now because the iron-rich knots are small, and previous x-ray satellites lacked the resolution to see them. Nor could optical telescopes spot the iron, because it barely shines at visible wavelengths. However, Chandra combines a powerful x-ray sensitivity with eyesight about as sharp as that of the best optical telescopes on the ground.

A team led by astronomer John Hughes of Rutgers University in Piscataway, New Jersey, used Chandra's clear vision to find that the most iron-rich blobs were at the fast-moving fringes of the expanding cloud. Such blobs, astronomers believe, could only arise deep within the core of the blast from the flash fusion of silicon atoms into unstable atoms of nickel, a process that lasts a fraction of a second and requires temperatures of at least 5 billion degrees. The nickel decays first into cobalt and then iron, driving the supernova's light display as intense radioactivity makes the explosion glow white-hot.

Hughes and his co-workers also saw plenty of silicon-rich blobs in Cas A, believed to arise from the explosive burning of oxygen atoms into silicon further out from the core at temperatures of perhaps 3 billion degrees. However, the images from Chandra reveal that the silicon-rich material is closer to the middle of the Cas A remnant than the iron-rich nuggets. "The deeper iron-rich ejecta is the last stuff that got out of the star, yet it's now the farthest from the center of the explosion," Hughes says. That argues strongly against a neat, spherically symmetric "onion-skin" explosion, in which the star's outermost layers would expand most quickly into space.

Researchers had seen hints of this asymmetry in Supernova 1987A, notes astrophysicist Stan Woosley of the University of California, Santa Cruz. Computer simulations by Burrows and others also suggest that massive instabilities in the first few seconds of a supernova blast should create "crooked fingers" of heavy elements that poke through the overlying star. However, the distribution of elements within Cas A may be more topsy-turvy than predicted by simulations. Further analysis of Cas A and other supernova remnants may help theorists re-create the exotic physics of the initial moments of the detonations. Two other powerful x-ray observatories will contribute to this effort: the European Space Agency's X-ray Multi-Mirror satellite, launched in December, and Japan's Astro-E, scheduled for launch early this year.

Chandra's observations also deepen an enduring mystery about Cas A: Why didn't 17th century observers see it more clearly? English astronomer John Flamsteed may have spied it in 1680 as a very faint "star," a description at odds with the potent radioactive energy that the explosion should have unleashed when its nickel-rich ejecta decayed into iron. "It must have been a brilliant supernova," says Woosley, who posits that "a whole lot of dust" near the star and between Earth and Cas A made it nearly invisible. Moviegoers can rest easy, however: Hollywood scriptwriters would never permit any such effect to dim the supernova now terrorizing our screen heroes in space.

–ROBERT IRION

ARCHAEOLOGY

Dredging at Israeli Site Prompts Mudslinging

A prehistoric site critical for understanding early human evolution appears to have suffered permanent damage after a local Israeli drainage authority allegedly bulldozed a big chunk of it last month. Prehistorians claim that the earthmoving, undertaken to prevent flooding of nearby farms during rainstorms, has destroyed their ability to make sense of the complex layers at Gesher Benot Ya'aqov, on the banks of the river Jordan in northern Israel. "This wanton destruction is a travesty that has caused irreparable damage to a site of worldwide significance," says archaeologist Steven Rosen of Ben-Gurion University in Beersheva, Israel. But according to the drainage official who oversaw the project, scientists are exaggerating the harm done to the site.

Happier times. A Hebrew University–led dig at Gesher Benot Ya'aqov.

While the current state of Gesher is contested, the site's importance is not. Gesher Benot Ya'aqov was first discovered in the 1930s and has been excavated several times since. Along with the nearby prehistoric site of Ubeidiya, also in the Jordan valley, Gesher is a key location for understanding how and when *Homo erectus*—an ancestor of modern humans—moved out of Africa, probably through the so-called Levantine corridor that includes Israel. "Israel and the Jordan valley are one of the great crossroads of human prehistory," says Clive Gamble, an archaeologist at the University of Southampton in the Unit-

ScienceScope

Inside Candidate A new name tops the list of potential future directors of the National Institutes of Health. Two high-level officials at different NIH institutes in Bethesda, Maryland, say that Gerald Fischbach, director of the National Institute of Neurological Disorders and Stroke (NINDS), is in the running to succeed Harold Varmus. Fischbach chaired the neurobiology departments at Harvard Medical School and Massachusetts General Hospital in Boston before taking charge of NINDS in July 1998. Through an assistant, Fischbach declined to discuss the rumor.

Wish Granted National Science Foundation director Rita Colwell has an extra bounce in her step, the result of winning White House approval for a double-digit budget increase. *Science* has learned that President Clinton's 2001 request, to be unveiled on 7 February, will include a boost of roughly 15% for the $4 billion agency. Congressional approval would mean the biggest spending increase for NSF in a decade and more than double the 6.6% raise the agency got this year.

NSF's budget is expected to highlight four areas. Three are ongoing efforts, in training, information technology, and biocomplexity, while the fourth—nanotechnology—is part of a new Administration initiative. The White House also has given the green light to EarthScope, which would create a mobile seismic network and probe California's San Andreas fault (*Science*, 26 November 1999, p. 1655), and to NEON, a string of high-tech field stations for ecologists (*Science*, 10 December 1999, p. 2068).

Small Spark Managers of the overbudget National Ignition Facility (NIF) at last have something to smile about. An independent panel appointed to get the laser fusion project "back on track" (*Science*, 10 September 1999, p. 1647) released a report this week that gives a qualified thumbs-up to the facility. The panel did find that the $1.2 billion project has "significant" managerial shortcomings, including inadequate oversight and emergency funds. However, says chair John McTague, "the panel has not uncovered any mechanical or technical obstacles that would prevent completion of NIF."

Some observers are less sanguine. The panel has underestimated the engineering challenge of getting a pellet of hydrogen to fuse and release energy, argues the Natural Resources Defense Council's Chris Paine, who contends that the report "is making an open endorsement for a system of potentially infinite cost."

CREDIT: NA'AMA GOREN-INBAR/HEBREW UNIVERSITY

an emphasis on saving face.

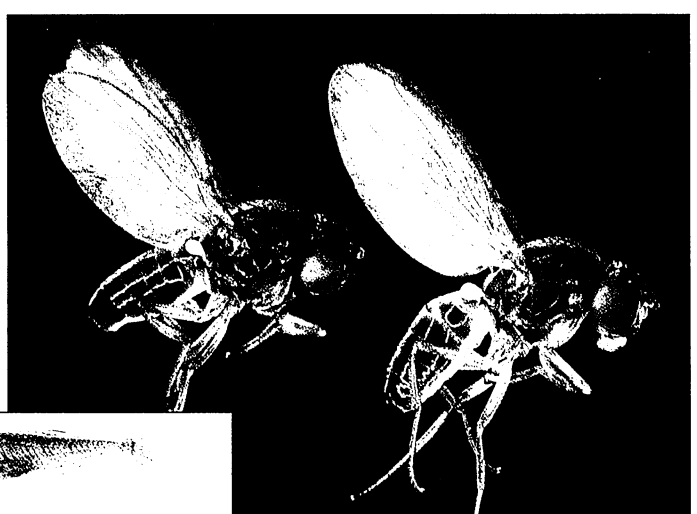
Yoo admits that her project hinges in part "on who I find" for the collaboration, a two-way street that will include training Korean students in U.S. labs. But if all goes well, she predicts, "the 21st Century Program will be a milestone [in our] leap ... to a more advanced scientific level." **–MICHAEL BAKER**

Michael Baker writes from Seoul.

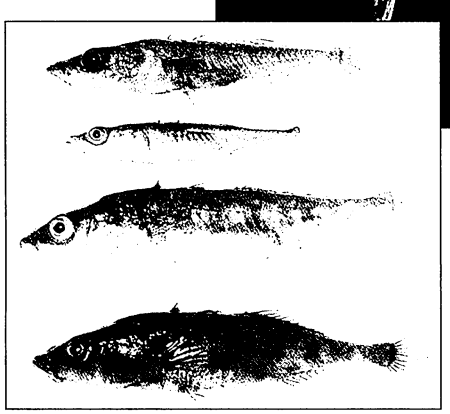
EVOLUTION

Nature Steers a Predictable Course

In Darwin's original formulation of his theory of evolution, he emphasized the importance of the local environment in shaping how organisms change through time. Over the past 2 decades, however, his assumption that natural selection, as it is known, is invariably the driving force of evolution has fallen somewhat out of favor. Some evolutionary theorists have argued that "genetic drift," random gene changes that accumulate over time, underlies the evolution of new species. Thus, even with natural selection, evolution's course should be rather unpredictable and not likely to be repeated time and time again, they concluded. But results reported in this issue by two independent teams indicate that natural selection seems to be as important as Darwin had thought, often overriding the randomness of genetic drift.



Parallel projection. European fruit flies in the New World are evolving wing size differences much like those seen in the flies in their native Europe *(above)*.



Like-minded lovers. Both the slighter fish (top two) and the hefty ones (lower two) accept similar-looking mates from distant lakes, despite their independent evolution.

CREDITS: (LEFT TO RIGHT) DOLPH SCHLUTER/UNIVERSITY OF BRITISH COLUMBIA; GEORGE W. GILCHRIST/CLARKSON UNIVERSITY; WAKAYAME *ET AL.*, *PNAS* 96 (26), 14987 (1999)

Both teams took advantage of nature's own evolutionary laboratory. Raymond Huey of the University of Washington, Seattle, and his colleagues studied a European fruit fly, *Drosophila subobscura*, that was introduced into California some 20 years ago. As the researchers report on page 308, they found that over the south-to-north range of the flies, the insects have evolved larger wings, a change that parallels what happened to this species in Europe.

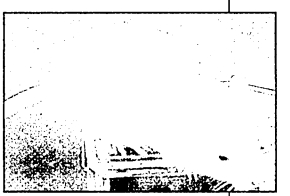
Dolph Schluter of the University of British Columbia (UBC) in Vancouver and his colleagues studied a very different species, a stickleback fish living in three isolated lakes on British Columbia's Pacific coast. In work described on page 306, the researchers report that the same two species have formed in all three lakes. Each lake contains one with hefty, bottom-dwelling individuals and one with streamlined individuals that feed in the open water. Both studies provide strong evidence confirming "the importance and strength of natural selection as the major agent of evolutionary change," says Douglas Futuyma, an evolutionary biologist at the State University of New York, Stony Brook.

Even the entomologists who first noticed the distinctively black European fruit flies in California almost 20 years ago thought this species provided an opportunity to see evolution in action. But Huey and George Gilchrist, now an evolutionary biologist at Clarkson University in Potsdam, New York, and their colleagues were the first to test whether the flies evolved the same way in the New World as they had in the old. In 1997, they collected *D. subobscura* flies from 11 spots ranging from just north of Santa Barbara, California, to north of Vancouver. The following year, Huey and Spanish colleagues trapped the flies over roughly the same range of latitudes in Europe, traversing the continent from southern Spain to the middle of Denmark.

The team then raised the different popu-

ScienceScope

Mouse Victory Following an appeal from animal rights groups, the National Institutes of Health (NIH) has agreed to scale back its use of a technique for making lab reagents—the "mouse ascites method"—which requires killing an estimated 1 million mice per year. In a policy shift, NIH says it "strongly supports" the adoption of new, in vitro approaches for making monoclonal antibodies. The ascites method involves injecting tumors into mouse abdomens and extracting antibodies with a needle. NIH did not ban the technique but promised to support a transition to in vitro methods.



"We're declaring victory," says John McArdle, a scientist now involved in animal rights work at the Alternatives Research and Development Foundation (ARDF) in Eden Prairie, Minnesota. McArdle predicts that 90% of monoclonal antibodies will be produced by in vitro methods in a short time. ARDF is the research arm of the American Anti-Vivisection Society of Jenkintown, Pennsylvania, which petitioned for this change (*Science*, 9 April 1999, p. 230).

Cyber Antidote Alarmed by rampaging computer viruses and the nation's vulnerability to hack attack, the White House is moving to beef up efforts to combat cyberterrorism. A new initiative intends to plow more funds into R&D on data security.

The plan calls for roughly $90 million in the 2001 budget; big-ticket items are $25 million for a program to lure budding cybercops into government service and $50 million for an Institute for Information Infrastructure Protection, run by the National Institute of Standards and Technology (NIST). The new shop would hand out peer-reviewed grants that "fill gaps" in the current research portfolio, which includes projects aiming to foil individuals who try to hack into corporate networks, as well as secretive work on thwarting the concerted code-cracking efforts of foreign powers. Exactly which promising areas are unfunded is still being deciphered, says Edward Roback, acting chief of NIST's computer security division. Another unknown is the response from Congress, which will consider the president's budget request later this year.

Contributors: Eliot Marshall, Jeff Mervis, Charles Seife