



Intrepid reformer. Yang Fujia aims to start a liberal arts college featuring small classes and abundant student activities.

In the meantime, the pool of high school graduates has shrunk. The number of students taking the college entrance exam peaked at 10.5 million in 2008 and has since declined to 9 million this year. Compounding the problem is that more and more Chinese are going abroad for undergraduate studies. In the United States, the number of Chinese undergraduates enrolled in the 2010–2011 academic year was 56,976—a roughly 43% increase over the previous year, according to the Institute of International Education in New York City.

The latest reform program, which charts goals to 2020, aims to make Chinese universities more competitive. This time around, the focus is on experimenting with new colleges and universities rather than consolidating existing ones—and encouraging older universities to distinguish themselves from the pack. Institutional branding is a global notion, Postiglione says. Many midtier universities in North America have successfully carved out a distinctive character, he says, by emphasizing institutional history or areas of academic strength.

China hopes its universities can do the same. One venture here wants to distinguish itself from the start: The new Shanghai University of Science and Technology, which received education ministry approval in April to prepare for student enrollment in 2013, aims to be China's California Institute of Technology, says Jiang Biao, head of the preparatory group.

Along with piloting new homegrown institutions, the education ministry has endorsed projects spearheaded by foreign universities. Among those is NYU Shanghai, which will enroll students starting in fall 2013 and, like Yang's project, is conceived as a liberal arts college. Another is the Joint Institute, an engineering school established here by the University of Michigan, Ann Arbor, and Shanghai Jiao Tong University. The curriculum is patterned after Michigan's: In addition to core technical courses, students will be trained in ethics, creativity, and problem-solving skills. Administrators hope the Joint Institute will one day "be compared with the top 20 engineering schools in the U.S.," says Robert Parker, associate dean for academic affairs. The institute has a powerful fan. State Councilor Liu Yandong, China's highest-ranking science and education official, had a case study of the project disseminated earlier this year to other univer-

HIGHER EDUCATION

With Eye to Innovation, China Revamps Its Universities

SHANGHAI, CHINA—For nearly 2 decades, Yang Fujia has been dreaming about building a world-class university in China. His vision may at last be within reach. Yang is establishing a private liberal arts college in Tianjin, with enrollment to start, he hopes, in the fall of 2013. In crafting his new institution, the 76-year-old nuclear physicist-turned-educator, who was president of Fudan University here from 1993 to 1999, is taking cues from top Western universities. Students at the yet-to-be-named institution will live in University of Oxford-style residential colleges, attend small classes, and participate in self-organized activities. Yang also hopes to correct what he calls "the biggest problem in Chinese higher education": Most Chinese universities, he says, focus on teaching students skills rather than nurturing their personal development.

Once, such a venture would have been unthinkable in a country with a tightly controlled education system. But Yang's proposal comes at a propitious time: The Chinese government is embarking on reforms directed at turning out more creative graduates. Though the Tianjin project has yet to receive a green light from the education ministry, it has the blessing of Premier Wen Jiabao, a Tianjin native who in the spring announced that the government is encouraging the establishment of liberal arts colleges, according to Xinhua, the state news agency. Since then, Tianjin municipal government has offered 68 hectares of land for the college.

China's leaders are "interested in experimenting with new models of under-

graduate education that can help students develop their creative potential," says Jeffrey Lehman, vice chancellor of a campus that New York University is building here with East China Normal University, called NYU Shanghai. As part of a comprehensive 10-year overhaul, the education ministry is rethinking the admissions process, encouraging universities to carve out unique identities, and raising the level of basic research. A series of ministry directives earlier this year called for an increased reliance on the private sector and foreign partners to turn out more well-rounded graduates and boost China's capacity for innovation. But the reforms leave intact the Communist Party's involvement in higher education and do not relax restrictions on "thought education": required courses designed to mold students' political philosophy.

In the late 1990s, China began revamping and expanding its higher education system. Based on the notion that world-class universities are comprehensive, then-State Council Vice Premier Li Lanqing ordered the merger of specialty colleges and vocational schools into sprawling regional institutions with tens of thousands of students. Enrollment mushroomed from some 4 million undergraduates in 1999 to more than 22 million in 2010. But outside the top echelon, standards declined. "Quality can become abysmal with a breakneck pace of expansion," says Gerard A. Postiglione, an education scholar at the University of Hong Kong. In China, he says, fall-out from expansion prompted a drive toward "boosting indicators of quality."

PALEOANTHROPOLOGY

A New Face Reveals Multiple Lineages Alive at the Dawn of Our Genus *Homo*

sities to encourage them to experiment with reforms, according to Parker and others.

But the ministry faces a challenge as it targets one pillar of the system: the high-stakes 2-day university entrance exam, or *gaokao*, required by all accredited undergraduate universities and colleges in mainland China. Though critics have long blamed the *gaokao* for promoting rote learning and stifling creativity, few advocate scrapping the test altogether. Founding President Zhu Qingshi of South University of Science and Technology of China, or SUSTC, sparked criticism when he bypassed the *gaokao* to admit the first batch of students (*Science*, 8 April 2011, p. 161). Many educators say *gaokao* reform should not ditch the test but allow universities flexibility in using test results for admissions. Zhu backtracked after SUSTC received ministry accreditation, opting to consider *gaokao* scores alongside high school grades and results of the university's own test. Last week, Liu urged a newly formed panel of 26 experts to come up with a plan to reform the content and format of the *gaokao* and give universities autonomy in admissions.

Overshadowing the experiments is the question of academic freedom. The reform plan reaffirms the requirement that college students take standardized courses with titles such as "Introduction to Mao Zedong Thought" and "Deng Xiaoping Theory." Foreign degree programs may be given more leeway; Lehman says NYU Shanghai "has been assured complete academic freedom." While classroom discussions at some universities can be quite open, students still face restrictions on starting independent publications and organizations. In order to remain operational, Postiglione cautions, foreign universities with campuses in China will have "to adapt to China's version of academic freedom."

Advocating for his liberal arts college, Yang did just that. In materials he distributed to government officials, he translated parts of Yale University's Report of 1828, which argues for a broad and standardized curriculum. But he omitted a sentence from the concluding paragraph describing the need for liberal arts in a nation where "a free government gives full liberty to the human intellect to expand and operate." Whether China's ambitious education reforms achieve their underlying goal of producing innovators may ultimately be determined not by residential colleges, small classes, or research funding, but by something that cuts to the soul of the nation.

—HAO XIN

With reporting by Mara Hvistendahl.

Ever since paleoanthropologist Meave Leakey got her first look at the skull of a strange new kind of human ancestor in 1972 at Koobi Fora, Kenya, she and others have searched in vain for more members of this enigmatic species. The 2-million-year-old skull had a big brain that made it a member of our own genus *Homo*. But its long, flat face and other features distinguished it from the other two members of early *Homo* known at the time, so many researchers thought of it as a new species, *Homo rudolfensis*. But some questioned whether it was a new species or just an unusual member of *Homo habilis*, which lived 2.3 million to 1.4 million years ago. "It was always an anomaly," says Leakey, of the Turkana Basin Institute in Kenya and Stony Brook University in New York. "We always knew we had to find more of it."

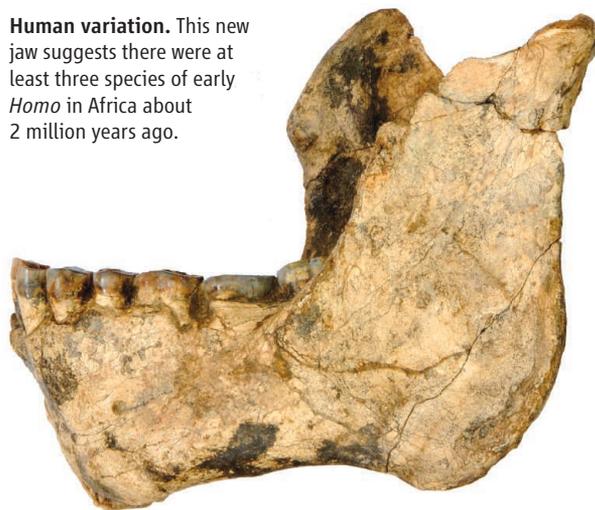
Now, after 40 years of searching, Leakey and her international team of researchers have found fossils of a face and two jawbones that they say belong to the same species as the mysterious skull of *H. rudolfensis*. Like the first find, the new fossils were unearthed at Koobi Fora on the east side of Lake Turkana. Together, they show that the original skull wasn't a "weird individual," and that a third type of early *Homo* did indeed live 1.78 million to 2.03 million years ago at Koobi Fora, says Fred Spoor of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, co-author of a paper on the specimens published this week in *Nature*. That means multiple lineages of early *Homo* lived at Koobi Fora at the same time as our direct ancestor *Homo erectus*, which lived about 1.8 million to 500,000 years ago in Africa and Asia. "This material shows there is really good evidence that there has to be *H. erectus* plus two or three other taxa," says paleoanthropologist Bernard Wood of George Washington University in Washington, D.C., who is not a co-author.

When the first small bit of jaw was found in 2007, Leakey didn't think it was particularly special. But then Elgite Lokorimudang of the Turkana Basin Institute found the well-preserved face and teeth of a juvenile protruding out of rock in 2008. This "was really exciting," Leakey says. It looked like a small

"pocket version" of the *H. rudolfensis* skull, known as KNM-ER 1470—with an unusually flat face, as opposed to the more jutting upper jaw found in *H. habilis*, Spoor says. Its small size also ruled out the older view that *H. rudolfensis* skulls were invariably larger than those of *H. habilis*.

With the discovery of a remarkably complete lower jaw in 2009, the team got its first good look at the jaw of this elusive species (1470 did not have a lower jaw). This and the new face revealed that *H. rudolfensis* had an unusual U-shaped palate, with canines fac-

Human variation. This new jaw suggests there were at least three species of early *Homo* in Africa about 2 million years ago.



ing the front of the jaw rather than aligned on the sides in a V-shaped palate, as in *H. habilis*. The new jaws also had smaller molars than expected; other flat-faced taxa, such as *Paranthropus boisei*, had huge molars. "Now we know: Having a flat face doesn't equal having big molars," Spoor says.

The new fossils were all found on the Karari Ridge of Koobi Fora, within 10 kilometers of the fossil beds where the 1470 skull was found—and within the same region where fossils of *H. habilis* and *H. erectus* have been discovered. Paleoanthropologist Timothy White of the University of California, Berkeley, warns that the new fossils could be *H. habilis* because "we still don't understand *H. habilis*." But if three species coexisted at roughly the same time and place, says paleoanthropologist William Kimbel of Arizona State University, Tempe, who is not a co-author, "we need to think about hypotheses to explain how they might have divided up their world adaptively." —ANN GIBBONS