view Letters, Canfield and his Iowa State colleagues present experimental evidence of its similarities to other intermetallics, most of which can be explained by the BCS theory. The Iowa State team found that the top superconducting temperature of MgB_2 increases by a degree when they make the material with the lighter isotope of boron, boron-10, rather than boron-11. This "isotope effect" is a classic signature of a BCS superconductor. "This does not prove it's a BCS superconductor, but it supports it," says Canfield.

Other results are bolstering that support. Another Iowa State team—this one headed by physicist Doug Finnemore—reports in another Los Alamos preprint that other standard tests done on MgB_2, which track the way materials conduct heat and behave in a magnetic field, show that the material's behavior closely resembles that of Nb_3Sn, a popular intermetallic superconductor. And both Finnemore's team and one headed by David Larbalestier at the University of Wisconsin, Madison, report that MgB_2 can transport large electrical currents between separate grains in the powdery material, again a behavior similar to Nb_3Sn.

Still, not everyone is ready to call off the hounds. For BCS theory, says Hirsch, MgB_2 is "a big outlier," and it's not clear what makes its electron pairs stick together at such a high temperature.

No matter what the mechanism, MgB_2 could generate an even greater buzz in the real world. Despite the hype that accompanied the earlier high-temperature superconductors, low-temperature metallic superconductors continue to dominate the applications arena, because these materials can be fashioned into wires that carry large currents. Among the metallic superconductors, niobium-based superconductors reign supreme, because wires made from it are durable and can carry huge electrical currents. Yet niobium is expensive, whereas magnesium and boron are cheap.

Last week, Canfield and another team posted another preprint reporting that they've already made MgB_2 wire filaments that superconduct up to 39 K. As a result, magnesium diboride could find itself the superconductor of choice for a wide range of applications, such as the wires that make up the high-field magnets in magnetic resonance imaging (MRI) machines. That could make this newcomer far more useful than its high-temperature cousins. **–ROBERT F. SERVICE**

CHINESE ACADEMY OF SCIENCES

In China, Publish or Perish Is Becoming the New Reality

A new program is funneling money and resources to a chosen few who are found to be highly productive—but at the expense mainly of older researchers

BEIJING—Being one of the chosen is paying off for Wu Xiangping. The 39-year-old astrophysicist at the Beijing Astronomical Observatory (BAO) received a fivefold boost in pay last year for his theoretical work on the existence and function of dark matter, which is funded by three government agencies. He also secured a long-term, renewable contract as a team leader and the authority to pick the rest of his research group.

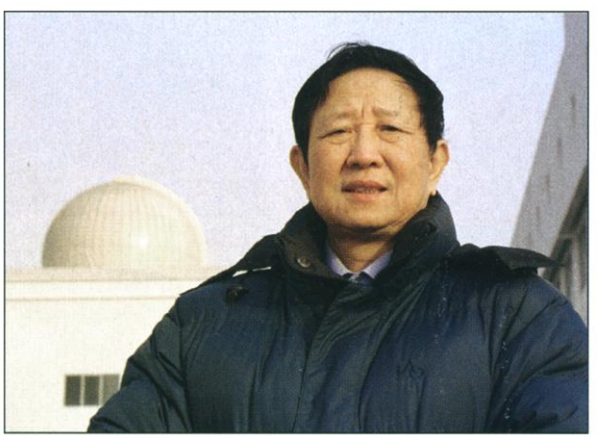
Things haven't worked out so well for a colleague, Li Xiaocong, who went through the same review that boosted Wu's salary and status. Two years ago, the 52-year-old researcher was forced to retire from the observatory's solar activities forecasting group and take a job at another institution that doesn't make use of her scientific skills. However, she's working on a paper that she hopes will restore her to the job she loves.

Wu and Li are two of the 305 scientists at BAO who have been through the first phase of a decade-long self-improvement regimen at BAO's parent body, the Chinese Academy of Sciences (CAS). Launched in 1998, the Knowledge Innovation Program (KIP) is the academy's attempt to tame a sprawling empire of 123 institutes that for almost 50 years provided not just jobs but a lifetime social support system for its 40,000-member workforce. That cradle-to-grave approach became an anachronism as China moved toward a market economy, leading CAS President Lu Yongxiang to order institutes to shrink their workforces, shed their nonscientific functions, eliminate unproductive research programs, and focus on their best scientists, including luring back those from overseas (*Science*, 30 January 1998, p. 649).

The shake-up is doing exactly what it set out to do: Create a cadre of elite researchers like Wu by channeling new funding to a chosen few. The first phase of the reforms has led to a 50% cut in staff at 76 targeted institutes. The second phase aims at a slimmed-down CAS of 20,000 researchers spread across 80 institutes. And it doesn't end there: KIP has also enshrined the principle of ongoing performance reviews, with the lowest performers—especially those older than 50—getting the boot. At the same time, some scientists complain that the quantitative measures being applied are too rigid to span all types of scientific activity.

A key element in the reform is the government's promise to spend more on those who are the most productive. CAS has allocated nearly $600 million for phase I, a sharp increase over previous spending rates, and has budgeted $1.2 billion over 10 years, a figure that could grow. The support has meant an extra $15,000 per researcher, a princely sum. With one-quarter going for salaries, scientists in the program can earn three to four times more than co-workers not chosen for KIP. (Under the reform, some CAS researchers have kept their jobs and receive small amounts of money from their institutes' regular research budgets but nothing from KIP.)

In addition to selecting for quality, CAS hopes to deepen the talent pool by bringing in more young scientists. By 2005, the academy plans to create positions for 20,000 graduate students and 5000 postdocs and visiting scholars. That would be a big jump from current levels of 12,000 graduate students and 1500 visiting scholars. It also plans to invite 500 outstanding young scientists from abroad to work as long-term CAS employees. If deemed a success, the approach is likely to be copied by other scientific institutions, universities, and high-tech businesses.



Triage. BAO's Ai Guoxing trimmed his staff based on productivity; age was also a factor.

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The chosen

Although CAS determines the overall guidelines that each institute must follow, individual institute directors have great leeway in implementing the reforms. Most

use some form of objective review, combined with age guidelines.

For instance, officials at a key national lab of the Institute of Zoology in Beijing began annual evaluations of staff based on the number of projects worked on, research grants obtained, international conferences and collaborations, students being advised, and papers published in Chinese and foreign journals tracked by the *Science Citation Index* (*SCI*). The last, a compilation of the Institute for Scientific Information in Philadelphia, is seen as an external measure of quality. "This system can help us judge a researcher's work more objectively and fairly," says Li Dianmo, the lab's director. Li says it's also the best way to determine future eligibility. "Only half of us can be chosen each year," he notes about a process that now involves annual reviews.

Power of the pen. Li Xiaocong hopes that publishing a paper may help her rejoin BAO's solar program.

Some 60% of the 10,000 "chosen" scientists are 45 years of age or younger, the average age that CAS has set for a research group. However, there are exceptions. At the Institute of Geography and Resource Science in Beijing, for example, senior scientists still play a prominent role, because geography is a "science [that] needs experience and accumulation," says Liu Jiyuan, head of the institute. A select group, mainly CAS academicians and tutors of doctoral students, are no longer on the official job rolls but serve as consultants to young and middle-aged scientists on research projects.

That's not the case at BAO, after Director Ai Guoxing decided that no one over the age of 50 could be chosen for KIP. Ai went even further, sorting researchers not chosen for KIP (about 150) into three categories. "The first group [of 30] is still involved in scientific research but does not benefit from the program funding," he says. "The second group [of 80] went to companies opened by the BAO to do product development and sales promotion. The third group [of 40], all above 50 years old, were asked to retire, and now they receive a pension."

Zhu Cuilian, a middle-aged woman who works in the "solar activity forecasting" research group at BAO, fell into the first category. She and one other researcher do the work of five people previously in her group. Her workload has increased, she says: "My colleague and I take turns doing the forecasting on weekends and holidays."

Whereas Zhu accepts the emphasis on youth—"I know that young people should be the main force of the Knowledge Innovation Program, and I am no longer young"—the transition has been much harder for Li Xiaocong. "I was worried about my living conditions when I was asked to retire," says Li, whose husband was laid off at about the same time from a state-owned enterprise. "I loved my job, and I need money to support my son, who just entered the university." Li says that there are many people like her who wanted to keep their jobs and did not feel old enough to retire.

Li, who receives a pension from BAO amounting to 80% of her former salary, has since found a temporary job elsewhere that does not make use of her astronomy training. But she harbors hopes of returning to BAO and knows that a new publication will greatly improve her chances of passing the next review. Toward that goal, she spends her spare time preparing one of her papers for publication in an *SCI* journal.

In contrast, KIP has been a real career builder for Wu. His pay jumped from $250 to $1250 a month after he won a CAS first prize for scientific findings and for publishing a paper in *The Astrophysical Journal Letters*. Each year he also receives $12,000 in research money from a state high-technology program and $25,000 from the National Committee for Natural Sciences fund, in addition to $55,000 from KIP.

Wu also can choose the members of his research group, which now includes three postgraduate students and a longtime assistant, and can set their pay based on the number of papers published and any awards received. He is one of only two people in the group to receive a long-term BAO employment contract, which runs for 3 years and is renewable after a review. Even those with less stellar achievements are doing well. The salaries of employees selected for the program have gone from $150 to $475 a month, whereas the rest have received only small increases.

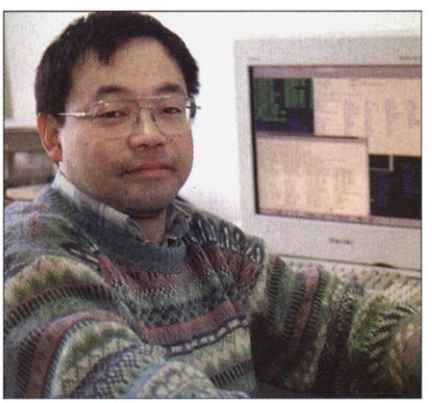
The publishing incentives—ranging from $240 to $1200, depending on the journal's reputation—have also worked, says Ai. The number of *SCI*-quality papers by BAO researchers has risen from 25 in 1998 to more than 70 last year. Even his students are part of the paper chase: They must publish four *SCI* papers before they are allowed to graduate, Ai says, and nobody has let him down.

More than money

Not all scientists agree with the use of financial incentives to spur productivity. "I believe that many people choose science as their career because they love to do it" and not because of monetary rewards, says Yuan Yaxiang, vice president of the Academy of Mathematics and System Sciences and director of the Institute of Computation Mathematics and Scientific Engineering Computing. A better way to evaluate a scientist, he says, is to solicit judgments about the work every few years from a group of outside experts.

Some young scientists agree with Yuan. The 36-year-old Zhang Dexing, who just returned from the United Kingdom to head a biological lab at the zoology institute, says that quantity isn't everything. Sometimes, he notes, he might go 2 years collecting specimens and carrying out the necessary analyses before he can prepare a paper.

But other scientists see "more papers, more bonus" as an appropriate policy for a transition period. "We did not have a rational evaluation system for basic research in the past, and there were some people who did not work hard," says Wang Huaning, a principal investigator at BAO. At least the number of papers published and citation rates track what a researcher has been doing, he says.



Star power. Astrophysicist Wu Xiangping has gotten raises and bigger research budgets based on papers in leading publications.

The bonuses also allow the authorities to reward talented researchers who might be tempted to go abroad to snare a higher salary. "All we have done is to build an environment for scientific research that is on a par with the world's advanced level," says Bai Chunli, vice president of CAS. "Modern research and development is actually a war for more talented people," he adds. "We are determined to win the war, with the help of the Knowledge Innovation Program."

–DING YIMIN

Ding Yimin writes for *China Features* in Beijing.

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