ed Kingdom. "A site like Gesher provides crucial information on the skills and capabilities of the earliest hominids as they came out of … Africa." During recent excavations at Gesher, stone tools such as hand axes and cleavers found in layers dated to 780,000 years ago were very similar to those at African sites of the same age. "The destruction of a site like Gesher is the destruction of a vital piece of our global heritage," Gamble says.

However, the Kinneret Drainage Authority had argued for years that it needed to dredge a stretch of the Jordan near the Gesher site to prevent regular flooding of the nearby Hula valley and its farmland. "Our main concern was to protect human life," says Aitan Sat, the drainage authority's managing director. While not disputing the dredging project's necessity in principle, officials at the Israel Antiquities Authority (IAA) had insisted that any operation must leave Gesher unharmed. Thus they were shocked late last month to find that the drainage authority had proceeded, without their knowledge, with a week of dredging in mid-December. The IAA applied for a court injunction to stop any further work, which was granted and has now been made permanent.

But it may be too late to undo the damage. According to prehistorian Na'ama Goren-Inbar of Hebrew University in Jerusalem, who has led recent excavations at Gesher, the bulldozers obliterated "several hundred meters" of the 2.5-kilometer-long site, including portions of the riverbank immediately north and south of her own 50-meter excavation. Goren-Inbar, who has visited Gesher on foot and flown over it by aircraft since the dredging took place, says that the workers left the dirt and sand in heaps by the river. "Strata which contain fossil remains, manmade stone artifacts, and a lot of organic material were all destroyed," she claims. "We will never be able to scientifically study this material because it is now out of context." Sat disputes that characterization. "They are lying about the amount of damage," he says, insisting that his crew dredged only in the river and not on the banks. Sat says that despite attempts at negotiations between his authority and the IAA, the IAA would not compromise on dredging in the Gesher area. "They were preventing me from doing my job."

Recent excavations at Gesher had only begun to tap into a wealth of exceptionally well preserved plant and animal remains, which have allowed scientists to begin reconstructing the prehistoric climatic conditions and ecology, says Goren-Inbar. Thus experts in human evolution will be lamenting the destruction for a long time to come. "Sites like Gesher are found very rarely," says Gamble. "This is not a record that should be discarded into a drainage ditch."

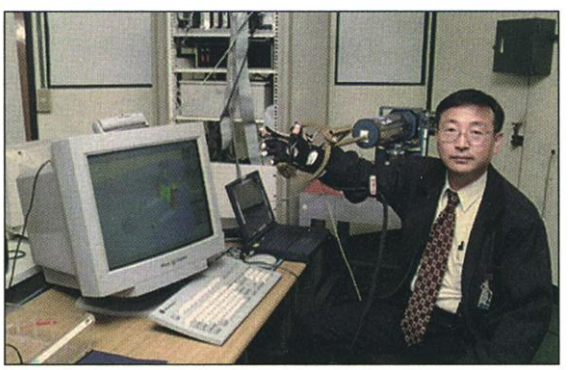
–MICHAEL BALTER

KOREA

Billion-Dollar Project Kicks Off New Century

SEOUL, SOUTH KOREA—Korean geneticist Yoo Hyang Sook is going fishing this month at the U.S. National Institutes of Health and at Washington University in St. Louis. What she hopes to hook is a few collaborators for research on the genes associated with stomach and liver cancer, the most common forms of cancer in Korea. Her project is one of the first out of the gate in a 10-year, multibillion-dollar effort to bolster Korean science.

Government officials hope the new initiative, called the 21st Century Frontier Research Program, will be more successful in generating new knowledge—and new products—than its predecessor, the Highly Advanced Research (HAN) Project that is nearing the end of its 10-year run. And requiring Yoo and other project leaders to link up with foreign researchers—as well as giving them the freedom to select those collaborators and manage the entire project—is a key element in the plan.



Roboscientist. Park Chong Ho demonstrates a cyber-glove used to operate a robot, work that will be extended in Korea's new 21st Century Frontier Research Program.

CREDIT: COURTESY PARK CHONG HO

The HAN project, begun in 1992, was supposed to be a springboard for Korea to catch up with advanced nations. (Its nickname is the "G7 project," after the group of seven countries that meet annually to discuss global economic and trade issues.) It funded 18 teams conducting research on everything from agrochemicals to nuclear fusion. Although the results have helped Korean companies to commercialize such products as high-definition television sets and 256-megabyte DRAM chips, the project fell short in other areas, including fusion and high-speed rail transportation. One of the major stumbling blocks, say officials at the Ministry of Science and Technology (MOST), was the shortage of homegrown talent. "For HAN, we thought that we could do it ourselves. [But] we found that outsourcing subprojects is better," says Yang Sung Kwang, a deputy director at MOST. That's why the 21st Century Program will include much more foreign collaboration.

The new program, which begins in stages from now until 2002, is expected to support 20 large projects at a total cost of roughly $3.5 billion. Like the HAN projects, it will be a mix of basic and applied research, but with a greater focus on environmental protection and such quality-of-life projects as improved geriatric care. Candidate areas include communications, new materials, biodiversity, molecular engineering, hydrogen power, and earthquake early warning systems. The annual budget for each new project, not yet set, is likely to mirror the average $8.7 million given to each HAN project.

The first two projects, announced in November, are Yoo's and a program led by robotics scientist Park Chong Ho to develop miniature integrated devices for medical applications and wearable computers. While Yoo is in the United States inspecting the human genome project and advances in DNA chip technology, Park will jet to Germany and Switzerland seeking assistance on everything from miniature batteries and communications components to endoscopic medical devices. His goal is to make Korea one of the top five countries in both researching and finding uses for such microsystems. "Without foreign experts, I think [that goal] is not possible," says Park.

One big difference between HAN and the new program is that a single leader will be firmly in control of each project and be given a relatively free hand to allocate resources. That's a big departure from HAN's piecemeal system, in which the central government selected and managed subprojects directly but did not hold anyone accountable for the overall direction of the research. To keep focused on their research, project leaders must sever ties with other institutions—Yoo left the Korea Research Institute of Bioscience and Biotechnology in Taejon and Park left The Korea Institute of Science and Technology in Seoul to head up their new projects—a demand not imposed on HAN scientists.

MOST will evaluate each project every 3 years, rather than annually, to reduce paperwork. But Yang says it will expect to see "visible, clear, and quantitative" evidence that project managers are accomplishing their goals. MOST officials promise that the government will pull the plug on foundering projects, but they expect some resistance in taking such measures. "That kind of competitive culture is not popular [with scientists]," says Yang about a society that places

an emphasis on saving face.

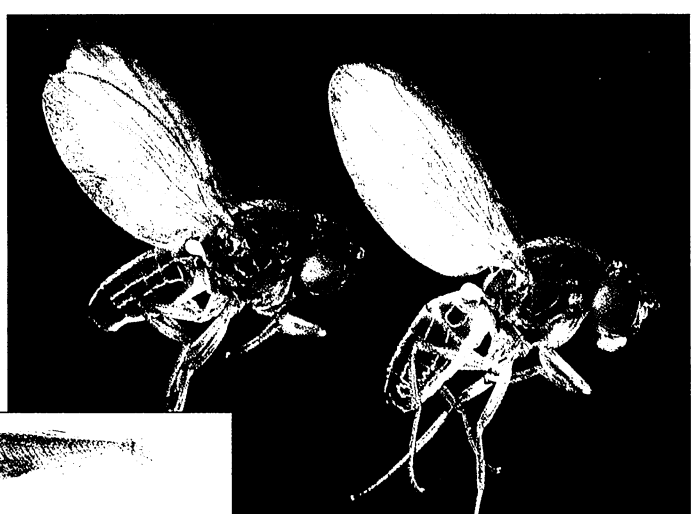
Yoo admits that her project hinges in part "on who I find" for the collaboration, a two-way street that will include training Korean students in U.S. labs. But if all goes well, she predicts, "the 21st Century Program will be a milestone [in our] leap ... to a more advanced scientific level." **–MICHAEL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

Michael Baker writes from Seoul.

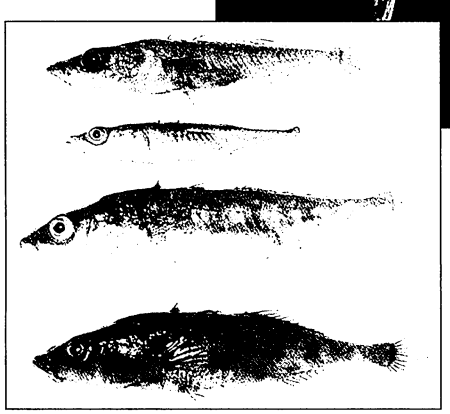
EVOLUTION

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.

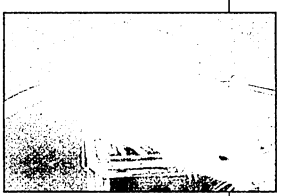
Dolph Schluter of the University of British Columbia (UBC) in Vancouver and his colleagues studied a very different species, a stickleback fish living in three isolated lakes on British Columbia's Pacific coast. In work described on page 306, the researchers report that the same two species have formed 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