

■ 主编 张志和 Editor-in-chief Zhang Zhihe

Progress in Ex-situ

# Giant Panda Research

## 圈养大熊猫

## 研究进展



四川出版集团 四川科学技术出版社

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Research

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献给保护和热爱大熊猫的人们

*To people who love and devote themselves to giant panda conservation*

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# 前言

成都大熊猫繁育研究基地是在国家建设部、国家林业局和财政部等单位的支持下，经成都市委、市政府批准，于1987年春天在成都的北郊揭开建设的序幕。从第一锹土埋下圈养大熊猫保护的种子开始，从此熊猫基地就肩负起了圈养大熊猫保护和繁衍的历史使命。20年的历程，20年的艰辛，基地人始终用大量的汗水浇灌着大熊猫保护事业的大树。基地围绕着大熊猫等珍稀濒危动物的科研、繁育、公众教育、教育旅游以及大熊猫文化品牌打造等工作，展开了富有创新性的劳动。通过努力，目前基地已成为世界瞩目的集大熊猫科研繁殖、公众教育和教育旅游为一体的研究机构和最佳旅游的目的地。

20年来，基地紧紧围绕大熊猫的疾病防治、饲养管理、繁殖育幼、营养、生殖内分泌和保护遗传学等多方面开展了广泛的科学研究，先后取得59项国家和省、市级科研成果。正是通过“大熊猫双胞胎育幼研究”、“大熊猫人工授精技术的研究”和“大熊猫DNA指纹探针研究及DNA提取方法的建立”等重大科技成果的转化应用，以20世纪80年代抢救野外受灾留下的6只病、饿大熊猫为基础，先后繁殖大熊猫82胎120仔，建立了现存数量达67只的全球最大的圈养大熊猫人工繁殖种群。成都大熊猫繁育研究基地因在大熊猫科研繁育、环境保护等多方面所做的努力而先后两次获得联合国环境规划署授予的“全球500佳”称号，还获得了“中华绿色科技金奖”、“首届中华环境奖”等多项殊荣。

在推进大熊猫繁育的同时，基地在科研基础的软硬件建设层次方面也逐渐得以提高。1997年由国家计委、成都市计委和成都大熊猫繁育研究基金会共同资助下建立了开放实验室。2001年12月国家科技部、四川省科技厅正式命名该实验室为“濒危动物繁殖与保护遗传四川省重点实验室”；2007年被国家科技部正式批准成为“四川省濒危野生动物保护生物学重点实验室——省部共建国家重点实验室培育基地”。实验室聚集了多年培养的包括国家级专家、省市拔尖人才在内的高中级专业技术人才40多人，研究领

域覆盖繁殖生物学、保护遗传学、兽医学、营养学和生殖内分泌学等多个学科。先后承担了国家重大基础研究前期研究专项（前 973）1 项、国家“十五”高新技术研究（863 计划）项目 1 项以及多项省、部、市级科研项目和成都大熊猫繁育研究基金会科研项目、国际合作项目。2003 年，基地被四川省委、省政府授予“四川省人才开发先进单位”和国家人事部授予的全国“博士后科研工作站”。

成都大熊猫繁育研究基地极为重视公众教育工作，把开展生态保护为主的科普教育，作为一项主要社会职能。以大熊猫活体和环境展示、大熊猫博物馆、熊猫魅力剧场和互联网站宣传等为载体，开展了形式多样的生态保护教育活动。不失时机地向来自世界各国的嘉宾、游客、广大中小学生传播着生态保护的最新知识和理念。近几年来，积极接待国内外中小学生，培训志愿者，并走进各大专院校、社区、中小学、幼儿园、自然保护区宣讲和传播野生动物保护与环境教育知识理念。因其突出贡献和科普教育软硬件的不断改进，被评选为“全国科普教育基地”、“全国青少年科技活动示范基地”。

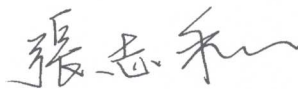
在国家外交部、国家建设部、国家林业局及中国动物园协会、中国野生动物保护协会、四川省林业厅等部门的协调下，基地与国际自然联盟、世界野生生物基金会等保护组织及美国、英国、日本、荷兰等国家的动物园和研究机构建立了长期合作关系，已建立和形成了广泛的国际研究网络平台。成都大熊猫繁育研究基地先后与日本、韩国、美国和西班牙等 8 个国家开展了大熊猫合作与研究，通过引进技术、项目、资金和人才，极大地推动了我国濒危野生动物的保护研究工作。同时，也为加强对外交往、增进国际友谊、传播中华文化、打造城市形象和提升城市知名度发挥了特殊而重要的作用。

随着基地在大熊猫科研繁育、科普教育事业的不断发展壮大和知名度的提高，基地按照一流景区和国际接待标准，不断开展旅游的优质服务。通过近 3 年努力，2006 年基地被国家旅游局正式授予“国家 AAAA 级景区”，游客持续成倍增长，门票旅游收入有了较大幅度提高，为实现基地大熊猫保护繁育科研的可持续发展打下了坚实基础。

基地在各个层面、各个领域获得了长足进步，特别是科学技术的进步。从 1980 年采用大熊猫冷冻精液人工授精产子、大熊猫出血性结肠炎的防治到 1990 年双胞胎大熊猫育幼技术突破、1999 年利用 DNA 指纹探针和微卫星技术进行大熊猫亲子鉴定等技术首创，为全国圈养大熊猫种群数量的迅速增加起到了决定性的推动作用。能够做出如此重大的贡献、能够获得今天这么巨大的成就，这与广大科技人员的辛勤耕耘是分不开的。为了进一步实现大熊猫保护的可持续发展，为圈养大熊猫提供良好的野化训练场所和优质的适应性过渡放养条件，基地目前正在向市政府申请建立“成都大熊猫繁殖野化放养研究中心”项目，以实现大熊猫最终放归大自然。

在基地成立 20 周年之际，我们高兴地把 97 年以来科技人员的论文收录编辑成为《圈养大熊猫研究进展》一书，以见证成都大熊猫繁育研究基地在圈养大熊猫保护方面做出的努力，也见证这 20 年的辉煌历史。

在今后的大熊猫保护和繁育科研工作中，我们将肩负起历史的重任，一如既往、求实创新、勤奋努力，把成都大熊猫繁育研究基地建设成为世界一流的科研繁育中心、世界一流的科普教育中心、世界一流的生态旅游中心。



张志和 博士  
成都大熊猫繁育研究基地主任  
2007 年 10 月 30 日



# Preface

With support from the State Ministry of Construction, the State Forestry Administration and the State Ministry of Finance, approval from the Party's Chengdu Committee and the Chengdu municipal government, the Chengdu Research Base of Giant Panda Breeding was established in the northern suburb of Chengdu in the spring of 1987. Since its inception, the Chengdu Panda Base has been dedicated to captive giant panda conservation and breeding. The staff of the Panda Base have worked hard for more than 20 years on panda conservation. The Chengdu Panda Base is committed to research, breeding, conservation education, educational tourism on giant pandas and other endangered animals, as well as building a better image for giant pandas. Thanks to the great efforts our staff have made, the Panda Base has become a well-known giant panda breeding research center, conservation education institution and educational tourism destination.

For more than 20 years, the Chengdu Panda Base has been studying all aspects of giant panda breeding. These include disease prevention, husbandry, reproduction, rearing of cubs, nutrition, endocrinology and conservation genetics. The Chengdu Panda Base has received 59 awards of scientific achievement from the Chinese State Government, Sichuan Provincial Government and Chengdu Municipal Government. Through the achievements and application of giant panda twins rearing research, giant panda artificial insemination research and development of the DNA fingerprinting probes and the methods to extract DNA from giant pandas, 120 giant panda cubs have been born to our base in 82 litters from 6 original sick and starved pandas rescued from the wild in the 1980s. Today, our captive population has increased to 67 individuals, making it the most successful captive-bred population in the world. We are proud of the fact that since the first six panda were rescued from the wild to found the Chengdu Panda Base, we have not removed any further giant pandas from their natural habitat. Because of our efforts and high levels of giant panda breeding research and conservation, we have been awarded with the "Global 500" by the United Nations Environment Program twice. We have also received the "Green Medal of Chinese Green Science and Technology" and the "China Environment Nomination Prize".

As we work on giant panda breeding programs, the Panda Base has also made great progress in infrastructure. In 1997, with support from the State Planning Commission, the Chengdu Municipal Planning Commission and the Chengdu Giant Panda Breeding Research Foundation, an open laboratory was established. In December of 2001, the laboratory was named the "Key Laboratory for Reproduction and Conservation Genetics of Endangered Wildlife of Sichuan Province" by the State Ministry of Science and Technology and the Sichuan Provincial Science and Technology Commission. In 2007, it was named the "Key Laboratory for Conservation Biology of Endangered Wildlife of Sichuan Province (developmental status for a State key laboratory in a joint venture between the Ministry of Science and Technology of P.R.C and Sichuan Province)" by the State Ministry of Science and Technology. More than 40 researchers, including State-level experts and provincial and municipal talents work for the laboratory in reproductive biology, conservation genetics, veterinary medicine, nutrition, and reproductive endocrinology. The laboratory has undertaken projects for the Key Project of Chinese National Programs for Fundamental Research and Development (973 Program), the State Plan for High-Tech Research and Development (863 Plan). Further Panda Base research projects are sponsored by the provincial, ministerial and municipal governments, the Chengdu Giant Panda Breeding Research Foundation, and other international collaborative programs. In 2003, it received the "Sichuan Provincial Talents Development Advanced Units" award from the Sichuan provincial committee of the Communist Party of China and the Sichuan provincial government, and the "post-doctoral mobile working station" award from the State Ministry of Personnel.

The Chengdu Panda Base also attaches great importance to conservation education and the development of a public education as responsibility. We have conducted a variety of conservation education programs via many kinds of exhibitions at the Panda Base, including real pandas and their enclosures, our museum, panda story cinema, and our website. We miss no opportunity to distribute



conservation messages to visitors who come from all over the world. In recent years, we have carried out programs for middle school and primary school students both at home and abroad; we train volunteers; we bring programs and presentations to universities, kindergartens, communities and nature reserves to convey the idea of wildlife and environmental conservation. Because of the outstanding facilities and great progress we have made, the Panda Base has been named the “National Conservation Education Base” and the “National Youth scientific and technological activity Base”.

Under the co-ordination of the Ministry of Foreign Affairs, the Ministry of Construction, the State Forestry Administration, the Chinese Association of Zoological Gardens, the Chinese Wildlife Conservation Association and the Sichuan Provincial Forestry Department, the Panda Base has built up an international research platform and established long-term cooperative relations with the International Union for the Conservation of Nature and Natural Resources (IUCN), the World Wildlife Fund (WWF), and other zoos and research institutions in the United States, United Kingdom, Japan, Holland, and elsewhere. The Chengdu Research Base of Giant Panda Breeding has collaborative giant panda research programs with 8 foreign countries, including Japan, Korea, the U.S., and Spain. We have provided a strong impetus to wildlife conservation research by importing advanced technology, projects and talents. We have also made great efforts in continuing collaborations and communications with international scientists and experts. Furthermore, we promote international friendship, Chinese culture, and a positive image for Chengdu. As a result, Chengdu has become increasingly well-known & influential.

As our breeding and education programs grow stronger and our Panda Base becomes more and more famous, the Panda Base will do its best to provide visitors good service as accords with any first-class international destination standard. Through our efforts over the last 3 years, our Panda Base was named the “National AAAA Tourism Attraction” in 2006 by the State Tourism Administration. More and more visitors come to visit the Panda Base. While the admission price has increased, this provides great support to the sustainable development of the breeding, research and conservation for giant pandas at the Panda Base.

Great progress has been made in many fields in the Panda Base, especially in science and technology. In 1980, our scientists successfully inseminated giant pandas with frozen semen and developed a successful treatment and prevention strategy of hemorrhagic enteritis. In 1990, a new hand-rearing technique for twins was developed at Panda Base. In 1999, DNA fingerprinting probes and micro-satellite technology was first used to study genetics of giant pandas at the Panda Base. The Panda Base has played an active and driving role in the growth of the captive giant panda population. Recognition for the achievements belongs to our scientists and researchers who have worked so hard. To improve the sustainable development of giant panda conservation and establish a reintroduction training centre, the Panda Base is applying for a new project - the “Chengdu Research Centre of Giant Panda Reintroduction” to the municipal government. We hope to reintroduce giant pandas back to the wild with this project.

At this, the 20th anniversary of our Panda Base’s establishment, we are so happy to edit this book -- *Progress in Ex-situ Giant Panda Research*, which includes many scientific articles about pandas since year of 1997. This book will be a witness to all the contributions and achievements in captive giant panda conservation the Chengdu Research Base of Giant Panda Breeding has made in the last 20 years.

We will shoulder the monumental responsibility of giant panda conservation and breeding, working hard as we always have. With continued hard work and innovations, the Chengdu Research Base of Giant Panda Breeding will become a world-class breeding research centre, a world-class conservation education centre, and eco-tourism centre.

Dr. Zhang Zhihe  
Director of Chengdu Research Base of Giant Panda Breeding  
Oct. 30<sup>th</sup>, 2007



1987年，成都市市长胡懋洲为成都大熊猫繁育研究基地建设奠基

In 1987, the former mayor of Chengdu, Hu Maozhou, at the foundation ceremony of Chengdu Research Base of Giant Panda Breeding.



成都市委、市政府领导亲临熊猫基地研讨建设规划

The leaders of the Chengdu Municipal Party Committee and the Chengdu municipal government are discussing plans for construction of the Chengdu Panda Base.



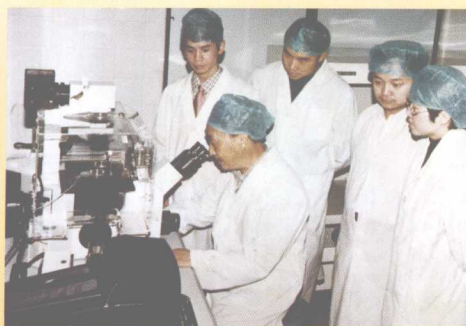
建设初期的熊猫基地

The Panda Base during initial construction



艰苦创业的两代科技人员

Two generations of hard working scientific and technical staff





# 圈养大熊猫研究进展

Progress in Ex-situ Giant Panda Research



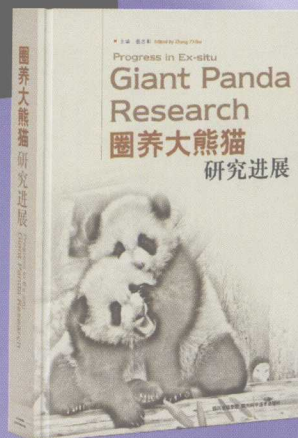
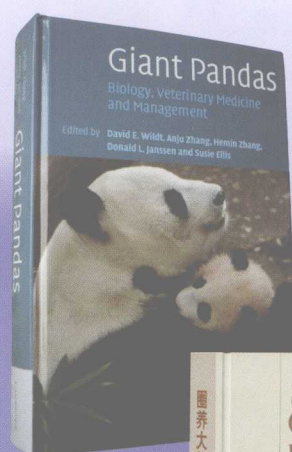
国内外研究员在实验室工作

Scientists conducting research in the laboratory of the Chengdu Panda Base



科研成果的汇集

Publications of the Chengdu Panda Base



世界上最大的大熊猫基因库

The Chengdu Panda Base holds the largest giant panda sperm bank in the world



“濒危动物繁殖与保护遗传四川省重点实验室”挂牌典礼  
Naming ceremony for the Key Laboratory for Reproduction and Conservation Genetics of Endangered Species of Sichuan Province.



“大熊猫细胞库的建立”论证会  
Scientists meet to discuss the establishment of a giant panda cell bank at the Chengdu Panda Base



中外专家合作开展大熊猫体检  
Chinese and foreign experts conduct comprehensive veterinary examinations of giant pandas at the Chengdu Panda Base.



大熊猫繁育技术委员会年会  
Annual meeting of the Chinese Committee of Breeding Techniques for Giant Pandas at the Chengdu Panda Base.



学术研讨会  
Academic Workshop



# 圈养大熊猫研究进展

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2006年是基地大熊猫繁育创记录的一年  
2006, a banner year for giant panda captive breeding at the Panda Base. There were 12 cubs born this year.



初生体重最轻的51克幼仔成活  
"51g", the smallest infant panda known to survive.



1980年, 首次采用冷冻精液产下人工授精大熊猫“蓉生”

In 1980, panda Rong Sheng was the first panda in the world born from artificial insemination with frozen sperm.



1990年, 世界首例双胞胎繁育成活  
In 1990, the first pair of giant panda twins were successfully hand-raised.

## 繁殖成就

Reproduction Accomplishments





夏令营活动  
Summer camp



生态保护教育推广项目启动仪式  
Opening ceremony for cooperative conservation education programs at the Chengdu Panda Base.



大熊猫走进日本未来科学馆  
Giant Panda exhibit at the Japanese National Museum of Emerging Science and Innovation.



熊猫基地外国教育专家赛娜·贝克索博士在幼儿园开展环境教育活动  
American Conservation Education expert Dr. Sarah Bexell conducting a Chengdu Panda Base education activity in a Chengdu kindergarten.



# 圈养大熊猫研究进展

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2002年，成都市市长李春城陪同联合国副秘书长克劳斯·特普费尔博士和国家环保局局长解振华视察成都熊猫基地

In 2002, United Nations Under Secretary-General, Dr. Klaus Toepfer Visited the Chengdu Panda Base, in the company of the mayor of Chengdu City, Li Chuncheng.



美国前副国务卿佐利克拥抱熊猫

A special moment between United States former Deputy Secretary of State, Robert Zoellick and a panda cub.







2006年5月，国务院副总理吴仪视察成都熊猫基地  
In May 2006, the Vice-Premier of State Council, Wu Yi visited the Chengdu Panda Base.



关爱大熊猫保护教育活动  
Panda Conservation Education program at Chengdu Panda Base.



# 圈养大熊猫研究进展

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美丽的天鹅湖  
Beautiful Swan Lake



熊猫基地新建博物馆  
The new panda museum



熊猫基地新建研究中心  
The new research center



熊猫基地三期工程规划图  
Planning for the third expansion phase