sold his fossils before strict European laws governing the disposal of excavated material came into effect, both Wyatt and the European dealer maintain that all their transactions are legal. In the United States, paleontological materials are not covered by antiquities laws, which apply only to artifacts, says Smithsonian paleobiologist Bill DiMichele. The only U.S. law governing human remains is the Native American Graves Protection Act, which covers ancient human bones found on U.S. public land.

The area of Zambelli's excavations is indeed a well-known fossil region, containing hundreds of limestone caves known for their rich trove of human fossils spanning some 200,000 years, says Neandertal expert Trinkaus. And although it seems that the fossils in question "have very little in the way of reliable geological or archaeological context," he says that they could be of scientific value if they were "properly excavated and appropriate notes taken."

But other anthropologists warn that in this case, buyers should be wary. Judging from photos at the Web site, paleoanthropologist Chris Stringer of the Natural History Museum in London says a "Neandertal" frontal bone (see photo), listed as "sold" for $8700, appears to lack the characteristic double-arched brow ridge of Neandertals; he says a left mandible also looks too modern. Duke University paleoanthropologist Steve Churchill adds that there are discrepancies between the information on Fossilnet and that contained in the *Catalogue of Fossil Hominids*, which lists all known hominid specimens. For example, he says, the Neandertal frontal bone is said to have been excavated from the Arene Candide cave in 1938, but according to the catalog, that cave wasn't discovered until 1940 and doesn't hold anything as old as Neandertal bones. In response, Wyatt cites his wholesaler as a reputable one. Because no one can be sure the bones aren't authentic, Stringer says, "It's very bad that they're being sold this way when they actually may have some important information."

The European dealer argues that other human fossils from Balzi Rossi remain accessible. The museum in Finale Ligure, a town near the excavations, is already bursting with fossils from Zambelli's digs, he says. Wyatt, who is working on a B.S. in paleontology at the University of Texas, Richardson, stresses that "what we're doing is completely legal. ... If a bus driver decides to buy a piece for $28,000 and put it on his dashboard, I have no problem with that." In any case, Wyatt's business is booming: "Later this year, I'm hoping to get some *Australopithecus* material from Ethiopia."

–Constance Holden