XTBG

Annual Report 2017

Xishuangbanna Tropical Botanical Garden
Chinese Academy of Sciences

Cover photos, anti-clockwise:

1. The Hengduan Mountains flora assembled disproportionately by in situ diversification;
2. ATBC-Asia Pacific Chapter Meeting 2017;
3. XTBG awarded plate of China's science and technology tourism bases;
4. Orchid diversity exhibition;
5. Program Office of SEABRI to be established in Lao PDR;
6. Amorphophallus titanum exhibition;
7. 2017 Annual Conference of XTBG.

Photo by DUAN Qi-Wu

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April 28, 2018

Xishuangbanna Tropical Botanical Garden (XTBG), Chinese Academy of Sciences is a non-profit, comprehensive botanical garden involved in scientific research, plant diversity conservation and public science education, affiliated directly to the Chinese Academy of Sciences.

XTBG's vision:

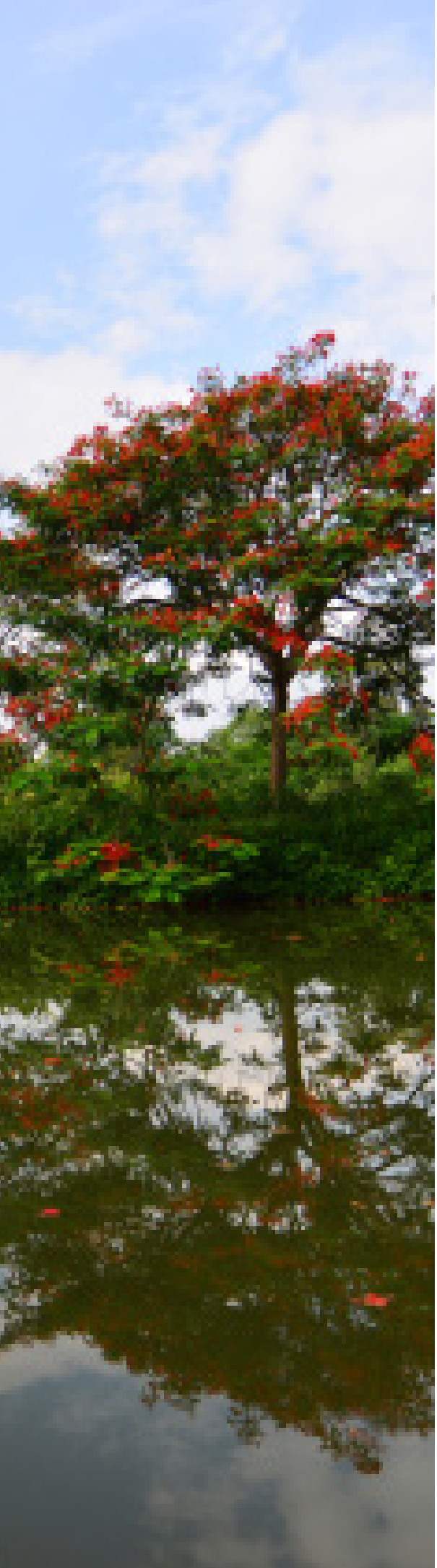
Desirable base for plant diversity conservation and ecological studies.

Noah's Ark for tropical plants.

XTBG's mission:

Promote science development and environmental conservation through implementing scientific research on ecology and plant diversity conservation, horticultural exhibition, and public education.

Photo by ZHU Ren-Bin



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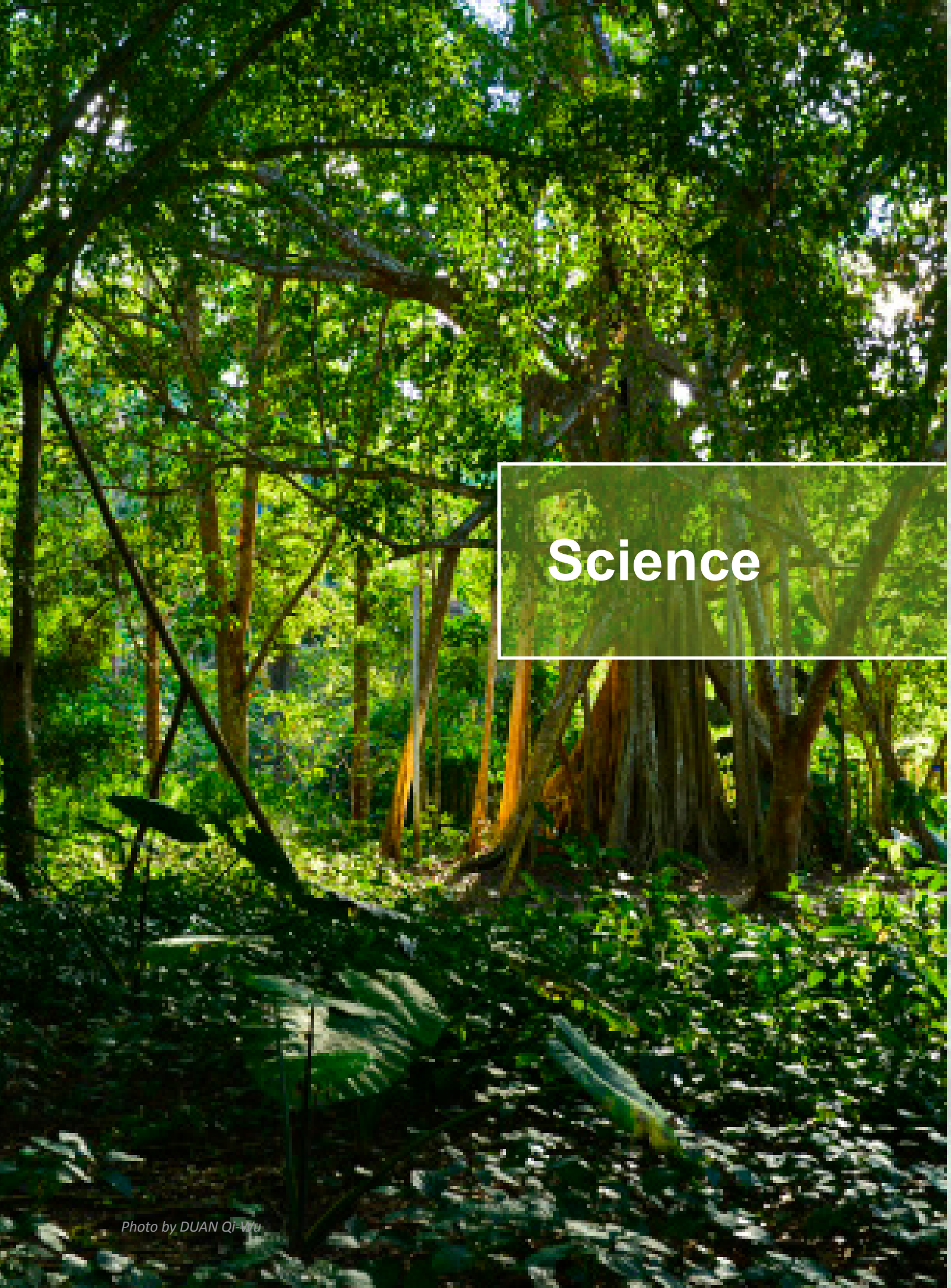


Photo by DUAN Qi-Yu

In 2017, XTBG received 127 million Yuan in research funds from 86 new projects:

34 projects funded by the National Natural Science Foundation of China;

34 projects funded by Yunnan Provincial Fund for Natural Sciences;

7 projects funded by CAS “President’s International Fellowship Initiative” projects;

11 projects supported by other CAS program

In 2017, XTBG researchers have achieved the following:

246 research articles published in internationally peer-reviewed scientific journals (Source Journals of ISI Web of Science);

1 published monograph;

4 authorized patents;

3 patented inventions;

1 waterlily cultivar officially registered by IWGS

a) Participants pose a group photo
b) Group photo

Project Development

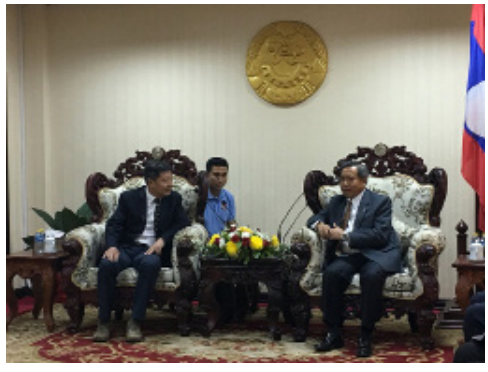
Project Development "Chinese Academy of Sciences-Southeast Asia Biodiversity Research Institute" Project

"Chinese Academy of Sciences-Southeast Asia Biodiversity Research Institute" project (CAS-SEABRI) was launched in 2014, prominent progress has been made in 2017.

CAS-SEABRI held its first annual meeting on January 17-19. The meeting provided a platform for concerning institutes and researchers to exchange ideas and summarize work in 2016, and seek ways for development in the future.

Under the organization of Bureau of International Co-operation, Chinese Academy of Sciences, the 3rd conference of the 1st Directorate of CAS-SEABRI was held in Kunming on 16 June, 2017. The council will have an important guiding significance for the construction of the CAS-SEABRI. CAS Bureau of International Cooperation, CAS Bureau of Science & Technology for Development, CAS Bureau of Major R&D Programs, CAS Bureau of Facility support and Budget Chinese Academy of Sciences, CAS Bureau of Frontier Sciences and Education, XTBG, etc. attended this meeting.

XTBG and Biotechnology and Ecology Institute (BEI) of Lao PDR are to collaborate to promote cooperation in human resource development and capacity building, biodiversity and ecosystem research and conservation, sustainable management of national resources, technology transfer and application and academic exchange, according to a memorandum of understanding (MoU) signed on August 17. Then Prof. Chen Jin, director of XTBG, headed up a 9-person delegation to Ministry of Science and Technology (MoST) of Lao PDR during November 9-15. The visit is mainly for promoting the establishment of program office of CAS-SEABRI and a 25-ha forest dynamics plot in Lao PDR.



Prof. Chen Jin and Minister Boviengkham Vongdara hold a talk

The China-Myanmar friendship forest project came to a successful completion

on August 31. At the ceremony marking the completion, Mr. U Ohn Win, Minister of Natural Resources and Environmental Conservation, said that Myanmar has planned to promote bamboo production industry in the country in cooperation with China. The friendship forest project, located in Nay Pyi Taw, was launched in October 2016, with representatives of the two countries jointly planting tree saplings of symbolizing bilateral friendship.

In a recent special issue of Zoological Research, it highlights a new effort by CAS-SEABRI to promote awareness of the biodiversity and its conservation in Southeast Asia. The special issue is entitled "SEABRI Reports on Biological Surveys in Southeast Asia".

Tropical Plant Identification and Forest Management Training Course opened in Nay Pyi Taw, Myanmar on October 17. The course was developed by SEABRI, in conjunction with Forest Department of Myanmar. 21 young Myanmar plant researchers or forest management workers received certificates of completion from Prof. Chen Jin in Nay Pyi Taw on October 21, which marked a successful end of the Tropical Plant Identification and Forest Management Training jointly sponsored by XTBG and Forest Department of Myanmar.

The 6th China–Myanmar joint field expedition by researchers of the SEABRI to survey biodiversity in north Myanmar came to a successful end on December 23. The large-scale biodiversity survey was the second of its kind in 2017. At the invitation of Natural Resources and Environmental Conservation of Myanmar, the joint field expedition was accomplished by 21 researchers from XTBG, Institute of Botany and Myanmar partner institutions. The researchers collected about 3000 sheets of plant specimens, 1250 DNA materials of plants, 950 specimens and 271 DNA materials of fish. They also set 80 infrared cameras in the dense forest.

Zoological Research

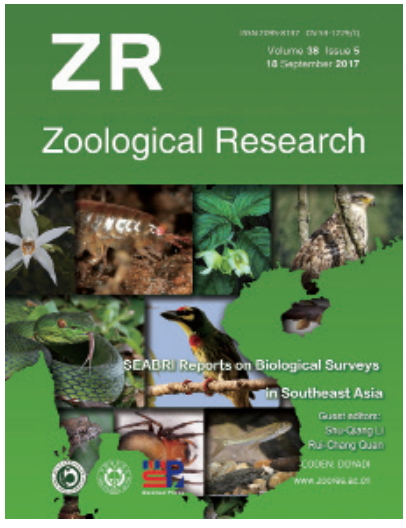


Plate unveiling of the China-Myanmar friendship forest

a) Training course on planting Pinelliaternata
b) Training course

Project Development "Chinese Union of Botanical Gardens" Project

Chinese Union of Botanical Gardens (CUBG), with 104 members, launched its program phase II in 2017, which has achieved initial outcome.

Full-Coverage Conservation Plan for Native Plants in China, with 14 pilot areas covered 38.6% lands of China, progressed remarkably. Those who have already participated in this plan continued their survey and comprehensive conservation in respective areas. For example, many species identified as extinct or critically endangered are rediscovered and protected with various measures in conservation toolbox, like Firmiana major in Yunnan, *Primulina cardaminifolia* in Guangxi and *Euryodendron excelsum* in Guangzhou. This year, another six pilot areas have joined in, which are Hunan, Guangdong, Jiangxi, Shan'xi, Chongqing and Fujian. Up to December 31, more than 80 experts have accomplished the assessment of the native plants in these areas. The results of the assessment will provide the basic data for the field survey and the conservation.

Newly-join areas	Guangdong	Hunan	Jiangxi	Shan'xi	Chongqing	Fujian
Species Numbers	6040	4915	4315	4320	4275	3823
1.Extinct (EX)	6040	4915	4315	4320	4275	3823
2.Critically Endangered (CR)	3	3	2	0	2	2
1.3.Endangered(EN)	60	39	26	36	31	13
3.Endangered(EN)	195	202	81	107	121	86
4.Vulnerable (VU)	258	361	132	150	176	147
5.Near Threatened(NT)	382	587	328	451	200	200
6.Least Concern (LC)	4631	3298	2978	3315	3745	3375
7.Data Deficient (DD)	511	425	768	261	99	159

First Version: Threatened Category List of Native Plants in newly-join areas

CUBG is always devoted to establish the system of digital botanical gardens in China for many years. As the development of Plant Information Management System (PIMS) matures, CUBG invites 17 member botanical gardens to test and experience with it this year. They could use this system for free. The display platform for PIMS has been set up and finished the data access.

Experts gave a discussion on CUBG Development Program Phase Ⅱ

CUBG has established a "3+1+X" Models for its training program. 127 participants from 81 botanical gardens and other organizations "thumb up" for its professional and practicality this year. CUBG holds four training courses in 2017, and these are the three branded courses on plant identification and classification, horticulture and environmental education, and one X series course on ex situ conservation techniques, among which seven excellent trainees are selected to study abroad in the famous botanical gardens like Royal Botanical Gardens Edinburgh (RBGE), Arnold Arboretum of Harvard University and Treborth Botanical Garden of Bangor University. Besides, six participants from 2016 training program finished their overseas training and submitted their study report with the desire to apply themselves to the daily work in botanical gardens.

CUBG has spearheaded a series of initiatives to promote the exchange and cooperation among domestic and foreign botanical gardens, like the launch of Talent Exchange Plan, signing MoU with Botanic Gardens Conservation International (BGCI), and

a)


b)


c)

a) Annual Work Meeting 2017 of CAS Botanical Garden
b) CUBG ex situ conservation training course, Prof. Chuck Cannon introduces sample collecting in the field
c) CUBG and BGCI join hands to conserve plant diversity worldwide

offering advisory for the development of botanical gardens in China.
CUBG lays emphasis on increasing publicity through multiple channels. Besides official website, CUBG interacts with the public through new media like Weibo. In 2017, CUBG released 1734 messages in Weibo with a strong fans of nearly 130,000.

NSFC-NERC joint project 'The evolution of vegetation and biodiversity change during the Paleogene and early Neogene' was initiated

The key Sino-UK joint project 'The evolution of vegetation and biodiversity change during the Paleogene and early Neogene', supported by National Natural Science Foundation of China (No. 41661134049, RMB 2.94 million) and Natural Environmental Research Council (No. NE/P013805/1, 1. £1,007 million), was initiated in 2017, project members from both sides attended the kick-off meeting in 23th February, London, three joint field works have been carried out in Yunnan. The aim of this four-year project is to understand the evolution of biodiversity and vegetation under paleoenvironmental changes in southern and southwestern China during key geological ages. Associate Professor Tao Su from Paleoecology Research Group (PRG) and Professor Paul J. Valdes in University of Bristol are co-PIs in this project.
The Qinghai-Tibetan Plateau (QTP), with 2.50 million kilometer squares and 4500 m in average altitudes, is the largest and highest plateau in the world. CAS initiated the secondary expedition to the QTP in August, 2017, which is about 40 years after the first expedition. PRG in XTBG joined the expedition to investigate Cenozoic floras in central Tibet; 40 days have been spent during two field works in high elevations in 2017. Totally, about 600 fossil specimens were collected ranging from the late Paleocene to the late Oligocene. Preliminary field investigation indicates that the plant diversity was much higher during the Paleogene than nowadays in the plateau.


NSEC-NERC kick-off meeting


Group photo during the field work in Tibet

Since 2011, PRG has done numerous field work in the QTP and collected more than 5000 fossil specimens, which are pivotal to understand the histories of biodiversity and paleoenvironment in the QTP.

“One Major Orientation, Three Significant Breakthroughs and Five Important Fostering Directions” project

Expert Committee review and discussion

XTBG held a new “One Major Orientation, Three Significant Breakthroughs and Five Important Fostering Directions” (shortened to “1-3-5”) special advisory council during the “Thirteenth Five-Year Plan” period. According to the schedule of "1-3-5 Organizations Implementing Management Regulations" during the "Thirteenth Five-Year Plan" of XTBG, XTBG organized the new "1-3-5" special chief scientists on September 18th during the "Thirteenth Five-Year Plan" period. The review and reply of the commander and the task book were made by the academic committee of XTBG and the “1-3-5” special expert committee conducted consultation and appraisal on the chief scientists/commander candidates and the project mission book of "1-3-5". The chief scientists/commanders of the three major breakthroughs and the five key training directions selected by each department elaborated the tasks and goals of their breakthroughs/directions in accordance with the requirements of the “1-3-5” organization. The main contents of the project research program and technical route, organization and management mechanism, team members, and budgets for funding are reviewed by the experts on the "three major" and "three-oriented" requirements of the Academy of Sciences and the strategic positioning during the " Thirteenth Five-Year Plan" period of the Academy. Clearly assessable, breakthrough and development potentials, management mechanisms, and talent training in the target and technology lines have conducted detailed questions on the three major breakthroughs and the five important training directions. At the same time when planning is affirmed, many concrete opinions and constructive suggestions were put forward from different angles. At the same time, the review experts also reviewed the chief scientist/commander candidates in terms of project implementation ideas, academic influence, and organizational capabilities. Finally, prof. Chen Jin, made a concluding speech. He pointed out that since its establishment, the Academy of Sciences has always been with the motherland, and it has taken responsibility for satisfying the needs of the country in different historical periods, and has set an example for the nation’s scientific and technical workers in many aspects such as institutional innovation. Focusing on the requirements of the “three aspects” and “three majors” of the Academy of Sciences in the new era, we must be more courageous to explore how to achieve truly cross-disciplinary joint research and achieve major results. Through the implementation of the new “1-3-5 Plan”, exploring innovative organizational mechanisms, on the one hand, giving young people more opportunities, allowing more young people to come to the front desk, exercise young people's growth through responsibility, and on the other hand, in project organizations. In terms of methods, we must break the PI system, fully respect the autonomy of the chief scientist/commander, and let everyone do things voluntarily and flexibly. Director Chen Jin emphasized that during the “Thirteenth Five-Year Plan” period, we must explore and try to be bolder, continue to enhance our influence, produce important results, and provide stronger support for the economy and society.

Research Progress and Outreach Highlights

Center for Integrative Conservation

Modern biotechnological tools contribute to conservation

Biodiversity conservation and biotechnology have traditionally been opposite poles of biological sciences, with little interaction. However, this paradigm is changing and conservationists increasingly recognize the need for a bigger toolbox and the potential of the novel tools offered by genomics and related technologies.

Prof. Richard Corlett reviewed current trends in the application of biotechnology in conservation. He aimed to inform biotechnologists of conservation needs and concerns, and show conservationists what biotechnology has to offer.

The researcher first asked whether combination of next-generation sequencing (NGS) with universal primers for common barcoding regions (metabarcoding) can become a routine biodiversity assessment and monitoring tool.

By consulting a large amount of literature, he found that metabarcoding has shown considerable promise for assessing biodiversity in mixed, bulk samples of taxa that are difficult to assess with traditional methods. However, some technical issues still need to be resolved, including PCR amplification biases that affect species detection, before metabarcoding becomes a routine biodiversity assessment and monitoring tool.

Modern biotechnological tools, including metabarcoding and environmental DNA, have potential to contribute to conservation. Resolution and precision will be further increased as whole-genome sequencing for conservation purposes becomes practical over the next few years. Gene editing, gene drives, and de-extinction of wild species are moving from theory to plausible conservation practice, although they face a host of practical, regulatory, and public perception issues.

The researcher regards that the key need is to make the new technologies available outside academic research groups (to small labs, government agencies, and the full spectrum of conservation practitioners) while continuing to assess and minimize risks. Knowledge, tools, finances, and communication are gaps between researchers and practitioners. The best practical way is likely to involve three-way collaborations between academics, commercial providers, and end-users.

The review entitled “A Bigger Toolbox: Biotechnology in Biodiversity Conservation” has been published online in *Trends in Biotechnology*.

Examples of Conservation Studies that have Benefitted from Genomics.

Cagy architecture may help some plant species to survive herbivory pressure

Although it has been recently recognized that plants that are able to form cage architectures may be more likely to survive in environments with a high density of mammalian herbivores, how these cages form has received little attention.

Dr. Tristan Charles-Dominique of XTBG and his cooperators conducted a study to test the effect of plant structure on the bite rate of large herbivores. They also investigated what developmental traits contributed to 'caginess'.

The researchers estimating goat (*Capra hircus*, a generalist mammalian herbivore) bite rate on 11 savanna trees of contrasting architectures. For each tree species, they described the architecture and indexed the caginess by considering the number of axis categories that are woody and/or spiny.

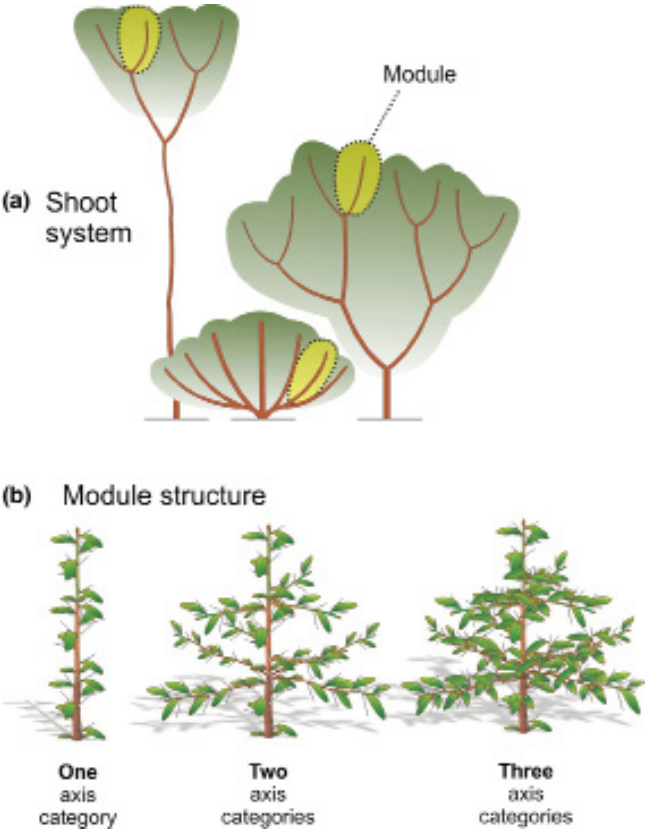
They determined the effect of caginess on goat bite rate by comparing bite rate between whole trees and isolated branches. They then evaluated how the caginess of trees slowed down herbivores when feeding on the inner leaves in tree crowns.

They observed that the bite rate of goats on inner leaves of the cagiest trees was so severely reduced that they could not satisfy their daily nutritional requirements. The cage effect mostly affected herbivore feeding time in situations where opportunities to forage only on the periphery of trees was limited (e.g. high depletion level due to few palatable trees being available, or high competition levels).

Among the three components involved in building a cage (i.e. spinescence, stem woodiness and number of axis categories contributing to the cage), spinescence was probably the most important factor contributing to slowing down the bite rate.

Their study provides strong experimental support to the hypothesis that cagy architecture may help some plant species to survive in a landscape with high herbivory pressure.

The study entitled "The architectural design of trees protects them against large herbivores" has been published online in *Functional Ecology*.



Examples of plant organization. (a) Shoot systems with the same module structure but with varying features of reiteration. (b) Modular unit with one, two and three axis categories.

Maps through species distribution models may assist in developing regional conservation priorities

Southeast Asian biodiversity is under threat. Multiple mechanisms have been advocated to develop regional conservation priorities. Assaying the protected area coverage of biodiversity centers for these taxa is essential. Until recently the lack of data prevented any large-scale detailed analysis on regional biodiversity patterns, making evaluating the efficiency and adequacy of protected areas impossible.

Dr. Alice Hughes of XTBG conducted a study to explore how current knowledge of species ranges based on IUCN "expert drawn" maps compares to those produced through species distribution models. The researcher also discussed the potential limitations, assumptions and challenges of both utilizing both approaches.

Using the best available information, the researcher developed maps of the ranges of 2471 vertebrate (birds, mammals, reptiles and amphibians) and 1198 plant species, and explored patterns of biodiversity and the adequacy of protection.

The researcher found that surrogates and indicator species provide fairly limited transferable information in terms of congruence with other taxa, and that effective targeting of conservation is likely to require multi-taxa inventories and evaluation. The percentage of species ranges protected areas also varied by taxa, from a maximum of 40% to reptiles with a mean of only 13.5% of species ranges protected.

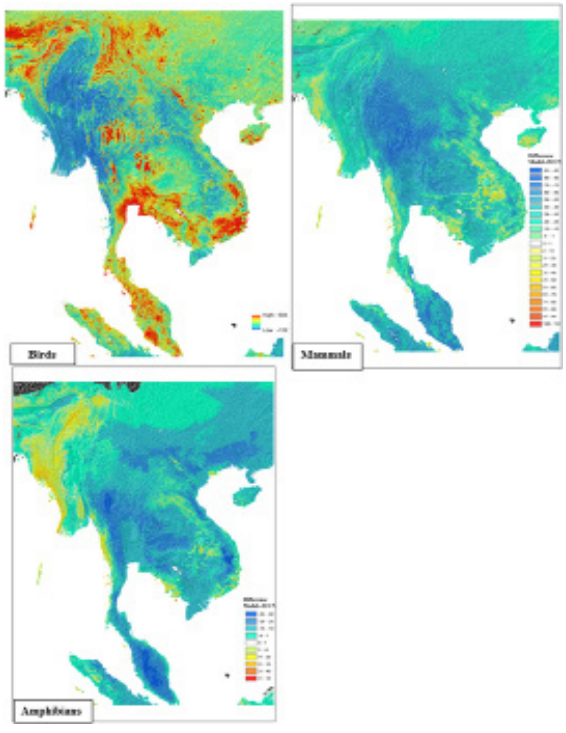


Fig. IUCN-model difference

The researcher's models showed that patterns of diversity even between different avian families vary markedly.

When compared overall to other vertebrate taxa, the patterns of diversity differ substantially. The IUCN hotspots covered a much larger portion of the region and potentially overestimated the ranges of many species.

Without protection many of these regions will see the loss of forests, and increased hunting due to infrastructural growth and increased accessibility.

The researcher thus suggested that further efforts are needed to better protect centers of diversity. The inclusion of IUCN "expert maps" and maps produced through species distribution models into regional conservation planning may greatly assist in increasing the effectiveness of conservation.

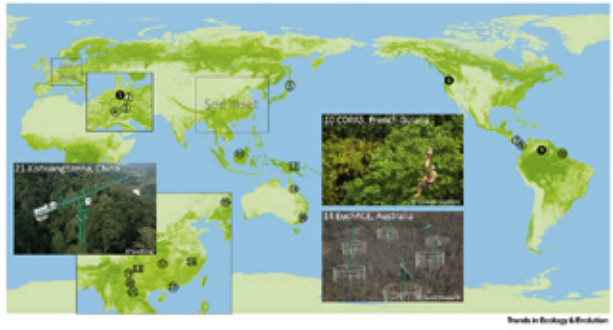
The study entitled "Mapping priorities for conservation in Southeast Asia" has been published in *Biological Conservation*.

Key Lab of Tropical Forest Ecology

Forest canopies deserve more multilateral and collaborative research effort

Forest canopies (i.e. the upper layers or aboveground zone of vegetation, generally formed by tree crowns) are hotspots of biological diversity, engines of global biochemical processes, and the dynamic interface between organic nature and the atmosphere. It plays an essential role in obtaining a clear picture of biodiversity and forest ecosystem function. However, the current knowledge of forest functioning is heavily biased towards the understory. Dr. Akihiro Nakamura of XTBG and his collaborators reviewed how progress (or lack thereof) in canopy-specific or canopy-inclusive studies would contribute to the understanding of the ecology and conservation of forests. They particularly emphasized on forest microclimate, species biodiversity and interactions, and biogeochemical processes.

The researchers consulted a large amount of literature and conducted field investigations. They explored how the forest canopy, with the aid of new technologies, experimental approaches, and a global canopy crane (i.e. a construction tower crane built in forested areas to gain access to the canopy stratum) network can be integrated into forest ecology. The researchers found that the forest canopy remains under threat from multiple human drivers, as does its resilience and resistance to change. The medium- and long-term implications of anthropogenic change which has shifted from local to global scales for canopy biodiversity, ecosystem function, and resilience are little understood.



World Map Showing the Locations of Canopy Access Facilities

They further found that the forest canopy is no longer 'the last biological frontier', with increased access through the expansion of infrastructure, and new technologies for the description and manipulation of diversity and function.

The researchers regard that more emphasis is needed on studying the canopy at fine vertical resolution. Although current understanding on forest canopies remains limited, it is clear that forest canopies are unique zones of biodiversity. Loss of forest canopies undermines global water and carbon cycle security and leads to biodiversity loss.

They propose that more multilateral and collaborative research effort should be directed towards forest canopies. A global system of large-scale, versatile canopy access facilities is necessary and emerging.

The study entitled "Forests and Their Canopies: Achievements and Horizons in Canopy Science" has been published online in *Trends in Ecology and Evolution*.

Rubber-based agroforestry systems are useful to maximize utilization of land and water resources

Land degradation resulting from rubber monoculture is intensifying in Xishuangbanna. Rubber-based agroforestry systems serve as a promising solution, and various rubber-based agroforestry systems have been applied in practice. However, the soil physical conditions and soil hydrological processes of different agroforestry systems are still unclear. Prof. Liu Wenjie and his team of XTBG conducted a study to comprehensively consider soil physical conditions and hydrological processes in identifying the mechanism that allows for ideal water sharing in intercropping systems with rubber trees.

The researchers developed rubber (*Hevea brasiliensis*) monoculture (RM), rubber and Clerodendranthus spicatus agroforestry system (RCS), and rubber and *Amomum villosum* agroforestry system (RAV) from a degraded land which had similar backgrounds of terrain and management measures for 50 years in Xishuangbanna. They applied conventional methods and conducted dye tracer experiments to measure the soil physical conditions and determine the water movement in soil, respectively.

After 5 years' grown, both RCS and RFA could effectively promote the soil physical properties, and optimize soil structure by improving the proportion of the three soil phase. Favorable soil properties, multiple-layered canopies, and ground cover in agroforestry systems could promote and enhance the formation of 3-D hydraulic redistribution in soil profile. The infiltration of rainfall into the soil was enhanced and surface runoff and soil erosion was mitigated, and then the more water was transported, redistributed, and stored into the different soil layers by the more dominant preferential flow, water exchange, and lateral flow in soil profiles. These water supply mechanisms could allow planting intercrops with rubber trees to uptake water from different water sources and coexist in an agroforestry system. These results highlighted that rubber-based agroforestry systems are a useful management practice to maximize the utilization of land and water resources. The study entitled "*Land degradation controlled and mitigated by rubber-based agroforestry systems through optimizing soil physical conditions and water supply mechanisms: A case study in Xishuangbanna, China*" has been published in *Land Degradation & Development*.

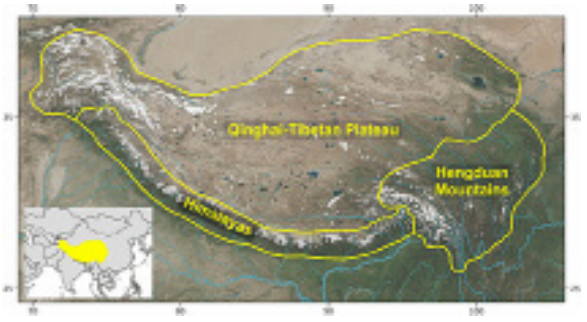
a) Serious soil splash erosion under the monoculture rubber
b) Rubber-based agroforestry system in Xishuangbanna

The Hengduan Mountains flora assembled disproportionately by in situ diversification

The Hengduan Mountains is very rich in plant diversity, with a vascular flora of about 12,000 species in an area of about 500,000 km^2. It is a biodiversity hotspot uplifted over the last 8 million years. However, it remains unclear how and why resident species accumulated. Of primary interest is tempo (the rate of accumulation) and mode (the process, whether by colonization via dispersal or in situ lineage diversification).

Prof. Xing Yaowu of XTBG and Prof. Richard H. Ree of The Field Museum, Chicago conducted a study to see how and why the tempo and mode varied in time and space. They aimed to better understand the origins of this remarkable flora through the lens of historical biogeography. They particularly wanted to test whether in situ diversification was accelerated by uplift of the Hengduan Mountains.

The researchers used the evolutionary histories of multiple plant groups to study the floristic assembly of the Hengduan Mountains region, focusing on comparisons to adjacent regions, especially the Himalayas and other geologically older parts of the Qinghai–Tibetan Plateau (QTP).



Map of the Hengduan Mountains region in relation to the QTP and Himalayas

They used data from 19 clades of vascular plants chosen for their potential to inform the biogeographic history of the Hengduan Mountains. They inferred regional rates of diversification and colonization through time from fossil-calibrated molecular chronograms and reconstructions of ancestral range and rates of lineage diversification.

Their phylogenetic inferences showed that after about 8 million years the rate of in situ diversification increased in the Hengduan Mountains, yielding a remarkable inflection point at which cumulative speciation overtakes colonization.

The result indicated that the Hengduan Mountains flora has been assembled disproportionately by recent in situ diversification that coincides temporally with independent estimates of orogeny.

The study showed quantitative evidence for uplift-driven diversification in the Hengduan Mountains. It tested the uplift-driven diversification hypothesis that orogeny creates conditions favoring rapid in situ speciation of resident lineages.

The study entitled “Uplift-driven diversification in the Hengduan Mountains, a temperate biodiversity hotspot” has been published online in *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*.

Soil microbes decrease allelopathic effects of invasive plants by degrading allelochemicals

Allelopathy has been widely studied as one of the mechanisms underlying the invasion success of exotic plant species. Previous studies have shown that soil microbes are important in mediating allelopathic interactions between invasive and native plants in the field. However, it was not known how these interactions vary in the process of biological invasions and the effects of soil microbes.

Researchers from Group of Plant Physiological Ecology with XTBG conducted a study to evaluate the effects of soil microbes on the allelopathic effects of Ageratina adenophora, a noxious invasive perennial weed and established in SW China.

The researchers first conducted a competition experiment using soils collected from six invaded and six non-invaded sites. They used activated carbon to diminish the allelopathic effects of the invasive species.

They then investigated the effects of the abundance of *A. adenophora* on the allelopathic effects of its leaf leachate, degradation of 9-Oxo-10, 11-dehydroageraphorone (DTD) and 9β-hydroxyageraphorone (HHO), and the allelochemical-degrading soil microbes by using soils collected from 30 sites with varying abundances of *A. adenophora*.

They finally isolated the allelochemical-degrading microbes from the invaded and non-invaded soils and determined their effects on the degradation of DTD and HHO, and on the allelopathic effects of the invasive species.

In their experiments, the allelopathic effects of the invasive plant were much stronger in soils from non-invaded sites than in soils from invaded sites. Activities of the allelochemical-degrading microbes were higher and degradation of the allelochemicals of the invasive plant was faster in soils from invaded sites than soils from non-invaded sites.

In living soils from 30 sites with increasing abundance of *A. adenophora*, the allelopathic effects of the invasive plant decreased and degradation of the allelochemicals and activity of the allelochemical-degrading microbes gradually increased.

The researchers isolated two bacterial strains from the soils. They found that inoculation of*Arthrobacter* sp. ZS, which was isolated from soil invaded by *A. adenophora*, greatly increased the degradation of the allelochemicals, thereby decreasing its allelopathic effects.

Their results showed that soil microbes may decrease the allelopathic effects of invasive plants by degrading their allelochemicals, and that the effects of soil microbes may increase with increasing invasive species abundance, gradually decreasing the allelopathic inhibition on co-occurring native plants.

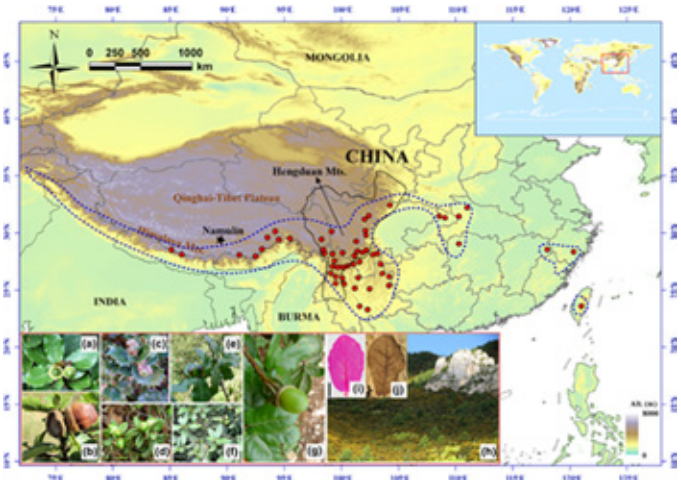
Ageratina adenophora

The study also indicated that application of the allelochemical-degrading microbes may facilitate ecological restoration of invaded or newly disturbed ecosystems.

The study entitled “Changes in soil microbial communities due to biological invasions can reduce allelopathic effects” has been published online in *Journal of Applied Ecology*.

How do oaks evolve in response to uplift of Himalaya–Hengduan Mountains

Quercus sect. Heterobalanus, a section of sclerophyllous oaks in high elevation of East Asia, are mainly distributed in the Himalaya–Hengduan Mountains (HHM) and the mountain tops of East China. The high quality of the fossil record and present distribution in the HHM region and eastern China indicate that *Quercus* sect. Heterobalanus is an ideal model for inferring the evolutionary response to both the geological and environmental changes of the HHM as well as the other regions.



Geographic distribution of Quercus sect. Heterobalanus.

Prof. Zhou Zhekun and his team of XTBG conducted a study to see how the distribution patterns of oaks changed in response to the HHM uplift. They examined the effect of tectonic events in the HHM region on the oaks and aimed to provide a biological perspective on the geological history of the HHM region.

The researchers used molecular dating, ecological niche modeling (ENM), ancestral range reconstructions, as well as the relative geological events. They wanted to elucidate the role of the orogenic processes that created the HHM in shaping the geographic distribution of plants in the surrounding region. They further wanted to illuminate the geological history of the HHM from a biological perspective.

The researchers collected a total of 529 foliar samples of *Quercus* sect. Heterobalanus from 56 populations at elevations between 1034 m and 4236 m. They genotyped the 56 populations by using four cpDNA regions and nine nSSR loci to assess population structure and diversity, supplemented by molecular dating and ancestral area reconstructions.

Molecular dating revealed that the HHM exhibited uplift during the late Miocene to early Pliocene, providing novel insight into the spatiotemporal evolutionary history of the HHM from a biological perspective.

The HHM uplift created new habitats and climate regimes, favoring speciation in some taxa such as *Quercus* sect. Heterobalanus. The lowland region of the eastern HHM and the valleys of the plateau, continued to harbor older lineages while accommodating more recently diverged lineages from the nearby the HHM.

Environmental effects influenced the oaks' geographic distribution pattern, whereas the response of the oaks to the uplift, colonizing from the warm region to cold plateau, imprinted the geological evolution of the HHM.

Therefore, the evolutionary history of oaks may somewhat illuminate the geological uplift of the HHM.

The study entitled “Warm–Cold colonization: Response of oaks to uplift of the Himalaya–Hengduan Mountains” has been published online in *Molecular Ecology*.

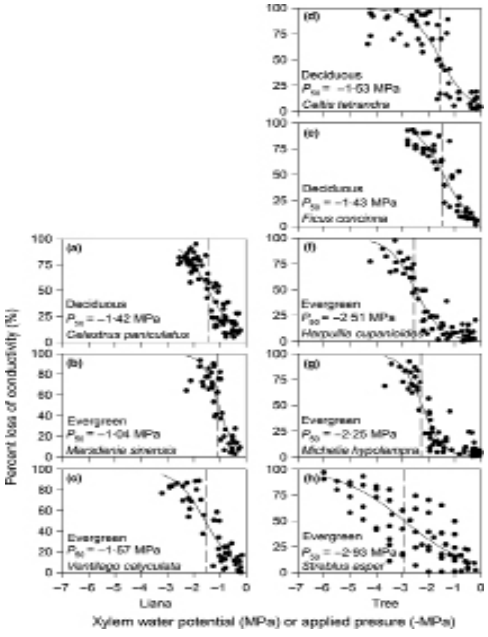
Physiological regulation aids lianas in mediating diurnal water and carbon balances

Liana or woody vines are considered to be structural parasites because they commonly use the stems of other plants (usually trees) to ascend to the forest canopy. Lianas appear to have low water-storage capacity and are vulnerable to drought-induced cavitation due to their wide vessels and slim stems. The mechanism by which lianas balance hydraulic efficiency with safety and the role of stomatal regulation are both poorly understood. Dr. Chen Yajun and his colleagues of XTBG conducted a study to determine how tropical lianas cope with the extremely high transpirational demands prevalent in forest canopies. Specifically, they tested whether physiological regulation aided lianas in mediating diurnal water and carbon balances.

The researchers examined the stem hydraulic properties, leaf drought tolerance, diurnal variations in leaf and stem water potentials, stomatal conductance, photosynthetic rate, sap flow, and stem native percentage loss of conductivity for four liana species in a tropical forest in southwest China. They also measured the same physiological properties for five co-occurring trees (two deciduous and three evergreen trees) for the purposes of comparison with lianas.

They found that lianas tended to have higher stem sapwood-specific conductivity than did the co-occurring trees, conferring lianas with greater water transport efficiency. Thus, despite losing up to nearly half of their conductivity at midday, lianas were able to continue to transport water efficiently to the canopy during the afternoon. Physiological regulation (stomatal closure) and efficient water transport from the soil to terminal branches (high stem sapwood-specific conductivity and sap flux density) may help lianas maintain stem water potential within the safe range to avoid xylem dysfunction.

They also found that lianas tended to deploy the majority of their leaves at the top of the forest canopy, where they flourish despite the trifecta of high light intensity, temperatures, and windiness—all of which increase vapor pressure deficit and thus water stress. Therefore, physiological regulation seemed to be particularly important for lianas.



Stem vulnerability curves for three liana (a?c) and five tree (d?h) species. PLC = the percentage loss of conductivity. P < 0•001 for all regression lines. The vertical dashed lines indicate the xylem water potential at 50% loss of stem hydraulic conductivity (P50).

Their results provided a potential physiological explanation of how lianas can have large vascular systems, which permit them to transport copious amounts of water, and yet still avoid catastrophic hydraulic failure and thrive in tropical forest canopies.

The study entitled "Physiological regulation and efficient xylem water transport regulate diurnal water and carbon balances of tropical lianas" has been published online in *Functional Ecology*.

Key Lab of Tropical Plant Resource and Sustainable Use

WRKY45 functions as positive regulator of GA-mediated leaf senescence in Arabidopsis

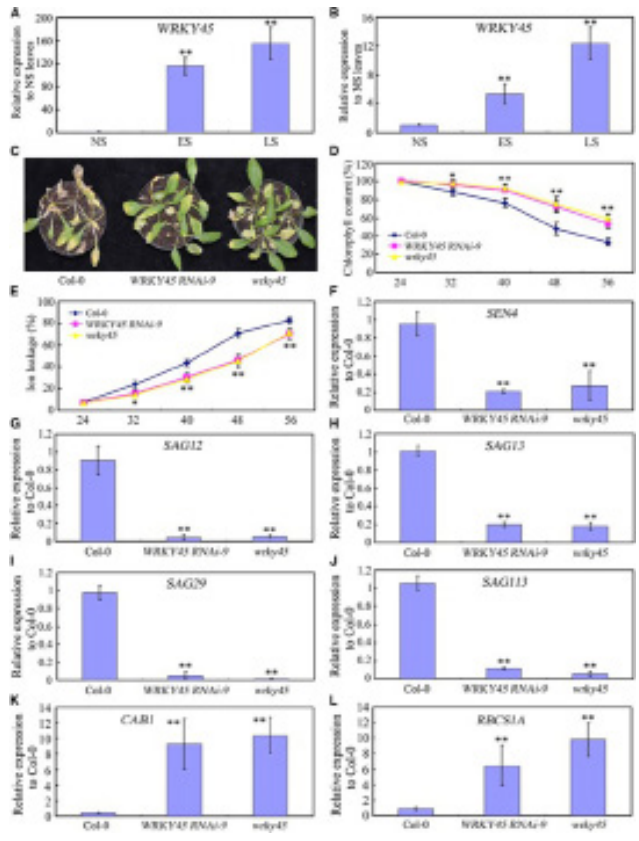
Plant senescence is a highly coordinated process during which leaf cells undergo active degenerative processes.

WRKY transcription factors have been suggested to participate in the regulation of leaf senescence, but the related signaling pathways and physiological mechanisms remain unclear.

Prof. Yu Diqiu and his team of XTBG used a molecular and genetic approach to investigate the role of Arabidopsis thaliana WRKY DNA binding protein 45 (WRKY45) in age-triggered leaf senescence.

Analysis of WRKY45 expression showed that WRKY45 is a senescence-responsive gene. It functioned as a senescence-associated gene (SAG) to regulate and fine-tune the complex signaling and transcriptional networks that mediate plant senescence. Altered WRKY45 expression affected gibberellin (GA)-regulated leaf senescence.

The researchers further found that constitutive over-expression of WRKY45 led to accelerated leaf senescence in transgenic plants. WRKY45 acts as a transcriptional activator to transmit GA-mediated leaf senescence signals.



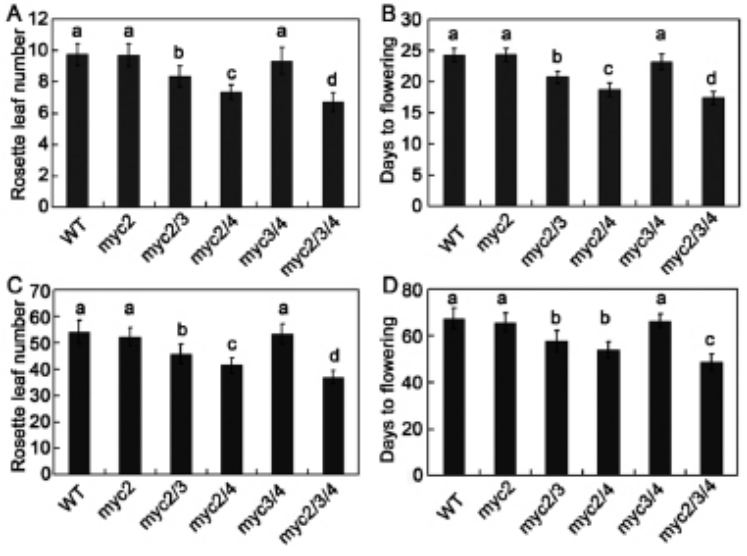
Loss of WRKY45 Function Delays Age-Triggered Leaf Senescence

The study entitled “Arabidopsis WRKY45 interacts with the DELLA protein RGL1 to positively regulate age-triggered leaf senescence” has been published online in *Molecular Plant*.

Jasmonate-activated transcription factors redundantly modulate flowering in Arabidopsis

Jasmonates (JAs) are a class of important phytohormones that control multiple physiological aspects of plant development, growth, and defense. It remains unclear whether JA-activated transcription factors MYC2, MYC3, and MYC4 (MYC2/3/4), which are the most extensively studied components in the JA signaling pathway, play a regulatory role floral transition. Prof. Yu Diqiu and his team of XTBG conducted a study to examine the role of MYC2/3/4 in floral transition.

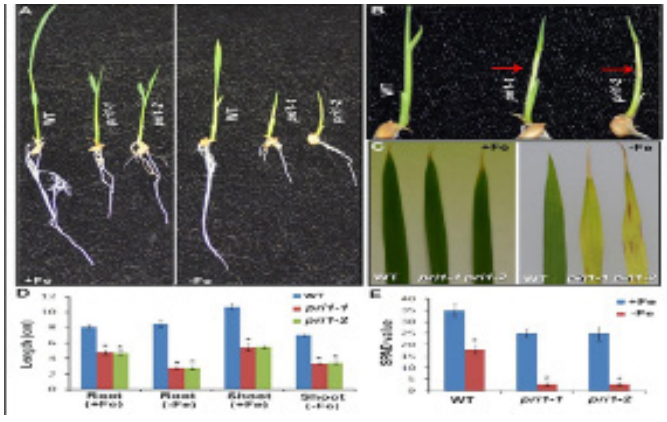
The researchers firstly analyzed the flowering phenotypes of myc2 mutants, myc2/3, myc2/4, and myc3/4 double mutants, and a myc2/3/4 triple mutant. Under long day (LD) or short day (SD) conditions, myc2/3 and myc2/4 double mutants exhibited earlier-flowering phenotypes compared with the wildtype, indicating that MYC2 plays a more important role than MYC3/4 in regulating floral transition.



MYC2/3/4 redundantly controls flowering time

The study entitled "The *bHLH* Transcription Factors MYC2, MYC3, and MYC4 Are Required for Jasmonate-Mediated Inhibition of Flowering in Arabidopsis" has been published in *Molecular Plant*.

POSITIVE REGULATOR OF IRON HOMEOSTASIS 1 maintains rice Fe homeostasis



Iron (Fe) is an essential mineral for plant growth and development. Although Fe is the second most abundant metal in the earth, plants are often exposed to Fe deficiency. It is unclear how rice senses external and internal Fe contents and regulates the expression of Fe-homeostasis–associated genes.

Identifying and characterizing the substrates of OsHRZ1 [HEMERYTHRIN MOTIF-CONTAINING REALLY INTERESTING NEW GENE (RING)-AND ZINC-FINGER PROTEIN 1] and OsHRZ2 may provide novel insights into rice responses to Fe deficiency.

Prof. Yu Diqiu and his team of XTBG identified a basic helix-loop-helix (*bHLH*) transcription factor as an interacting partner of OsHRZ1. They named it as POSITIVE REGULATOR OF IRON HOMEOSTASIS 1 (*OsPRI1*).

They found that *OsPRI1* was ubiquitously expressed. Loss-of-function mutation to *OsPRI1* resulted in enhanced sensitivity to iron deficiency and impaired iron translocation from the roots to the shoots. *OsPRI1* affected the transcriptional regulatory network associated with rice responses to Fe deficiency. Further analysis confirmed that *OsPRI1* bound to the promoters of OsIRO2 and OsIRO3 to activate expression. *OsPRI1* might be regulated at the post-transcriptional level under Fe-deficient conditions (e.g., altered *OsPRI1* protein abundance or activity). Moreover, the stability of *OsPRI1* was negatively correlated with OsHRZ1 production. The hrz1-2 seedlings were insensitive to Fe-deficient conditions. When the pri1-1 (homozygous pri1 mutant) mutation was introduced into hrz1-2 mutants, the pri1hrz1 double mutant was more sensitive to Fe deficiency than the hrz1-2 mutant. The expression levels of Fe-deficiency-responsive genes were lower in the hrz1pri1 double mutant than in the hrz1-2 mutant.

The results revealed that *OsPRI1* functioned downstream of the Fe-binding sensor OsHRZ1 and directly controlled the expression of OsIRO2 and OsIRO3 for iron homeostasis in rice.

The study entitled “POSITIVE REGULATOR OF IRON HOMEOSTASIS 1 (*OsPRI1*) positively regulates iron homeostasis in rice” has been published online in *Plant Physiology*.

New book

In September 2017, the Rain Forest Feather—Birds in the Xishuangbanna Tropical Botanical Garden of the Chinese Academy of Sciences, jointly written by Wang Ximin, Zhao Jiangbo, and Gu Bojian, was formally published by the China Forestry Publishing House.

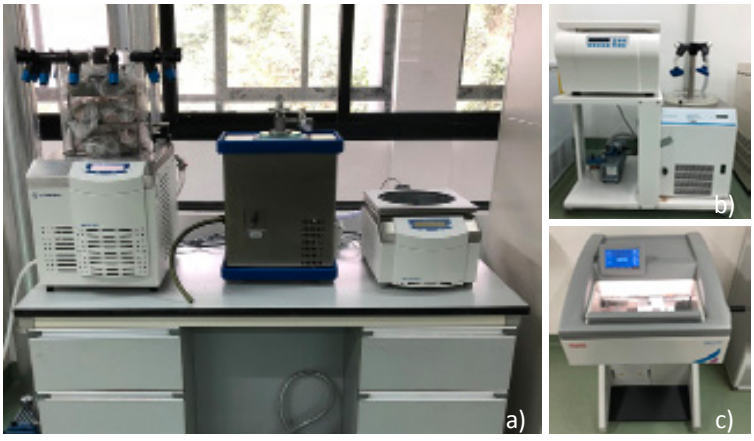
The book is both a bird illustration and a bird storybook, which collects more than one hundred kinds of common and characteristic birds in XTBG. In addition to the introduction of the distinguishing characteristics of birds, the book focuses on the distribution and living habits of these birds in XTBG and summarizes the results of the authors' observations over the years. Due to the representativeness of the botanical garden, this book can also be used as an instruction manual for bird watching in Xishuangbanna. XTBG is currently a famous bird-watching resort in China and attracts a large number of bird-watching enthusiasts each year. In addition to photographs taken by the authors of XTBG, most of the books are collected from all walks of life in the country, and have also received active support from many bird friends.

For the convenience of readers, this book is specially made into a pocket book. In addition to being used by bird lovers, this book will play an important role as one of the primary and secondary school students' biodiversity conservation education guidance books for Xishuangbanna Prefecture.

Improvement of Research Facility

Central laboratory perfects pre-processing system of biological samples

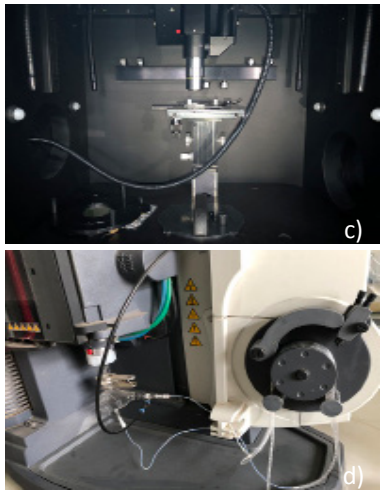
Pre-processing of biological samples plays an important role in their long-term storages and effective detections and analyses. It includes many steps, such as separation, purification, concentration and chemical derivatization of components to be tested. In order to perfect current pre-processing system, low temperature vacuum concentrator (ScanSpeedMini Vac Beta), freeze dryer (ALPHA 2-4 LD plus) and vacuum concentrator (RVC 2-25 CDplus) were introduced to central laboratory from Labogene (Denmark) and CHRIST (Germany), and these machines contribute to quick purification, concentration and freeze-drying of biological samples. In addition, central laboratory introduces freezing microtome (HM525 NX UV) from Thermo Fisher (America). By using the machine, many types of cell biology and immunology experiments can be conducted on the basis of keeping the activities of antigen and enzyme. Putting to use of four types of machine will effectively accelerate pre-processing biological samples under the premise of keeping their vitalities.



a) Freeze dryer and vacuum concentrator
b) Low temperature vacuum concentratorXishuangbanna
c) Freezing microtome

Two projects passed the acceptance by CAS

"Function exploitation of Plant Vivo Imager-Establishment of microbe vivo imaging system" and " Study on the determination method of available phosphorus in forest soil by Inductively Coupled Plasma-Atomic Emission Spectrometry(ICP-AES) " were successfully passed the acceptance by CAS. The former has expanded the imaging function of plant vivo imager to biological samples with small size, such as fungi and orchid seeds. Furthermore, the expanded machine may real-time moitor their changes. The latter not only improves the level and capability of laboratory testing, but also helps to thoroughly study the phosphorus cycle of the tropical rainforest ecosystem. Two projects were supported by "the equipment functional development of technological innovation projects of CAS", with a total of 600,000 Yuan was funded.



c) The expanded Plant Vivo Imager
d) The improved ICP-AES

Establishment of the Test data Management System in the Public Technology Service Center

The Test Data Management System (TDMS) was established in the Public Technology Service Center on December 7th 2017. The system includes two racks of servers. The test data of each instrument can upload to servers. Users can download the data from their computers, avoid unsafe and fussy copy through CD or USB. The system can not only make users get data quickly, but also reduces the workload of the staff, and help to further enhance the service quality and management level of the Public Technology Service Center.

The Test Data Management System

A ceremony held for Robert Spice's kind donation of his library to XTBG

A ceremony was held to thank Prof. Robert Andrew Spicer for the kind donation of his collection of books to XTBG on October 24.

At the donation ceremony, Prof. Zhou Zhekun gave a brief introduction to Prof. Robert Andrew Spice and his donating books.

Prof. Chen Jin awards Certificate of Donation to Prof. Spicer

Prof. Chen Jin, director of XTBG, expressed gratitude to Prof. Spicer, an Emeritus Professor of Earth Sciences in the Department of Environment, Earth and Ecosystems at the Open University and a senior visiting scholar of XTBG.

The books donated are a library of 1670 books and journals, including some printed materials. Being a carrier of knowledge, these books are a ladder to improve scientific research of XTBG.

Prof. Chen Jin awarded a certificate of donation to Prof. Spicer, witnessed by Prof. Zhou Zhekun, Richard Corlett, Xu Zengfu, Fu Yun, Su Tao, and other audience.

The donated books are a lifetime collection of Prof. Spicer.

Conferences and Symposia

ATBC-Asia Pacific Chapter Meeting 2017

On the 25th of March the Association of Tropical Biology and Conservation formally opened their 11th Chapter meeting in XTBG. The meeting included around 300 people of 37 nationalities from 108 institutions, and included around 150 international participants.

In the 11 years since the Asia-Pacific Chapter launched in Kunming it has convened annually in countries across the region, and co-convened twice with the main ATBC in addition to jointly hosting a meeting with the Society for Conservation Biology in Singapore last year.

Conservation in China was also discussed in a panel session chaired by Alice C. Hughes (XTBG) and featuring Becky Shu Chen (ZSL), Bosco Chan (Kadoree Botanic Farm) and Shi Kun (The wildlife Institute). The panel highlighted the threats posed by the destruction of native habitats (especially forest) and the trade in endangered species, especially at border markets such as Mongla and Botan, and the impact of the farming of some endangered species on the survival of wild populations. They also highlighted the growing interest of the public in biodiversity, and the use of social technology to help promote biodiversity and sustainable use. The panel also highlighted the need for conservation champions to promote positive conservation messages, and the need for capacity development to prevent wildlife trade and reduce demand for endangered species. The panel also mentioned the need to work to help the effective implementation of the new wildlife protection laws, and the need for baseline data on little known species.

The ATBC always aims to support young researchers, so they can access the specialist skills they need to become experts, but also to present their research well and to form the networks they ultimately need to be successful and effective scientists and conservationists. To complement this, we also had one wildlife photographer and two artists showcasing the beauty and diversity of the natural world and showing how easy

it is to engage with biodiversity.
Throughout the conference we also aimed to maintain gender balance, and the initial keynotes both male and female speakers as national, regional and global speakers (as initially 6 keynotes were included). Panel sessions also were designed to have a total of 4 male and 4 female participants and one male, and one female chair. This is an important component of the meeting, as young scientists need role models they can identify with, and frequently in the past men have had greater opportunities for representation in these meetings. We feel that by showing that equality should be the normality we can also showcase that there are many excellent speakers and experts of both genders and that we need to provide equal opportunity to all.
The conference marked the progress in conservation in some parts of the region, but also the need for more work-particularly to reduce the unsustainable demand for wildlife, the prevention of the further destruction of threatened habitats and the enforcement of regulations which protect species and systems. We also showed the need for further capacity for the implementation of conservation in many parts of the region.
At the closing ceremony, 5 prizes were awarded to students for their impressive research. Antony Lynam gave a speech as the outgoing chair of the ATBC's Asia-Pacific Chapter, and welcomed Alice C. Hughes as the incoming Chair, and Director Chen Jin thanked all delegates and organizers for their contributions.

International workshop on the response of forest ecosystems to climate change

International workshop on the response of forest ecosystems to climate change

An international workshop on the response of forest ecosystems to climate change was held between 12th -15th October 2017 in XTBG.
The workshop brought together more than 100 researchers and students involved in ecology studies, from China, Japan, UK, US, Norway, Thailand, Australia and Germany. At the workshop, ecologists and young researchers present their research progress. Prof. John Grace, Prof. Jan Mulder, Prof. Yunting Fang, Prof. Wang Yingping , Prof. Richard Corlett, Prof. Liang Naishen, Prof. Du Mingyuan, Prof. Iain Colin Prentice and Prof. John Tenhunen were invited keynote speakers. 21 ecologists presented their work. 19 poster presentations were available.
World leaders in ecological science exchanged the most recent cutting-edge studies and ideas on the functions and response of forest ecosystems to climate change and established a new international collaboration network for elucidating the adaption and feedback mechanisms of forest ecosystems to regional and global climate change.

Collaborative Workshop on Science and Technology Cooperation Biodiversity: Global Awareness and Sustainability

On the 5th of November 25 researchers from Chinese Academy of Sciences institutes convened in Chiang Mai (Thailand) for their fifth annual meeting with the Thailand Research Fund, this year under the title of "The Workshop on Science and Technology Cooperation Biodiversity: Global Awareness and Sustainability". The initiative seeks to develop collaborative ties between researchers within the Chinese Academy of Sciences, and researchers in Thailand and to further strengthen the linkage between the leading institutions in both countries.

In 2016 XTBG hosted the meeting, and in addition to two days of presentations, additionally developed priorities for joint collaborative research. This year's meeting saw the further building of that initiative, with the first round of collaborative grants made available to researchers within Thailand to develop collaborative research proposals with researchers from the Chinese Academy of Sciences funded by the Thailand Research Council, and many applicants to the funds also attended the meeting in Chiangmai.

This years meeting included delegates from across CAS ecological institutes in addition to the chair of the PIFI research grant program, and was facilitated by Saengpetch Issarapanichkit and Voravee Hoven on the Thai side, and Alice C. Hughes on the China side. After opening speeches from Dr. Suthipun Jitpimolmard, from the Thailand Research Fund, Dr. Cao Jinghua the Director-General, Bureau of International Affairs, and Professor Chen Jin on behalf of CAS-SEABRI the first academic session opened with a presentation on China's mammal fauna from Zhang Zhigang, followed by a talk on Thailand's Copepods from La-orsri Sanoamuang.

a) Delegates assemble for a group photograph
b) Dr Suthipun Jitpimolmard the Director of the Thailand Research Fund presents gifts Dr Cao Jinghua and Professor Chen Jin
c) Participants interact at the poster session

The scientific program included 20 short oral presentations and 28 posters, with approximately half from China and half from Thailand under the themes of 1: Biodiversity Monitoring and Documentation; 2: Biodiversity Conservation; and 3: Utilization of Bioactive Compounds Derived from Bioresources.

During the executive committee meetings mechanisms to facilitate future collaborative interactions were discussed, including the format for future meetings and the development of new bi-lateral grant and funding programs, and these will be further developed by next years joint meeting at the Shanghai Institutes for Biological Sciences.

The meeting was concluded by a trip to Doi Inthanon, where all participants enjoyed the diverse and interesting high altitude landscapes.

2017 Annual Conference of XTBG

The 2017 Annual Meeting for XTBG is the premier conference for more than 260 students, scholars, and researchers. On December 1-2, scientists, researchers, and students gathered together at the XTBG headquarter for two days of oral presentatitons, discussion, communication, and posters.

On behalf of the two key laboratories and conservation center respectively, Prof. Xing Yaowu, Prof. Xu Zengfu, and Prof. Harald Schneider made plenary presentations on the first day. Their presentations included “Impact of environmental change on biodiversity and distribution pattern of angiosperm in the Cenozoic”, “Cytokinin regulation of plant sex determination”, and “Predicting the impact of the Anthropocene on the tree-of-life”.

32 principal investigators presented the research progress of their groups respectively. Responsible persons of supporting platforms presented their supporting functions in scientific research. 21 young researchers and students presented their work. 23 poster presentations were also available.

With members of the XTBG Academic Committee as judges, the presentations by young researchers were evaluated. The best presentation winner prize went to Dr. Wang Houping. The second prize was conferred to Chen Zhanqi and Zhang Xiaoxiao. The third prize winners were Wu Junen, Hu Yingxiong and Wang Xiaojing.

“The annual conference is held to learn progress of each research group, work progress of functional departments. Most importantly, it provides a platform to have academic exchange and interaction, invigorate academic atmosphere. It also aims to accelerate the growth of early-career scientific researchers,” said Prof. Chen Jin at the opening ceremony.

The two-day conference was very intensive. Presentations and discussions took about 10 hours each day.

“The annual conference witnessed development of XTBG. The research groups are competitive. We expect better development at next annual conference”, added Prof. Chen Jin.

Participants pose a group photo

Forum of young researchers in plant sciences held at XTBG

The second forum of young researchers in plant sciences took place at XTBG on November 25-28. The Forum brought together over 200 outstanding young researchers from academic institutions and universities with expertise in a shared filed in the plant sciences to engage in scientific discussions.
The theme of the forum is “genomics and plant biotechnology”. 29 young researches presented their latest research projects with an in-depth analysis.
Prof. Yu Diqiu of XTBG was invited to deliver a keynote speech to share his research experience and progress.
Mr. LI Hongwei, CPC secretary of XTBG, delivered a welcoming speech.

The Forum was organized by Prof. Tian Zhixi, Cui Xiaofeng, Wang Jiawei, Wang Hongbin, Yan Jianbin, and Chen Jianghua.
The aim of the Forum is to inspire and bring together young researchers in the field of plant sciences. It offers young researchers the possibility to meet and discuss research topics and methodologies, share and develop ideas, learn from each other and gain knowledge from senior researchers.
According to the organizers, the forum will be held annually.

Participants pose a group photo

XTBG presents at 6th Global Botanic Gardens Congress

6th Global Botanic Gardens Congress of BGCI

The 6th Global Botanic Gardens Congress of Botanic Gardens Conservation International (BGCI) was held at the City of Geneva, Switzerland from June 26-30. The congress brought together over 500 representatives of 300 botanical gardens from 70 countries and regions. Prof. Chen Jin, director of XTBG, was invited as one of the 7 keynote speakers.
Chen Jin headed up 5 representatives of XTBG. He delivered a keynote speech entitled “Environmental education in botanical gardens: a child’s play ?”. He pointed out that education has been regarded as one of the core functions of botanical gardens. Combining with environmental education achievements of XTBG over the past years, he presented why education is important and how to make education more effective in botanical gardens.
The theme of the congress is “Botanic gardens in society: visions for the future”. It aims to stimulate discussion and innovative reflections on the role and relevance of botanic gardens in society. Major topics include plant conservation, education and outreach, botanic garden management challenges and communicating the big issues via landscaping, with workshops and discussion sessions organized during the course of the meeting to address specific issues.

XTBG Seminar Program

Since its establishment in 2010, the XTBG Seminar Program has conducted more than 329 seminars, with new speakers virtually every week in 2017. A total of 48 talks were given by speakers from the USA, the UK, Australia, India and 13 other countries. Prof. John Kress, the distinguished research professor, Smithsonian Institution, Prof. Dr. Jens G. Rohwer of Hamburg University of Germany, Prof. Hugh Pritchard, Royal Botanic Gardens, Kew and other prominent scientists on ecology, biodiversity conservation, resource plant studies and other research fields were invited to talk in XTBG. XTBG Seminars are held on every Tuesday, with video link to the XTBG Kunming division. Talk language is in English. The program provides XTBG scientists and students a platform to communicate with international researchers while helping outsiders know more about the institute.

Horticulture

Photo by ZHU Ren-Bin

Facts:

1. Total number of accession: 23081
2. Total number of species: 13598
3. Total number of unidentified species: 5128
4. Total number of species from wild: 8210
5. Number of accession collected in 2017: 2705
6 Number of species collected in 2017: 2592

The orchid show 2017 in XTBG --Natural orchids: the gift of nature

The orchid show “Natural orchids – the gift of nature” opened at XTBG on April 12. This exhibition encompassed -conservation, horticulture, sciences, and art displays. A diverse collection of more than 10,000 live orchids from over 200 species were displayed, showing the different shapes, colors, patterns and textures of the flowers. Some research on orchids, such as -pollination, mycorrhiza, Chinese culture, history -and conservation were also available at the show.

As the exhibition is one of the CAS botanical garden “Famous garden, famous flower exhibition” programs, most of the CAS botanical gardens were invited to join the program. Botanical gardens from neighboring countries, such as South China Botanical Garden, Shanghai Chen Shan Botanical Garden and Wuhan Botanical Garden , etc. It was a comprehensive exhibition of diverse tropical orchids, involving conservation, horticulture, science, and art, where “introducing orchids into villages” and orchids rewilding became the highlights.

Orchid diversity exhibition

For a long time, XTBG has been devoting itself to orchid research and conservation. It has not only collected and conserved large number of endangered orchids through breeding and seed propagation, but working on systematic orchid resource evaluation. By holding the exhibition, XTBG called for the public’s wider engagement in orchid conservation.

Amorphophallus titanum exhibition

From May 27 to June 2, *Amorphophallus titanum*, commonly known as the titan arum or corpse flower, bloomed in the Shade Plants Garden. It started blooming at 7pm and was in full bloom at 11pm, May 30. This is the first time that the corpse flower was on display at XTBG and also one of the few places were it was displayed outside a glasshouse.

The bloom of the enormous inflorescence was so spectacular that it was reported by national media organizations like CCTV, Xinhua News Agency and attracted over 8.79 million hits on XTBG official micro-blog. More than 37 000 people watched the blooming broadcast live online. According to incomplete statistics, more than 10 million people focused attention on the events.

Amorphophallus titanum exhibition

Improvement in some orchids seeds propagation technology

New orchids were propagated in the nursery and grown in the garden such as- *Spathoglottis plicata, Phaius tankervilleae, Goodyera procera*. They successfully bloomed and were transplanted in the Shade Plant Garden before the orchid show. This provided a successful example on how propagation, and exhibitions contribute to the conservation of orchids. *Arundina graminifolia* plants which were propagated from asymbiotic seeds culture -and blossomed in the Shade Plant Garden as well as the Flower Garden. The entire technique from asymbiotic propagation, weaning and cultivation was developed for this orchid, an important but endangered Dai's medicinal herb in Xishuangbanna.

Arundina graminifolia

pink moon

A new cultivar of *Nymphaea*ceae was registered by IWGS

A new cultivar of *Nymphaea*ceae, *Nymphaea*'Pink Moon'which was bred from bud sport of *Nymphaea rubra*, has been officially registered by the International Waterlily and Water Gardening Society (IWGS). It was the first waterlily cultivar officially registered by IWGS in XTBG.

Over 50% of “Zero extinction species” of Xishuangbanna have been preserved in XTBG

The zero extinction plan aims to explore effective ways to protect native plant species in China, and to improve the capacity of botanic gardens to preserve native plants by conducting pilot plant survey and protection in every geographic region of China. We started plant collection for the project in 2014. In 2017, the collecting was improved by overcoming the lack of collection sites information. 39 “zero extinction species” were introduced in 2017. Up to now, 182 priority species in Xishuangbanna have been preserved in XTBG (including the species had been collected before the plan started), which accounts for 53% of the total. In the next years we will continue to collectand expect that 100% of the zero extinction species from Xishuangbanna will be conserved in XTBG.

Passiflora xishuangbannaensis survived in XTBG by grafting after introduction from the field

Start the project of verifying and identifying the original plants in XTBG

There are 2463 taxa recorded in the conservation area (the C42 area, the river floodplain, the rainforest, the green stone forest, etc.). However, many species in these areas can’t be easily found when we need them because we don’t know their exact location. In 2017, in order to find the exact number, distribution area and population size of the accessions, we launched the project of verifying and identifying the species in the plant conservation area. By the end of 2017, a total of 471 species of vascular plant had been checked and recorded by field survey, and GPS positioning had been done for every species so that the species could be quickly and accurately found when needed. During the investigation work, a total of 1164 specimen (592 numbers) were collected and more than 3600 photographs were taken.

verifying and identifying the original plants

XTBG introduced rare fern *Schizaea dichotoma*

Schizaea dichotoma

Schizaea dichotoma is a rare fern in China restricted to Hainan Island and southern Taiwan. It is evaluated as critically endangered (CR) in the Red List Assessment of Lycophytes and Ferns in China (Dong et al., 2017). This specialized fern occurs throughout the Malesian Archipelago and grows in forests on nutrient poor soils. In order to conserve this rare species and maintain its genetic diversity, several individuals were introduced from Brunei with the support of Dr. Daniele Cicuzza (University Brunei Darussalam) to XTBG. This is the first conservation activity for this remarkable fern in Chinese botanical gardens. The fern research group aims to work out its best cultivation conditions and try to maintain it in the garden. The cultivation of this fern is considered to be challenging because of its adaption to extreme nutrient poor soils and the obligate association with mycorrhizal fungi.

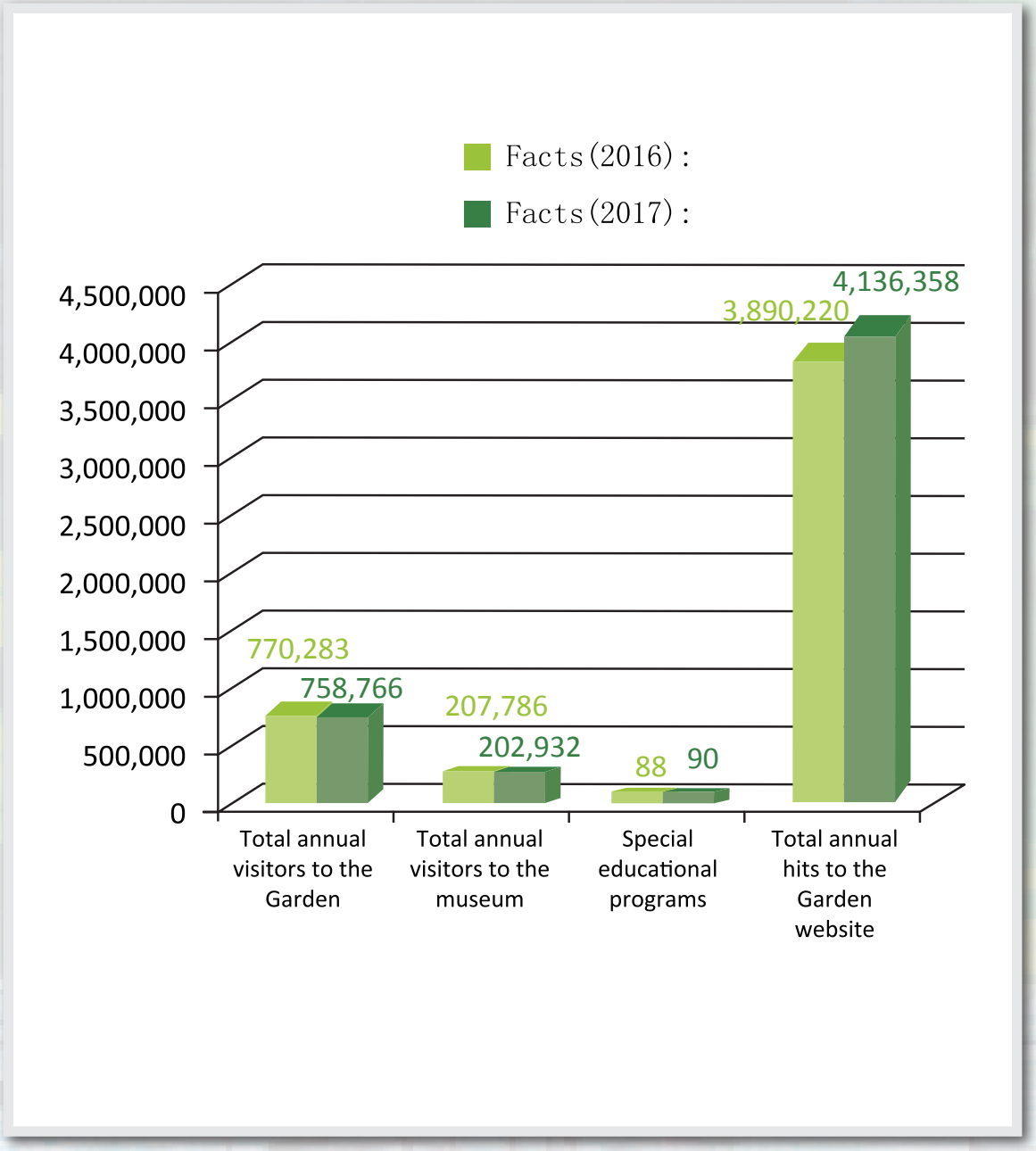
A novel to restore over-collected medicinal orchids *Dendrobium devonianum*

Due to increasing demand for medicinal and horticultural uses, the Orchidaceae is in urgent need of novel propagation techniques that address both market demand and conservation. Orchid seeds cannot germinate under natural conditions unless they are colonized with compatible mycorrhizal fungi that supply seeds and young plants with carbon and inorganic nutrients (Rasmussen, 1995). Traditionally, restoration techniques have been centered on ex situ asymbiotic or symbiotic seed germination techniques that are not cost-effective, have limited genetic potential and often result in low survival rates in the field. Based on the previous study on compatible fungal isolation with No. CY (protected by patent No. ZL201510078367.X.) from host protocorms and promoting efficiency on seed germination and subsequent seedling development, we propose a novel in situ advanced restoration-friendly program for the endangered epiphytic orchid species *Dendrobium devonianum*, in which a series of in situ symbiotic seed germination trials base on conspecific fungal isolates were successfully conducted at two sites in Yunnan Province, China. The new restoration technique will have broad applications in horticulture for the conservation of the Orchids.

Seedlings of Dendrobium devonianum by in situ symbiotic seed germination

Public Education

Photo by ZHU Ren-Bin


Facts(2016):
Facts(2017):
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
770,283
758,766
207,786
202,932
88
90
3,890,220
4,136,358
Total annual visitors to the Garden
Total annual visitors to the museum
Special educational programs
Total annual hits to the Garden website

Advancement of Quality Training Programs

In 2017, XTBG organized more than 20 training programs, including such major ones as Advanced Fieldcourse in Ecology and Conservation (AFEC), Environmental Education Research and Practice Training, Nature Education Training for Elementary and Secondary School Teachers, and Environmental Interpretation Training for Tour Guides from Eco-Tourism Attractions. AFEC is an international training program for young scientist and students working on ecology and conservation. Of the 86 applicants, 29 were accepted. They were from Myanmar, Thailand, Nepal, India, Pakistan, Sri Lanka, Singapore, Philippines, Indonesia, Bangladesh, and China. The Environmental Education Research and Practice Training program aims to improve environmental education practitioners' theoretical understanding of the field and their research capability, which could in turn contribute to better environmental education practice. Enrolled in the program were 26 applicants from universities, NGOs, foundations, nature education organizations, and botanical gardens. Similarly, the Nature Education Training program also intends to bring about better nature education practice, with an emphasis on close collaboration with school education system. 25 school teachers from Yunnan Province joined in and completed the training. The Environmental Interpretation Training program targets tour guides, who play an essential role in influencing tourists' experiences in nature attractions. 37 tour guides, representing parks, nature reserves, botanical gardens and travel agencies, participated in the training. In addition, to answer the need of SEE (Society of Entrepreneurs & Ecology, a nationally renowned conservation organization), XTBG coordinated a nature education training for SEE's partners. All these programs had a total of over 460 participants from more than 10 countries. The number of applicants, the enrolment rate, and the post-training surveys had shown an increase of the training programs' popularity and impact.

Nature Education Training for Elementary and Secondary School Teachers

Luosuo River Science Education Forum, Pooling Resources across Fields

a) Forum speech
b) The group photo of Science Education Forum

July 13 and 14, XTBG held the 2nd Luosuo River Science Education Forum, themed "Create together and Share. Science Education under cross-field innovation." Involved in the forum are over 100 participants from organizations affiliated with Chinese Academy of Sciences, botanical gardens, publishers, colleges, elementary and secondary schools, and civil nature education organizations. They discussed the new trends of science education development under cross-field innovation throughout the 4 plenary sessions and 18 sub-forum sessions. Major topics discussed during the forum included integrated development of formal and non-formal education, conservation education and citizen science, art and environmental education, and science outreach in the era of new media. This forum had become an important platform for advancing high-end scientific research's outreach plan and "Science and China" science education plan, and for promoting consensus across fields.

Youth Science Festival, Bridging the Gap between Scientists and the Public

May 20-22, XTBG held the 2nd Botanical Garden's Youth Science Festival, exhibiting to the public its latest scientific achievements via posters, science equipment, and face-to-face communication. The festival engaged more than 2000 participants, including XTBG's researchers, middle school students from Xishuangbanna, and tourists. Meanwhile, XTBG worked with China Central Television, and launched a live webcast, bringing scientific researchers and the public closer to each other, and enhancing the public's understanding of science. The festival had made a positive impact both on-spot and online.

a) Talking about the conservation of green peafowl
b) Talking about Beehotel
c) Researcher interviewed by CCTV online

Tropical Rainforest Eco Culture Exhibition Toured to Chongqing

a) Hand-on activity with the students
b) Press conference for the Exhibition

From September to October, XTBG collaborated with Chongqing Nanshan Botanical Garden on a Tropical Rainforest Eco Culture Exhibition—"Rainforest Fairyland, Unique Xishuangbanna." This exhibition had 178 real-object items of 109 sorts on display, and almost 1000 exquisite photos of Xishuangbanna tropical rainforest and folk culture. In the exhibition hall, interpreters provided specialized interpretation for the public to understand the significance of tropical rainforest and biodiversity conservation. The exhibition had also attracted local media cover, leading to a wider influence on the society.

Marathon Widened Environmental Education Audience

September 16, XTBG held a marathon during the National Science Outreach Day. Themed "Run into A Greener Future," the marathon attracted 262 contestants, including some celebrities and business elites. To highlight this marathon's characteristic, to combine marathon with environmental education, XTBG also organized for the contestants a conservation talk, an environmental education activity and a night hike after the marathon. Furthermore, XTBG hosted a cross-field dialogue on the construction of ecological civilization, where representatives of the contestants joined with XTBG's scientific researchers to discuss how scientific research and marathon may come together to encourage the public to contribute to the construction of ecological civilization.

a) Marathon runners
b) Cross-field dialogue

Hairy-footed Flying Squirrel Made It to China Central Television News

March 10, China Central Television News broadcast XTBG's discovery of hairy-footed flying squirrel (*Belomys pearsonii* Gray) in its rainforest. According to available information, hairy-footed flying squirrel is the single species in the genus of Belomys. It has a small population, and was red listed by IUCN in 2008. Due to its nocturnalism and secretive life habits, it was understudied in the scientific community, whether via text or image. Hairy-footed flying squirrel can be found and can breed successfully in rainforest below the altitude 600m. This news sparked widespread attention from the public, with the highlight of how XTBG promoted ecosystem holistic conservation through the protection of endangered plants.

9 Steady Progress of Summer and Winter Camps

In 2017, XTBG received a growing number of summer and winter campers. The 1469 participants came in 43 different groups, and stayed 2-5 days in XTBG for camps featuring nature experience and scientific inquiry. The science inquiry camps added a new activity this year—"Challenge Scientists," where scientific researchers and middle school students came together to discuss science. The researchers were impressed by the students' rich knowledge and acute thinking. XTBG also saw an increase of partners for its nature experience camps. Such increase was not just in quantity. It also referred to the expansion of places from which they came, an expansion from major cities to medium and small-sized cities, such as Wuhan, Chengdu, Qingdao, Zhengzhou, Shenzhen, and Dali.

Into the rainforest

Partnership

Photo by ZHU Ren-Bin

Domestic

XTBG and Yunnan University jointly set “Elite Class for Ecology Studies”

An “Elite Class for Ecological Studies” will be jointly set up by XTBG and Yunnan University, according to a signing ceremony in Kunming on June 18.

As representatives of the two sides, director Chen Jin of XTBG and vice principal Yang Zeyu of Yunnan University signed the cooperation agreement.

a) The signing ceremony
b) Representatives of the two sides pose a photo

According to the agreement, XTBG and Yunnan University are to jointly set up platform for talent cultivation and scientific research, by giving full play to each advantage. Training programs will be provided to promising students majoring in Ecology studies.

For the elite class, the team of lecturers will be composed of professors and associate professors from the two sides. Training programs, multidisciplinary lectures, scholarships will be provided to promising students majoring in Ecology studies.

XTBG and Yunnan University have stablished close ties over the past decades. With establishment of the elite class, the ties will be closer. The two sides aim to contribute more to ecological civilization of China.

The “elite class” is a response to the “Science and Education combined with Cooperative Education *Action Plan*” by Chinese Academy of Sciences (CAS) and Ministry of Education.

XTBG and Pu'er College renew strategic cooperation agreement

On January 8th, XTBG and Pu'er School held a meeting, Chen Jin, director of the XTBG, Li Hongwei, party secretary, Hu Huabin, secretary of the Disciplinary Committee, and Mao Baoxiang, party secretary of the Pu'er Academy, and Dean Cheng, were present at the meeting.

XTBG and Pu'er Academy have a long-term basis for good cooperation. The two sides have continued to innovate in cooperation in running schools and personnel training models. Talent cultivation has achieved remarkable results and has shown distinct characteristics in running schools. At the meeting, the two sides fully affirmed the effectiveness of the cooperation in running schools. At the same time, they conducted in-depth discussions on the applied talents of this specialty, the cooperation of the institutes, and the training of professional masters.

a) Meeting venue
b) Signing the Strategic Cooperation Agreement

In order to promote the construction of Pu'er National Green Economy Experimental Demonstration Zone and promote regional biodiversity conservation and scientific development, the two sides held talks and reached consensus on scientific and technological cooperation, personnel training and exchanges.

Based on the detailed cooperation plan, the two sides renewed the "strategic cooperation agreement" to further deepen cooperation in running schools and cultivate more competitive applied talents.

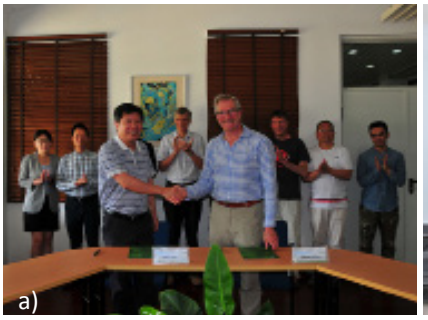
XTBG Signs Strategic Cooperation Framework Agreement with Yunnan Plant Pharmaceutical Co., Ltd.

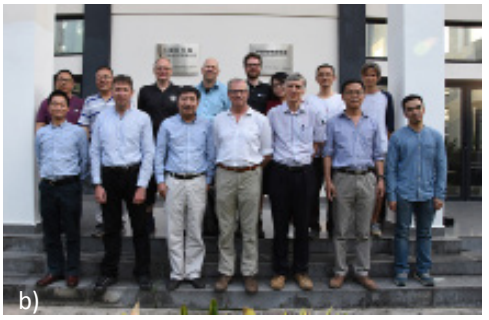
On the afternoon of March 13, XTBG and Yunnan Plant Pharmaceutical Co., Ltd. signed a strategic cooperation framework agreement in Kunming. Professor Chen Jianghua, assistant to director of XTBG, researcher Cai Chuantao of the medicinal plant cultivation technology research group, Guo Yu, deputy general manager of the Yunnan Plant Pharmaceutical Co., Ltd., Huang Chunqiu, vice president of the research institute, and Li Zhentai, director of the plant resources research department attended the meeting. At the meeting, Prof. Cai Chuantao and assistant professor Liu Guizhou introduced the "Preliminary Study on the Status and Molecular Identification of the Rare Medicinal Plant Brachypodium przewalskii Resource" and the "Study on the Investigation and Artificial Breeding of Rare and Medicinal Plants of the Wild Rare Kidney Tree". At present, the cooperation with Yunnan Plant Pharmaceutical Co., Ltd. is ongoing. The two sides exchanged views on the current status and application prospects of the two wild plants. Guo Zhen fully affirmed the work done by the XTBG on the two plants, the fern and the false-kidney. Chen Jianghua also introduced the personnel advantages and research platforms of XTBG, and expressed that there is a broad space for cooperation with Yunnan Botanical Pharmaceutical Co., Ltd. in the subsequent development of related products. Subsequently, Chen Jianghua and Guo Zheng signed the agreement on behalf of both parties. According to the agreement, the two sides will cooperate in the collection of resources for endangered medicinal plants and medicinal herbs, the establishment of standardized cultivation systems, personnel training, and joint construction of research platforms. The signing of the framework agreement will help promote the transformation of scientific research results in XTBG into production applications.

Representatives of both parties sign a cooperation agreement

International

Scotland


a)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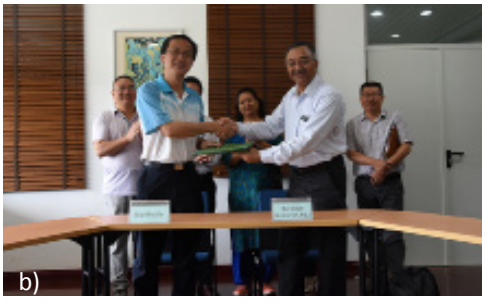
a) Prof. Chen Jin and Prof. Simon Milne sign the MoU
b) Representatives of the two sides pose a photo

A memorandum of understanding (MoU) was signed between Royal Botanic Garden Edinburgh (RBGE) and XTBG on April 9. The two sides will have comprehensive cooperation from 2017 to 2012, with the agreement.
According to the MoU, the two sides will cooperate in species reintroduction/ translocations, combining horticulture, science, practical conservation and public engagement. They will jointly apply for funds, carry out training /education programs, and share experience on botanic garden management and profile development. The two sides will also share information on strategic development of responses to emerging plant health threats, and jointly explore opportunities for distributed ex situ collections. Furthermore, they will have joint expeditions and support plant material exchange for horticulture, research and conservation.
The MoU was signed during a visit of Prof. Simon Milne and his companions to XTBG. During their stay at XTBG, the RBGE delegates delivered lectures and held discussion with XTBG researchers.


a)


b)

a) The two sides have discussion
b) The two sides sign a MoU

India

Prof. Ravinder Kumar Kohli, vice chancellor of Central University of Punjab, India, paid a visit to XTBG during May 30 and June 1. A MoU was signed between the two sides.
According to the MoU, the two sides will collaborate to promote and carry out ecology, plant resources, and *biological conservation* related researches. The potential joint work includes exchange of staff and students, scientific literature, information and methodology, acquiring grants, etc.
The two sides will explore options for collaboration in the field of forest ecology, evolutionary ecology, climate change, biodiversity conservation, biological invasion, etc. They will also strengthen collaboration on savanna ecosystems, resource plants and sustainable use.
During his stay in XTBG, Prof. Ravinder Kohli had discussion with XTBG researchers. He also delivered a lecture entitled “Alien Plant Invasion: Ecological Impact in India”.

Lao PDR

Program Office of SEABRI to be established in Lao PDR

XTBG and Biotechnology and Ecology Institute (BEI) of Lao PDR are to collaborate to promote cooperation in human resource development and capacity building, biodiversity and ecosystem research and conservation, sustainable management of national resources, technology transfer and application and academic exchange, according to a MoU signed on August 17.

XTBG and BEI will further jointly conduct biological and biodiversity inventory in those conservation strategic areas and least scientific known areas, such as Savanna, dry/mixed-Dipterocarp regions in Lao PDR, and trans-boundary regions between Lao PDR and China.

The two sides will cooperate in sustainable management of national resources, technology transfer and application. They agree to jointly build a 25 to 50 hectare tropical rainforest permanent research plot in a proper site of Lao PDR.

Moreover, the two sides will collaborate in academic and scientist exchange, on-site training courses, and exchange of information and publications, etc.

CAS president Bai Chunli and other leaders witnessed the signing ceremony of the MoU.

Chen Jin and BEI sign MoA

During the visit of Lao delegation at XTBG, a MoU was also signed between University of Chinese Academy of Sciences (UCAS) and Department of Personnel (DoP) of Lao MoST.

The Lao delegation also visited living collections and scientific facilities of XTBG and communicated with neighboring villagers.

XTBG and University of Bristol sign MoU

A MoU was signed between University of Bristol and XTBG on October 25. As representatives of the two sides, Prof. Paul Jonathan Valdes and Prof. Chen Jin signed the agreement.

According to the MoU, the two sides will join hands to improve talent training and scientific research. They will also enhance exchange visits of researchers and students; jointly conduct studies on environmental change, variation of biodiversity, and conservation biology.

Present at the MoU signing ceremony were Profs. Hu Huabin, Richard Corlett, Zhou Zhekun, Xu Zengfu, Fu Yun, Dan Lunt, Dr. Su Tao, and others.

Prof. Chen Jin and Prof. Paul Jonathan Valdes sign MoU

Bristol is one of the most popular and successful universities in the UK and was ranked within the top 50 universities in the world in the QS World University Rankings 2018.

Talent Training and Team Building

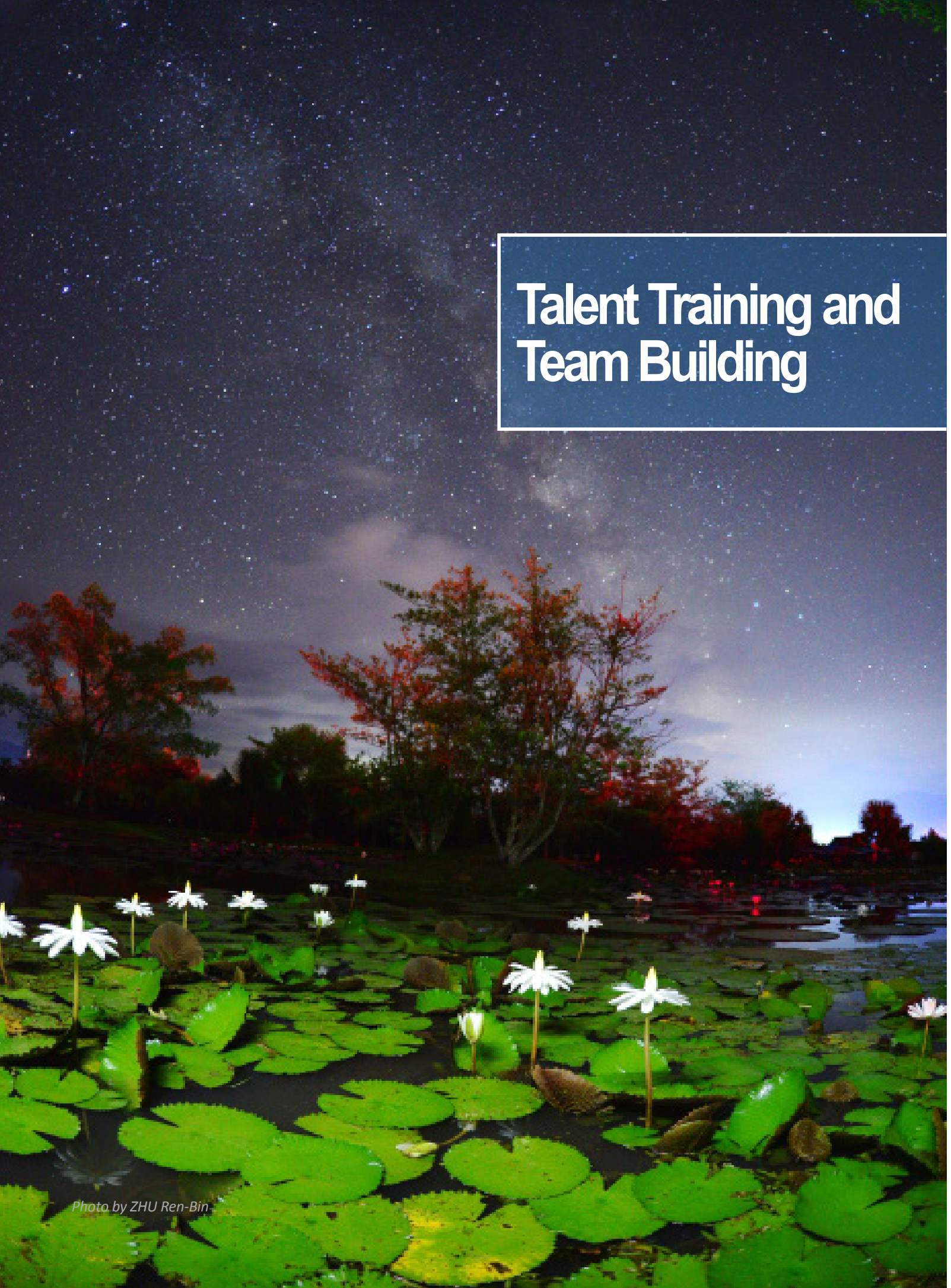


Photo by ZHU Ren-Bin

Postgraduate Education

Excellent Doctoral Dissertation Award


证书

张 帆：

您的博士学位论文《碳基磁性催化剂制备及其催化合成生物柴油绿色工艺研究》，被评为2017年度中国科学院优秀博士学位论文。特发此证，以资鼓励。

The University of Chinese Academy of Sciences (UCAS) announced the winners of the Excellent Doctoral Dissertation 2017 and Excellent Tutor 2016 on September 22. The thesis written by Zhang Fan, a Ph.D graduate of XTBG, was awarded the CAS Excellent Doctoral Dissertation Award 2017. Zhang Fan's work focuses on the study of green production of biodiesel concerning these issues. The catalysts and process combined with reactors proved their potential application in industry for the green production of biodiesel and hydrogen.During his doctoral studies, Zhang Fan has published his research in such journals as *Green Chemistry, Applied Energy, Energy Conversion and Management, etc.* He also got 6 patents.


Zhang Fan


Chen Yajun


Fan Yongli

According to an announcement by Yunnan Provincial Department of Education, the dissertations of Dr. Chen Yajun and Dr. Fan Yongli are two of the 35 doctoral dissertations enlisted in the 2017 Provincial Excellent Dissertations of Yunnan. Chen Yajun's doctoral thesis is entitled "The water-use characteristics of tropical lianas and the comparison with co-occurring trees". Fan Yongli's doctoral thesis is entitled "Reproductive adaptation in gingers (Zingiberaceae): anther-stigma cooperation matters".

Dr. Wang Houping receive CAS President Award


Wang Houping

Dr. Wang Houping of XTBG were on the list of laureates for 2017 CAS President Award. During his studies in XTBG, Wang Houping entered XTBG in September 2012 to pursue a master's degree, and in March 2015 he became a doctoral student. During his study, he published four papers with the first author in journals such as *Molecular plant, Plant physiology,* etc.

The President Awards are the top honor for graduate students at Chinese Academy of Sciences (CAS). Receiving of this award reflects the improvement in innovation capability and training quality of graduate students at XTBG.

Graduates and teachers pose a photo

Graduation Ceremony 2017

Congratulations to the graduates of XTBG for the successful completion of their studies! This year, the graduation ceremony fell on June 15, a time to get together with family, friends and colleagues to acknowledge their success before moving on to the nexr phase of their career.

On the morning of June 15, the outgoing students in their gowns of master degree or doctoral degree planted a tree for memory in front of the students' apartment. They just followed the tradition as their alumni did.

The graduation ceremony and degree awarding was held in the afternoon, presided over by Prof. Liu Wenyao. All students and supervisors gathered together to celebrate the "big day" of the graduating students, to celebrate their academic achievement, to honor their hard work and dedication.

Prof. Chen Jin, director of XTBG, addressed the graduation ceremony. He talked about "insistence, choice, share, and experience", expressed his expectations and good wishes to the graduates.

As teacher representative, Prof. Peng Yanqiong sent warm congratulations to graduates on their successful completion of studies. Graduate representatives reviewed the joys and sorrows of studying in XTBG, and spoke out their feelings and expressed their heartfelt gratitude to their teachers. Prof. Chen Jin moved the tassel of the caps of every graduate to the right place. He also posed photo with every outgoing graduate. At last, the graduates sang "Our garden, our home" in chorus, to express their love of the garden. The audience expressed congratulations to all graduates of doctoral or master's degree amid enthusiastic applause. A farewell evening party was held, which was filled with laugh and applause.

Outgoing graduates and their teachers plant a tree for memory

Talent Training

Advanced Fieldcourse in Ecology and Conservation - XTBG 2017

From 12 October to 23 November 2017, XTBG held the Advanced Fieldcourse in Ecology and Conservation - XTBG 2017 (AFEC-X 2017). In total, 86 students and young researchers from 53 organizations in 15 countries applied for the course, and finally 29 applicants from 14 institutions in 8 countries were accepted.

AFEC-X 2017 had five components, i.e. Lectures and practicals, Student's own work presentation, Field trips, Independent projects, and Course symposium. During the whole course, 28 staffs and students (mainly from XTBG) were teaching and assisting the course. Professor Richard Corlett, Alice Hughes, Kyle Tomlinson and Akihiro Nakamura were the core instructors. Jing-Xin Liu was the coordinator.

Students learned Conservation science and ecosystem red-listing, Academic skills (How to find, manage and effectively read a paper; Powerpoints and CV skills), Climate change ecology, Biodiversity science (insects, vegetation, birds, bats), Tropical environments and ecosystems of east Asia, Techniques in ecology and conservation (species distribution modelling, using fossils and tree rings to study past climate, drones, camera traps, thermal cameras, pollination ecology methods, plant functional traits), Soil ecology, Statistics with R and experimental design, Scientific writing. Participants also made a two-day trip to visit XTBG's 20 ha permanent plot and Canopy crane to get to know how the plot was setup and maintained, and how to carry out canopy ecology work, during the field trip two group projects were carried out, i.e. Herbivory difference of Canopy trees and Lianas, Bird community and diversity difference between forest and nearby rubber plantations.

a) Group photo
b) XTBG Director, Prof. Jin Chen with the best research group members

On Nov. 23, a symposium was held to present the findings of the independent research projects. Each student group's performance was evaluated by a panel of judges composed of Richard Corlett, Alice Hughes, Kyle Tomlinson, Mareike Roeder, Aki Nakamura, Hua Lin, Jin Chen, Hua-Bin Hu, Xiao-Dong Yang, Yan-Qiong Peng, and Jian-Wei Tang. The best research project award went to "Ant community dissimilarity explain high predation pressure on dummy caterpillars during early night" completed by Xiang Liu from Fudan University, Zheng-Hong Wang from Kunming Institute of Botany, Chen-Yu Huang from Shanxi University, Man-Ru Li and Farkhanda Bibi from XTBG. Afterwards, the participants received certificates from the judges.

AFEC-X is mainly supported by XTBG. This year it was also funded by Bureau of International Co-operation Chinese Academy of Sciences, Bureau of Personnel Chinese Academy of Sciences, and University of Chinese Academy of Sciences Education Foundation.

XTBG Summer Camp 2017 for Outstanding College Students completed

The 2017 XTBG Summer Camp for National Outstanding College Students was held successfully from August 1 to 7. The summer camp was aimed to promote the communication of the outstanding students from colleges and universities around the country, and provide more chances for them to learn more about plant sciences and ecology.

a) The campers sing Our Garden, Our Home in chorus
b) Group photo

At the opening ceremony of summer camp on August 1, the campers (69 undergraduate students from 30universities across the country) sang the XTBG song “Our Garden, Our Home” in chorus. Prof. Chen Jin, director of XTBG, delivered a welcome speech at the opening ceremony.

Afterwards, XTBG CPC Secretary Li Hongwei expressed a warm welcome to all campers and gave a brief introduction to the development of the Garden. He hoped the campers have a better understanding on XTBG and its graduate study. He also encouraged the undergraduates to approach scientific research and connect nature.

The camp extends a tradition of excellence to outstanding college students through a-week-long activities including visit, study, communication, lectures, and other activities to approach and understand XTBG.

The campers listened to 17 academic lectures which were given by professors Yu Diuqiu, Li Jie, Xu Zengfu, Harald Schneider, etc. All of these teachers have indicated some current status and future of plant sciences and ecology and helped the participants to learn more about the fields better.

During the interview process, the participants talked with the teachers face to face and knew more about their majors. Then, they got the chance to visit the laboratories and learned a lot there.

The campers also visited field stations and the canopy crane at Bubeng.

At the closing ceremony on August 5, representatives of teachers and campers expressed their feelings and wishes. Profs. Zhang Jiaolin, Yu Diqiu and Hu Yanru issued certificates of completion for the students.

CUBG Environmental Education Training Course 2017 completed

The two-week-long environmental education training course 2017 of the Chinese Union of Botanical Gardens (CUBG) came to a successful end on August 19, which is marked by 11 interesting oral presentations by trainees.

26 trainees involving environmental education from botanical gardens, non-governmental organizations (NGOs), and universities got certificates of completion from Prof. Chen Jin, director of XTBG and current chairman of CUBG.

This is the fifth session of the Environmental Education Training Course which is initiated by CUBG and held annually in XTBG since 2013.

Basic theories and methods of environmental education studies, statistical analysis, literature comprehension, small research projects, etc. were main contents of the training course.

Prof. Chen Jin delivered lectures, discussed with trainees, and guided through the whole course.

Prof. Peter Higgins, a professor with University of Edinburgh and chair in Outdoor and Environmental Education, was invited to teach within and improve practice in outdoor, environmental and sustainability education.

Prof. Zhang Zichao shared experience and case studies of environmental education in Taiwan.

Dr. Credic Tan from University of Oxford was another invited lecturer. He shared methods of entailing innovative teaching and outreach in conservation and research into the effectiveness.

Prof. Kyle W. Tomlinson and Mr. Wang Ximin also guided the whole course.

Divided into 11 small groups, the 26 trainees raise scientific questions, design experiment, collect data, and analyze data. Afterwards, they presented their results to a 5-person expert panel on August 19.

The presentation entitled “Are tiger moms more prone to environmental protection? A study on the interrelationship of childbearing attitude and environmental awareness” won the first prize.

a) Prof. Chen Jin delivers a lecture
b) Teachers and trainees pose a photo

The presentations by the trainees were exciting and won praise from the training specialists, which marked the training course a success.

In his closing remarks, Prof. Chen Jin called for the trainees to form teams to conduct environmental education, with proper theoretical guidance. He also encouraged the trainees to conduct environmental education as profesionals, with professional methods.

Team Building

Wu Junen funded by China Postdoc Innovation Talent Supporting Program

According to an announcement by National Postdoc Management Committee, 300 newly graduated Ph.D students or soon-to be graduated Ph.D students will be funded by the China Postdoc Innovation Talent Supporting Program. Wu Junen, who is to graduate from XTBG is on the name list. Wu Junen, under the guidance of Prof.Liu Wenjie, will receive a fund of 600,000 RMB for his postdoc studies in two years. During his studies in XTBG, WU Junen has shown excellent science potential and academic morality and engaged in life science research. He has got his research results published in *Journal of Applied Ecology, Agriculture, Ecosystems & Environment, Scientific Reports*, etc.

Wu Junen

10 Scientists of XTBG were approved by CAS "Light in Western China" Project

After the approval of CAS Personnel Bureau, 10 scientists in XTBG (Prof. Tan Ken won "Introduction of Western Talents"Project; Song Liang, Hu Yuehua, Chen Hui won A category for "Western Young Scholar", while Wang Houping, Song Xiaoyang, Liu Qiang, Han Tingshen, Huang Jian, Li Yang won B category for "Western Young Scholar"), were approved by CAS "Light in Western China" project, in total of 4.8 million Yuan.
By the end of 2017, 104 scientists in XTBG had received funding from the "Light in Western China" project, totaling 20.44 million Yuan.

Photo by HUANG Tian-Ping

New members of Youth Innovation Promotion Association, CAS

a) Jiang Xiaojin
b) Meng Honghu

Dr. Jiang Xiaojin, Dr. Wang Houping and Dr. Meng Honghu were enlisted of the membership of Youth Innovation Promotion Association, CAS (YIPA). 2,400,000 Yuan was funded. YIPA is a non- profit youth academic organization approved by CAS in 2011. YIPA is aiming to bring outstanding CAS young scientists together, to improve their innovative and creative ability, thereby making more scientific progress to CAS and China.

Postdoctoral fellows received funding from China Postdoctoral Science Foundation

Dr. Wu Junen, Dr. Chen Zhangqi Dr. Mei Song and Dr. Ana Rita Peres Cardoso Gouveia etc. of XTBG received funding from China Postdoctoral Science Foundation, in total of 2,700,000 Yuan.

Richard Corlett attends Premier Li Keqiang's meeting with foreign experts

China will continue to promote a new round of higher-level opening up to the outside world, Premier Li Keqiang said Friday. The statement came as Li had a discussion with over 70 foreign experts working in China prior to the Lunar Chinese New Year, which falls on Jan.28 this year.

Prof. Richard Colrlett, a British national and a high-end talent with XTBG, won Friendship Award by China's government in 2016. He was one of the 72 foreign experts who attended the meeting during which Premier Li listened to advice and suggestions from four experts on issues concerning nurturing talent, innovation, intelligent manufacturing and vocational education, and on how to elevate the influence of China's story. Prof. Richard Corlett submitted a proposal on establishing more nature reserves in tropical areas of China.

News Broadcast Report

Kyle Tomlinson wins 2017 Yunnan Friendship Award

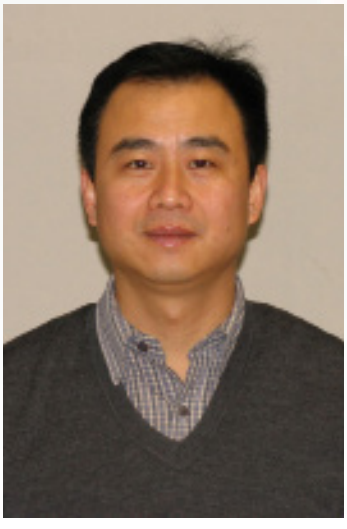
Prof. Kyle Warwick Tomlinson of XTBG is on the list of the 10 foreign experts who are honored with 2017 Yunnan Friendship Award, according to an announcement issued by Yunnan Provincial Government in October.

Yunnan Friendship Award is the highest honor for achievement by a foreigner in Yunnan province. It is set up in 1997 by Yunnan government, which aims at praising foreign experts who have made outstanding contributions to the social and economic development of Yunnan Province in different aspects, such as agriculture, industry, technology, medical care, culture and education. It is the highest honor available for foreign experts in Yunnan.

Prof. Kyle Tomlinson is currently principal investigator of Community Ecology and Conservation Group at XTBG. He has published his research in such journals as *Annals of Botany, Journal of Ecology, Oikos, Philosophical Transactions of the Royal Society B,* etc.

a) Yunnan governor Ruan Chengfa confers medal to Prof. Kyle Warwick Tomlinson
b) XTBG CPC secretary Li Hongwei congratulates Prof. Kyle Warwick Tomlinson on winning the award

Prof. Li Jie wins the State Council Special Allowance



Prof. Li Jie of XTBG is approved to enjoy the 2016 State Council Special Allowance. The news is according to the latest list of special government allowance recipients from the State Council which was announced by the Ministry of Human Resources and Social Security of the People's Republic of China. Prof. Li received 20,000 Yuan tax-free allowance from the central government.

Prof. Li Jie is now leader of Plant Phylogenetics & Conservation Group. He has been engaged in studies of plant phylogenetics, biogeography, flora, DNA barcoding of plants, plant conservation, etc for many years. Prof. Li got his studies published in many international peer-reviewed journals. He has supervised a batch of young researchers, made outstanding achievements in both scientific research and talent training.

Visits

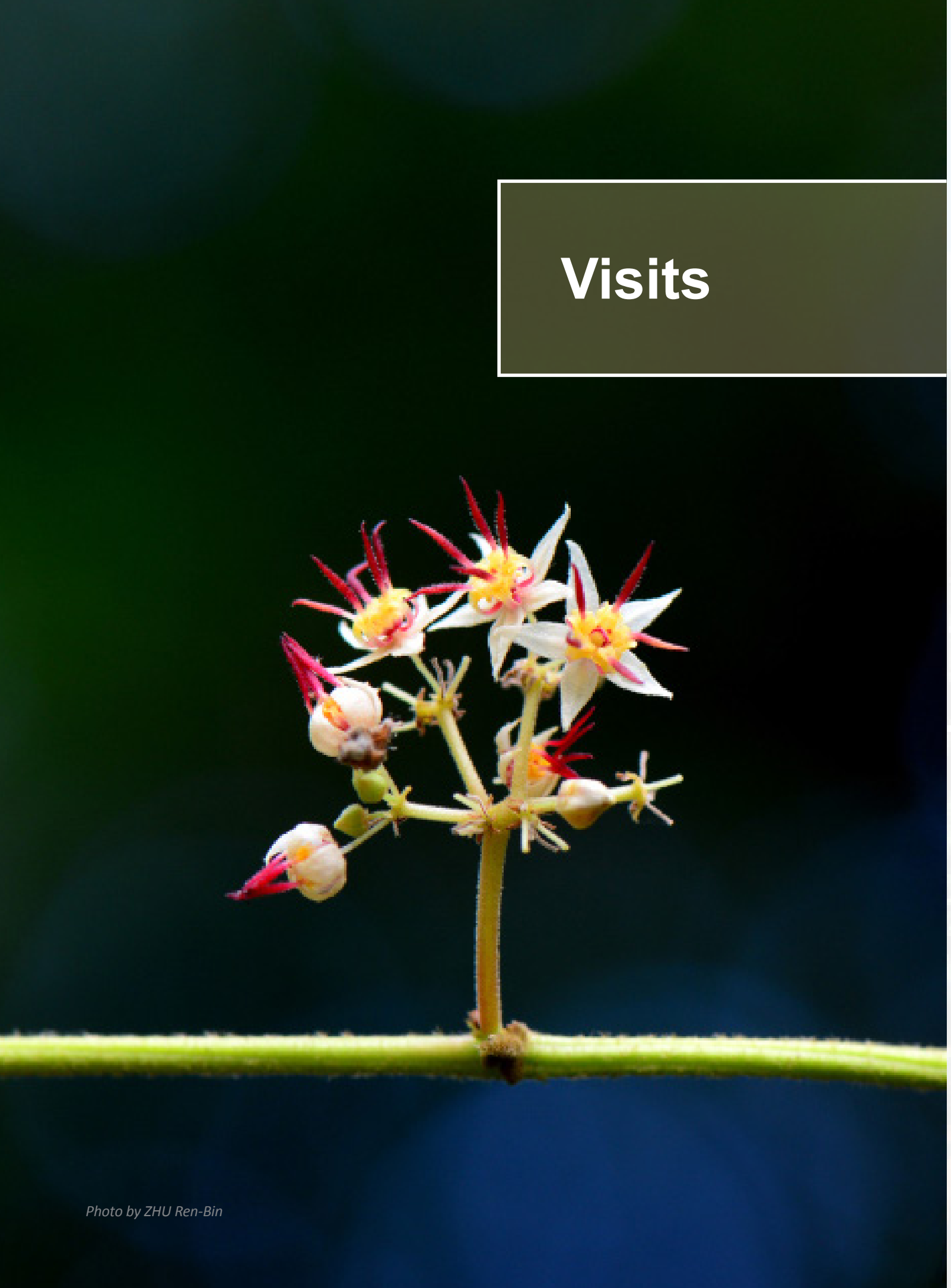


Photo by ZHU Ren-Bin

Yunnan CPC Secretary Chen Hao inspects XTBG

Mr. Chen Hao, the Communist Party Secretary of Yunnan province, paid an inspection tour to XTBG on May 13. His tour was accompanied by provincial and Xishaungbanna local officials.
The officials firstly visited the research center and living collections like Palm Garden, Medicinal Plant Garden, Vine Garden, and Flower Garden. They gave high praise for the campus construction and management of the Garden.

Prof. Hu Huabin, deputy director of XTBG, made a work report to the officials. His report focused on the progress concerning development of Menglun Tourism Township since Prof. Chen Jin has been appointed as director of the management committee of Menglun tourism town.
The report included the general master planning, protection of Luosuo River, protection of natural and historical heritages of Menglun, urban redevelopment, livelihood promotion, village development, etc.
Chen Hao said that priority support will be given to Menglun if its development meets the requirement of 'characteristic towns' (literally 'small towns with special characteristics', which are towns built around an identified industry theme. The towns are also built with great consideration to environmental protection and cultural preservation.).

Liu Ping researches progress of construction of tourism town in Menglun

On February 16th, Liu Ping, head of Yunnan Provincial People's Government and the head of the provincial government's tourism and cultural industry development supervision team, accompanied by Deputy Governor of Xishuangbanna Prefecture Lv Yonghe and others, visited XTBG for research and held a meeting.

Liu Ping highly affirmed the effectiveness of the pre-construction work in the Menglun Tourism Town: well-planned, well-structured, and well-financed plans laid a good foundation for the implementation of the requirements of the provincial party committee and the provincial government, especially the Secretary of the Chen Hao, in the town of Menglun. An important step has been taken.

Liu Ping emphasized that all good things begin with ideals and become a struggle. With excellent talents, we must have scientific ideas and advanced concepts to guide the actual actions of unremitting efforts to achieve a beautiful ideal, and then come up with outstanding results.

Liu Ping fully affirmed the strong research, management and leadership of the XTBG in the construction of the Menglun Tourism Town. He believes that Chen Jin's plan for the construction of the Menglun Township is both an excellent paper and a beautiful prose. It has far-reaching significance.

Secretary of the Party Committee of Kunming City, Cheng Lianyuan and his party investigated XTBG

From April 16th to 17th, Yunnan Provincial Party Committee Standing Committee, Secretary of Kunming Municipal Party Committee, and Yu Zhongyuan, Secretary of the Party Committee Working Committee of Jizhong New Area visited XTBG for research and held a meeting. Participating leaders fully affirmed the efforts and achievements of the XTBG in scientific research, species conservation, and science education. The two sides exchanged views on the construction of the XTBG and the work of the National Museum of Botany and conducted in-depth discussions.

Subsequently, Secretary Cheng Lianyuan pointed out in his speech that the construction of the National Museum of Plants will be led by the government and the Chinese Academy of Sciences will be the main force. The Chinese Academy of Sciences has concentrated on the most advanced scientific research and professional talents. The display of the National Museum of Botany is external, and scientific research is intrinsic fundamental. Therefore, its construction, including technical support and the maintenance and development of the later period, can only be done by scientific research units of the Chinese Academy of Sciences. To build a National Museum of Plants, we must develop great health based on the big ecosystem. The core sentence, serving the national strategy, focusing on the city's positioning in Kunming, and the development of a large health industry. The government must ultimately plan to integrate the power of the subordinate units.

Prof. W. John Kress, National Museum of Natural History, Smith Institute, U.S.A. Visits XTBG

From August 6th to 7th, at the invitation of Professor Chen Jin, director of the XTBG, Professor W. John Kress of the National Museum of Natural History of the Smith Institute of the United States visited XTBG.

On the afternoon of the 7th, Professor W. John Kress gave an academic report entitled "Beyond the Tree of Life: Scientific Collections in the Age of Biodiversity" at XTBG SEMINAR. First of all, he briefly introduced the history of the National Museum of Natural History of the Smith Institute in the United States. By comparing past and present sample types and research methods of museum collections, he analyzed the impact of climate change using new research methods at global and local scales. Changes in land use, extraction of natural resources, crop pests and diseases, shortage of agricultural products, and human coercion. Then it introduced in detail the techniques used by the Smithsonian National Museum of Natural History, such as sample digitization, image recognition technology, and DNA barcoding. These new technologies opened the door to widespread dissemination of biodiversity information. Finally, Professor W. John Kress reminded us that due to the degradation of natural habitats, more and more species are on the verge of extinction, and museum collections will continue to contribute to the discovery of species.

Prof. John Grace visits Xishuangbanna Tropical Botanical Garden

Funded by CHINESE ACADEMY OF SCIENCES PRESIDENT'S INTERNATIONAL FELLOWSHIP INITIATIVE, Prof. John Grace visited XTBG from February 27th to April 16th 2017.

Prof. John Grace is a celebrated specialist in forest flux, executive board member of Carbo Europe-IP, emeritus professor & senior research fellow of The University of Edinburgh, UK, former head of Institute of Atmospheric & Environmental Sciences, UK. He has published more than 300 research articles in peer-reviewed journals, including top journals such as Nature. He has written three books as sole author, edited or co-edited seven academic monographs.

One week before his departure, Prof. John Grace and all the members of Global Change Research Group held a meeting to discuss future collaboration between University of Edinburgh and XTBG. Both sides are looking forward to working closely on the research of climate change and related research fields.

Other Visitors

January

10 Dr. Terry townshend of Birding Beijing visited XTBG and gave a talk at XTBG Seminar and agreed to conduct the cooperative study.

17 Dr. Taku from Japan Society and Technology Agency visited XTBG and discussed the coorperation issues.

February

17 Prof. John Grace of the University of Edinburgh visited and conducts cooperative research on forest carbon and water fluxes and gave a talk at XTBG Seminar.

23 Prof. Robert A. Spicer from the Open University of the UK visited XTBG and collaborated with the Paleoecology Research Group to conduct research on the cooperation between Paleogene and Neogene fossils in Southwest China.

March

2 Dr. Becky shu chen of Zoological Society of London visited XTBG and gave a talk at XTBG Seminar.

8 Dr. William v. Bleisch of China Exploration and Research Society visited XTBG and gave a talk at XTBG Seminar.

10 Prof. Teresa Elizabeth Vernon of the Open University in the UK visited and studies the flora of the New Age.

15 Associate Professor Liang Naishen of the National Institute of Environmental Studies of Japan visited and conducted research on forest greenhouse gas cooperation.

16 Xu jianxiang of Nymphe imperial co.,ltd visited XTBG and gave a talk at XTBG Seminar.

22 Associate Professor Gaurav Srivastava, Institute of Botany of Ancient Botany, Birbal Sahni, India, visited and conducted cooperative research on Palaeoenvironment.

April

1 Dr. Marianne krasny of Cornell University visited XTBG and gave a talk at XTBG Seminar.

6 Dr.Ma kun of BGI Research Institute visited XTBG and gave a talk at XTBG Seminar.

7 Simon Milne, director of the world famous Edinburgh Royal Botanic Garden visited XTBG and signed MoU.

9 The Myanmar Flower Arts Association Pan Khet Khet and his party visited the "Orchid Exhibition" and "Dandan Race" to carry out work exchanges.

9 Bala kompalli of Royal Botanic Gardens, Kew visited XTBG and gave a talk at XTBG Seminar.

16 Prof. Pieter Zuidema and Frank Sterck from the Wageningen University in the Netherlands visited XTBG and visited the tree rings and plant physiology and ecology research group.

22 Chen liangbi of Hunan Normal University visited XTBG and gave a talk at XTBG Seminar.

May

1 Prof. Steven Russell Manchester of the University of Florida visited XTBG.

2 Dr. Gaurav Srivastava of Birbal Sahni Institute of Palaeobotany visited XTBG and gave a talk at XTBG Seminar.

11 Dr. Zhang shuang of Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences visited XTBG and gave a talk at XTBG Seminar.

15 Prof. Steven Russell Manchester of the University of Florida visited XTBG and Paleoecology Research Group to conduct research on the Cenozoic plants in Southwest China.

30 At the invitation of the Bureau of International Cooperation of the Chinese Academy of Sciences, Ravinder Kumar Kohli, vice president of the Central University of Punjab in India, visited XTBG and signed MoU.

June

1 Benjamin Blanchard from University of Chicago, USA visited and conducted cooperative research on insect behavior

6 Roderick w. Bouman of Hortus Botanicus and the Naturalis Biodiversity Center, in Leiden, the Netherlands visited XTBG and gave a talk at XTBG Seminar.

8 Dr. Zewei song of University of Minnesota, Twin Cities, Department of Plant Pathology visited XTBG and gave a talk at XTBG Seminar.

13 Dr.Raphael k. Didham of the University of Western Australia visited XTBG and gave a talk at XTBG Seminar.

15 Prof. Benjamin David Blanchard from the University of Chicago, visited XTBG and conducted academic exchange on tropical forest ecology.

16 Prof. Adam of Sun Yat-Sen University visited XTBG and gave a talk at XTBG Seminar.

20 Dr. Xing shuang of the University of Hong Kong visited XTBG and gave a talk at XTBG Seminar.

July

1 Prof. James Nieh from the University of California, San Diego, visited XTBG and conducted research.

4 Dr. Kevin s. Burgess of Columbus State University visited XTBG and gave a talk at XTBG Seminar.

7 Prof. Jan Peter Mayser, University of Bristol, UK, visited XTBG to conduct paleoenvironment research.

11 Prof. Jerry M. Baskin and Carol C. Baskin of the University of Kentucky visited XTBG and conducted seed functional traits in 20 hectare plots.

15 Prof. Ram Oren from U.S. Duke University visited XTBG to conduct data analysis, collaborate on new research experiments, and discuss future cooperation plans.

17 Prof. Ericska Cintulová from the Czech University of Life Sciences visited XTBG and conducted academic exchange on the diversity and function of termites in tropical forests

31 Prof. Juliano Sarmento Cabral from the University of Wuerzburg, Germany visited to conduct academic exchange on tropical forest canopy ecology.

August

1 Prof. Jens Gunter Rohwer from Hamburg University, Germany visited to carry out academic exchanges on taxonomy and phylogenetics of Polygonaceae.

2 Prof. Harue Abe from Niigata University, Japan visited for academic exchanges

6 Prof. Peter James Higgins, University of Edinburgh, visited and conducted academic research on environmental education.

7 Prof. Pia Pickenbrock of the University of Münster visited and exchanged the role of vines in the food web of forest ecosystems.

12 Cedric Kai Wei Tan from Oxford University in Singapore conducted environmental education research visit.

26 Dr. Yves Francois Basset from the Center for Tropical Research in Panama, came to work with the Young Canopy Ecology team to conduct joint research to monitor changes in insect diversity.

September

10 Prof. Lu Dengsheng from the Center for Global Change and Earth Observation at Michigan State University visited XTBG and exchanged ideas with the Global Change Study Group and gave a report on “XTBG SEMINAR”.

11 Dr. Shu-miaw chaw of Biodiversity Research Center, Academia Sinica (AS) visited XTBG and gave a talk at XTBG Seminar.

18 Researcher Xiao Qing of the Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences visited and accepted the hyperspectral imager and exchanged near-surface remote sensing research techniques.

30 Prof. Hans Kerp of the University of Münster in Germany and Prof. Feng Zhuo of Yunnan University visited the Paleontological Group Laboratory and discussed the cooperation of Tibetan flora.

October

1 Prof. Benjamin Paffhausen of the Free University of Berlin in Germany visited XTBG and carried out research on bee information exchange and cooperation.

6 Prof. Robert A. Spicer from the Open University of the UK visited XTBG and the Paleoecology Research Group to conduct research on the cooperation of the Paleogene and Neogene fossils in Southwest China.

12 Jan Mulder and his delegation participated in the International Symposium on Carbon and Nitrogen Water Cycle.

23 Thailand's Ministry of Science and Technology participates in the Mo Singto Collaborative Research Seminar.

20 The National Tropical Botanical Garden of the United States Michael Joseph De Motta visited the ex situ conservation of plants.

November

1 Dr. Katerina Sam of the Czech Academy of Sciences visited XTBG to implement the Sino-Science Science and Technology project. He also collaborated with the Young Canopy Ecology Team in a tropical forest plot and conducted a report at XTBG SEMINAR.

7 The French National Academy of Sciences Martine Hossaert-Mckey and his team visited XTBG and carried out the symbiosis system ecology of Eucalyptus urophylla.

21 Kiyotaka Hori, Kochi Prefectural Government of Japan, was invited to XTBG for academic exchanges.

December

8 Dr. Sam leslie of WWF visited XTBG and gave a talk at XTBG Seminar.

12 Dr. Antoine wystrach of French university visited XTBG and gave a talk at XTBG Seminar.

Photo by ZHU Ren-Bin

Financial Review

Income and Expenditure (Million Yuan)

	Categories	FY 2015	FY 2016	FY 2017
INCOME				
	Government Grants	49.974	64.922	65.255
	Infrastructure	0	0	0
	Admissions and Services	82.277	85.688	84.620
	Grants for Research	66.777	79.298	92.614
	Miscellaneous	2.374	3.475	6.790
	Sum	201.402	233.383	249.280
EXPENDITURE				
	Staff Costs	104.629	132.588	107.974
	Maintenance	4.329	24.097	7.768
	General and Admin. Expense	1.627	6.131	39.154
	Infrastructure	0	0	0
	Equipment	26.256	18.479	21.129
	Research and Horticulture	76.675	48.234	61.322
	Miscellaneous	0	0	0
	Sum	213.516	229.530	237.346

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