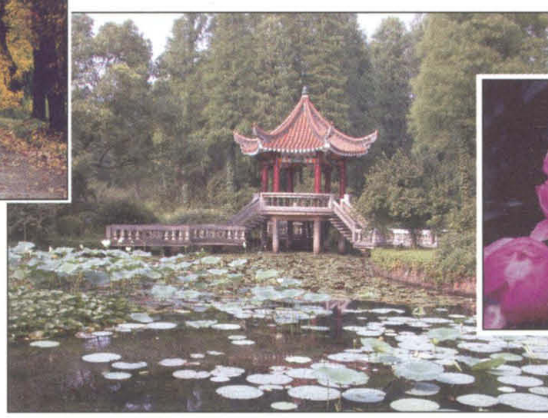
Conserving Native Plants in China

THE CHINESE ACADEMY OF SCIENCES (CAS) has established a comprehensively planned, geographically structured, ex situ conservation program to address conservation of China's indigenous plant species. China's estimated 31,000 species of vascular plants make up ~10% of the world's total; they are the living remnants of the early Miocene (15 million years ago) floras of the whole North Temperate regions and are the sources of numerous crops and of medicinal and horticultural plants. They are greatly threatened by the increasing demands of China's huge population for improved standards of living.

The conservation of plant diversity around the world is of fundamental importance for the future of humankind, because of the significance of individual plant species and the communities and ecosystems they make up for the establishment of global stability. For this reason, a Global Plant Conservation Strategy was adopted by the parties to the Convention on Biological Diversity earlier this year. It highlights the importance of a well-established information base on plants for conservation efforts generally and provides a strategy for preserving the estimated 300,000 to 425,000 species of vascular plants both in nature (in situ preservation) and in botanical gardens and seed banks (ex situ preservation) (*1–3*). The rapid decline of many critical ecosystems around the world, even when they have been included in parks, reserves, and other protected areas, must be strongly resisted (*4–6*). Conservation efforts must be strengthened, especially in view of our inadequate knowledge of many groups of organisms, because in situ preservation is able to protect the unknown along with the known.

In China, the situation is particularly critical because of the demands of a very large population. An example of the difficulties of in situ preservation is presented by the well-known Wolong Nature Reserve, established in 1975 for the protection of the endangered giant panda, with major financial support from the Chinese government and conservation organizations worldwide (*5*). Lessons learned at Wolong and other similar areas in China compel us to examine ex situ alternatives for the preservation of species (*7, 8*), because diverse habitats and biological diversity continue to be lost rapidly in nature. Ex situ conservation must not be overlooked, because many species cannot survive in nature given expanding human pressures.

To manage China's ex situ program of plant conservation more efficiently, the CAS has rigorously evaluated the collections and programs of its 12 botanical gardens. These 12 institutions serve as leaders in conservation, research, and public education for ~140 Chinese gardens, many of which are located in city parks or serve as tourist attractions in addition to their roles in plant conservation and scientific studies (*9*).



(Left) Beautiful sweetgum (*Liquidambar formosana*) at the Kunming Botanical Garden. (Middle) An aquatic garden at the Wuhan Botanical Garden. (Right) "Silver needle" peonies (*Paeonia lactiflora*) at the Beijing Botanical Garden.

The Academy has drafted a 15-year master plan to guide the overall program of conserving China's indigenous species. The first 5-year period of this plan is now being implemented. It has five goals: (i) to increase the number of Chinese species represented in the 12 CAS botanical gardens from ~13,000 species to ~21,000, which would be more than two-thirds of China's indigenous species; (ii) to enhance or establish botanical garden collections for the ~500 plant species considered rare and endangered; (iii) to create five regional gardens to be maintained as complex communities mirroring neighboring ecosystems, to improve the chances of survival of additional species of plants; (iv) to establish an information network among the gardens; and (v) to improve horticultural and landscaping architecture of the gardens.

The five regions in which these new gardens will be established are the North China temperate and plain forest; the Yangtze River regional aquatic flora (east-central China); the subtropical monsoon evergreen broad-leaved forest (South China); tropical rainforest (southwest China); and the south-central China Henduan mountain flora. The initial 5-year plan is also addressing one of the historical drawbacks of botanical garden collections by aggressively increasing the genetic diversity of the samples of living plants present in the collections.

The CAS will also establish nine specialized gardens and acquire and renovate 15 existing ones as special collections for the conservation of plants from areas of particular interest, such as the plants of the karst region. In addition, there will be special collections of the useful plants of China, such as one for medicinal plants at the Kunming Institute of Botany.

Although many challenges remain, the first one is to identify and forcibly address the missing components of our global conservation needs. We are attempting to do this, and we enthusiastically invite comments, insights, and participation from the world scientific community.

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CREDIT: (LEFT TO RIGHT) KUNMING INSTITUTE OF BOTANY; WUHAN INSTITUTE OF BOTANY; INSTITUTE OF BOTANY

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A Historical View of Nonsense Triplets

MEMOIRS ARE A TRICKY LITERARY GENRE, EVEN for towering figures such as Sydney Brenner (*1*) ("A scientific kokopelli," B. Edgar, Books *et al.*, 7 Dec., p. 2103). His accomplishments are so extensive that a small correction of the record on nonsense triplets and their suppressor genes might be excused as a concession to the historical accuracy and completeness that Sydney espouses. He summarizes the entire history of nonsense triplets as follows: "And so putting all this together I worked out that the most likely sequence for the three nonsense codons was UAG, UAA and UGA." And later, "I've had many different kinds of achievement… And the two things here are the triplet nature of the genetic code and the decoding of suppression triplets." In this case, Sydney has swept too much under the carpet with his "Occam's broom."

In our rash youth, Sydney and I competed in a dash to identify nonsense triplets that acted as translation-terminating signals in the genetic code and the suppressor genes that enabled nonsense triplets to become sense triplets (*2*). The existence of nonsense triplets was first deduced in 1962 from the experiments of Benzer and Champe on the rII genes of coliphage T4 (*3*) and the experiments of Obaid Siddiqi and myself on the alkaline phosphatase gene of *Escherichia coli* (*4*). Direct evidence that nonsense triplets generated truncated protein fragments was first reported by Sydney's laboratory for coliphage T4 (*5*) and later for coliphage f2 (*6*), beta-galactosidase (*7*), and alkaline phosphatase (*8*). To identify the three nonsense triplets indicated by the patterns of nonsense suppression (*9*), Sydney's laboratory and mine chose different approaches, which had to be indirect because DNA sequencing methods were still in the future. Sydney and his colleagues chose to analyze specific base changes in T4 DNA generated by chemical mutagenesis, while Martin Weigert and I chose to analyze amino acid changes in revertants of alkaline phosphatase nonsense mutants and to deduce the nonsense triplet from the sequence relationships of the revertant codons. The first nonsense triplet identified was UAG (*10*, *11*). The remaining nonsense triplets, UAA and UGA, were identified by Sydney's laboratory (*11*, *12*) and mine (*9*, *13*), using our respective approaches.

The next goal was to identify suppressor genes for nonsense triplets. Active suppressor genes, called Su+, enable a cell to translate a nonsense triplet and thereby reverse the premature termination effect of the triplet on translation (*3–5*). Sydney's laboratory and mine identified and mapped several suppressor genes for the nonsense triplets (*14–17*). The search for the amino acids incorporated into the nonsense sites of a protein by the Su+ genes occupied several years, culminating in the identification of the amino acids associated with all of the known Su+ genes for the three nonsense triplets (*17–27*).

For those who wish to delve further into this chapter of early molecular genetics, my review, written while memories were fresh (*2*), might serve as a counterbalance to Sydney's remembrances of things long past. His memoir remains a fitting tribute to a remarkable protean scientist and colleague.

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Wetware Problem, Not a Software Problem

THE TITLE OF THE ARTICLE "SOFTWARE GLITCH threw off mortality estimates" (News of the Week, J. Kaiser, 14 June, p. 1945) is misleading. There was no software glitch involved—the tool worked exactly as specified. The scientists overestimated the risks of fine particles in the air because they specified incorrect parameters for the algorithm. That the scientists misused their tool is not the fault of the tool. This is a blunder on the part of the scientists, not the software.

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CORRECTIONS AND CLARIFICATIONS

NEWS FOCUS: "The battery: not yet a terminal case" by J. Alper (17 May, p. 1224). The name of one of Quallion's collaborators in developing a new solid polymer electrolyte battery was omitted from this article. Argonne National Laboratory is also taking part in the research.

NEWS OF THE WEEK: "U.S. science academy elects new members" (10 May, p. 1001). In the list of new foreign members elected to the U.S. National Academy of Sciences, countries printed in parenthesis indicate the nationality of each newly elected member, not the country in which the individual's current institution is located.

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.