



# Annual Report 2016



**Xishuangbanna Tropical Botanical Garden  
Chinese Academy of Sciences**





Cover photos, anti-clockwise:

1. An individual honey bee responds to attack by hornet.
2. 2016 Annual Conference of XTBC.
3. Vice Premier LIU Yandong visited XTBC.
4. China-Myanmar established Biodiversity Research Institute unveiled in Nay Pyi Taw.
5. XTBC wins honor of Best Chinese Botanic Garden 2016—"Fenghuai Award".
6. The 1st Luosuo River Science Education Forum Held in XTBC.
7. Origin of Hainan Island





# **Annual Report 2016**

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Chinese Academy of Sciences

April 28, 2017

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.







## CONTENTS

<b>SCIENCE .....</b>	<b>2</b>
Project Development .....	4
Research Progress and Outreach Highlights .....	9
Improvement of Research Facility .....	25
Conferences and Symposia .....	28
<b>HORTICULTURE .....</b>	<b>34</b>
<b>PUBLIC EDUCATION .....</b>	<b>38</b>
<b>PARTNERSHIP .....</b>	<b>44</b>
Domestic.....	45
International.....	46
<b>TALENT TRAINING AND TEAM BUILDING.....</b>	<b>48</b>
Postgraduate Education .....	49
Talent Training .....	51
Team Building .....	54
<b>VISITS .....</b>	<b>58</b>
Other Visitors.....	62
<b>FINANCIAL REVIEW.....</b>	<b>64</b>
<b>PUBLICATIONS .....</b>	<b>66</b>



# Science



Photo by ZHU Renbin

In 2016, XTBG received 81.7 million Yuan in research funds from 80 new projects:

- 29 projects funded by the National Natural Science Foundation of China;
- 13 projects funded by Yunnan Provincial Fund for Natural Sciences;
- 3 projects funded by CAS “President’s International Fellowship Initiative” projects;
- 18 projects supported by other CAS program (including 2 STS projects);
- 27 projects funded by local government, enterprises and international agencies.

In 2016, XTBG researchers have achieved the following:

- 223 research articles published in internationally peer-reviewed scientific journals (Source Journals of ISI Web of Science);
- 3 published monographs;
- 3 authorized patents;
- 1 patented inventions;

# 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 as a preliminary research program in 2014, prominent progress has been made in 2016.

On 13<sup>th</sup> June, under the organization of the Bureau of International Cooperation, Chinese Academy of Sciences, the Second Session of the First Council of CAS-SEABRI was held in Kunming. The Council will have important role in guiding the development of the CAS-SEABRI.



*Discussed the key areas of the future work*

On 5<sup>th</sup> August, CAS-SEABRI conducted a project review in Kunming. The expert review group composed by the Academic Committee of CAS-SEABRI, and Zhihong XU, Academician of Peking University, served as the head of the assessment team.

On 12<sup>th</sup> October, CAS-SEABRI unveiled its official sign in Nay Pyi Taw. CAS president BAI Chunli and Permanent Secretary U Than Myint for Natural Resources and Environmental Conservation of Myanmar unveiled the sign. President BAI Chunli delivered an opening speech. Prof. CHEN Jin, director of Xishuangbanna Tropical Botanical Garden (XTBG), reviewed the process and achievements of CAS-SEABRI. Mr. U Khin Maung Ye, Permanent Secretary for Natural Resources and Environmental Conservation of Myanmar, expressed his belief that CAS-SEABRI will provide opportunity for Myanmar counterparts to improve their capacity.

The CAS-SEABRI was officially launched in August 2015. Prof. CHEN



*The unveiling ceremony*

Jin is named its director.

Since its inauguration, the CAS-SEABRI has set up four research groups, completed three large-scale field biodiversity investigations, collected 1500 plant specimens of 3500 accessions, observed records of bird and mammal species, and 10,000 photos using infrared thermal cameras, described 20 new plant species, 100 new spider species, etc.

Under the invitation of the Ministry of Natural Resources and Environmental Protection, Myanmar, Prof. QUAN Ruichang led delegates from XTBG, FRI and Staff of Putao NWCD office to conduct a biodiversity field survey in Hponkanrazi Wild Sanctuary, Putao County, Northern Myanmar, from April 23 to May 21, 2016. Headed up by Prof. QUAN Ruichang of XTBG, a 27-people team conducted the fourth field biodiversity in Myanmar







*Group photo of the biodiversity field survey in North Myanmar.*

during 26th Dec 2016 to 5th Jan 2017. The field survey is a part of regular work of CAS-SEABRI.

## “Full-cover conservation plan of native plant species in China” project

China is to launch a preservation program to cover all the country's plant species. The program, expected to last ten years and involve 94 of the nation's botanical gardens, will involve a thorough survey of existing plant species across China and catalog the findings accordingly, said CHEN Jin, director of XTBG under the Chinese Academy of Sciences.

According to CHEN, who is also president of the Chinese Union of Botanical Gardens (CUBG), China currently has over 192 botanical gardens but only around 66 percent of the country's indigenous plants are covered by conservation initiatives.

Only 34 percent of China's rare or endangered plant species are under proper protection, according to the evaluation of the first phase of the program, CHEN said, warning of low proportion protection and a lack of balanced protection of plants from different provinces.

The CUBG secretary JIAO Yang said the preservation program currently involves eight gardens from eight typical geographic

areas and targets most of the country's plant species.

The preservation program will carry out evaluations of different species' endangerment levels and identify priorities. It also includes public awareness projects.



*Phalaenopsis mannii, a critically endangered orchid species in Xishuangbanna*



*Begonia Linn.*

## Excellent Young Scientists Foundation "Palaeoenvironmental changes in the Qinghai-Tibetan Plateau and the evolution of biodiversity" from Bureau of Frontier Sciences and Education, Chinese Academy of Sciences

Associate Professor SU Tao from the Palaeoecology Research Group won an Excellent Young Scientists Foundation entitled "Palaeoenvironmental changes in the Qinghai-Tibetan Plateau and the evolution of biodiversity" (No. QYZDB-SSW-SMC016) from Bureau of Frontier Sciences and Education, Chinese Academy of Sciences. The duration of this project is August 2016 to December 2020 and the total amount of the project is 2.5million RMB (0.5 million RMB per year). The aim of this project is to integrate several lines of evidence, including palaeobotany, chronology, geochemistry and modeling, to understand the evolutionary history of biodiversity under the Cenozoic's dramatic palaeoenvironmental changes in the Qinghai-Tibetan Plateau and areas nearby.

The evolutionary and biogeographic histories of plants have been dramatically shaped by environmental changes throughout geological time. The Qinghai-Tibetan Plateau, the highest plateau in the world with average altitudes of greater than 4,000 m, underwent dramatic tectonic activity throughout the Cenozoic, which not only shaped the topography of eastern Asia, but also had profound influence on regional and even global climate patterns. Consequently,

palaeoenvironmental changes in this region greatly contributed to the diversity of plants there. Today the Qinghai-Tibetan Plateau, especially to the southeast and surrounding regions, is one of the world's modern biodiversity hotspots. Fossil records provide solid evidence for the biodiversity history of living creatures on earth; however, well-preserved fossil floras uncovered in the core areas of the Qinghai-Tibetan Plateau are still rare, preventing us from exploring the interesting scientific question mentioned above.

During the last decade, Dr. SU Tao and his colleagues have studied plenty of Cenozoic floras and associated palaeoenvironments from the southwestern margin of the Qinghai-Tibetan Plateau. Their research results



*a) Field work in Lunpola basin, central Tibet*

*b) A workshop was held in December 2016, Xishuangbanna. Colleagues from XTU and Vietnam National Museum of Natural History joined in this workshop to discuss cooperation in the near future.*





indicate the intensification of the monsoonal climate strongly shaped modern biodiversity patterns there. Meanwhile, they have been in high altitudes of the Qinghai-Tibetan Plateau to do field work for more than ten times, and many fossil floras ranging from Paleocene to Pliocene were found with excellent preservation conditions in core areas of the plateau. During 2016, more than 1,000 pieces of fossil specimens were collected by themselves. Meanwhile, a workshop was held in November 2016, to initiate joint cooperation on palaeofloras in the north part of Vietnam. The results stemming from

these floras will provide pivotal evidence for the biodiversity history of Southeast Asia under the influence of palaeoenvironmental changes in the Qinghai-Tibetan Plateau.

## **"Assessment of the Conservation Effectiveness of China's Typical Nature Reserves" project**

The "Assessment of the Conservation Effectiveness of China's Typical Nature Reserves" project went smoothly in 2016. The project is jointly undertaken by XTBG and the Chinese Research Academy of Environmental Sciences (CRAES). Prof. CAO Min is the principal investigator in charge of the project. The project was officially approved in January 2016. On 21th March, the kick-off meeting of the new program was held in XTBG.

There will be 15 nature reserves separately submit an assessment report in this project. At present, 9 nature reserves have been identified, including the Shennongjia National Nature Reserve, Dinghu Mountain National Nature Reserve, Xilinguole National Nature Reserve, Shapotou National Nature Reserve, Xishuangbanna National Nature Reserve, Wuyishan National Nature Reserve, Yunwu Mountain

National Nature Reserve, Honghe National Nature Reserve and Changbai Mountain National Nature Reserve. In 2016, the first draft of the assessment report of five of the nature reserves had been completed, and an evaluation index system of nature reserves had been completed too.

The project aims to find out the existing management and protection issues in the nature reserve based on the assessment results of the protected areas. Under the guidance of scientific basis, we can develop a more reasonable and effective protection planning and measures in the future.



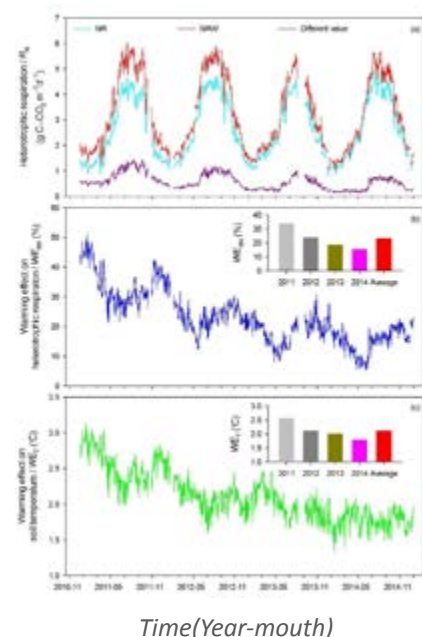
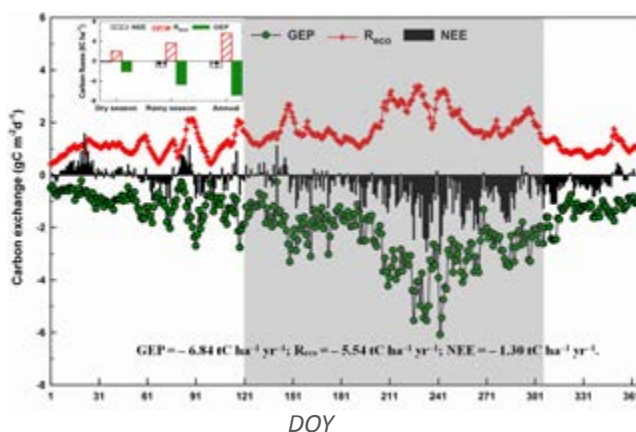
*Overall planning meeting*

## “Response of Yunnan's typical forests to climate change” project

The project of “Response of Yunnan's typical forests to climate change” is a four-year-project which was first launched in 2013. In 2016, the researchers have conducted experiments and fieldwork in different ecosystems. Markedly research progress has been achieved. Prof. ZHANG Yiping is the principal investigator in charge of the project. In this study, the eddy covariance technique (EC) and the biometric-based method (BM) were used to determine carbon exchange in a savanna ecosystem in Southwest China. The BM-based net ecosystem production (NEP) was  $0.96 \text{ tC ha}^{-1} \text{ yr}^{-1}$ . The EC-based estimates of the average annual gross primary productivity (GPP), ecosystem respiration (Reco), and net ecosystem carbon exchange (NEE) were  $6.84$ ,  $5.54$ , and  $-1.30 \text{ tC ha}^{-1} \text{ yr}^{-1}$ , respectively, from May 2013 to December 2015, indicating that this savanna ecosystem acted as an appreciable carbon sink. The ecosystem was more efficient during the wet season than the dry season, so that it represented a small carbon sink of  $0.16 \text{ tC ha}^{-1} \text{ yr}^{-1}$  in the

dry season and a considerable carbon sink of  $1.14 \text{ tC ha}^{-1} \text{ yr}^{-1}$  in the wet season. However, it is noteworthy that the carbon sink capacity may decline in the future under rising temperatures and decreasing rainfall. Consequently, further studies should assess how environmental factors and climate change will influence carbon-water fluxes.

As heterotrophic respiration (RH) has great potential to increase atmospheric  $\text{CO}_2$  concentrations, it is important to understand warming effects on RH for a better prediction of carbon–climate feedbacks. However, it remains unclear how RH responds to warming in subtropical forests. Here, we carried out trenching alone and trenching with warming treatments to test the climate warming effect on RH in a subtropical forest in southwestern China. During the measurement period, warming increased annual soil temperature by  $2.1^\circ\text{C}$ , and increased annual mean RH by 22.9%. Warming effect on soil temperature (WET) showed very similar pattern with warming effect on RH (WERH), decreasing yearly. Regression analyses suggest that WERH was controlled by WET and also regulated by the soil water content. These results showed that the decrease of WERH was not caused by acclimation to the warmer temperature, but was instead due to decrease of WET. We therefore suggest that global warming will accelerate soil carbon efflux to the atmosphere, regulated by the change in soil water content in subtropical forests.





# Research Progress and Outreach Highlights

## Center for Integrative Conservation





### Agreed criteria necessary to decide if and when to intervene in conservation

By consulting a large amount of literature, Prof. Richard Corlett of XTBG reviewed the strategies and discussed some of the options that have been suggested and identified the major research gap in modern conservation. All three strategies have a target of returning the area to a state more similar to that which existed in the past, before human impact. However, many environmental changes in recent decades and centuries are, in practice, irreversible. Climate change is an obvious example of this, but there have also been irreversible changes in the atmospheric composition, the soil structure and nutrient availability, and the flora and fauna, as a result of extinctions and species introductions. Past ecological conditions can be used as guide but conservation must look forwards, not backwards. The researcher found that many of the recently proposed interventions have been – and often still are – controversial and there is a danger that policy makers will pick actions from the expanding menu on grounds of cost, convenience, perceived ‘coolness’, or political acceptability, whereas the risks of

unforeseen consequences are overlooked. He suggests that the most important conservation debates in the coming decades will probably not be about baselines, targets, and techniques, but about if and when to intervene, and that agreed criteria to facilitate these decisions are necessary.

The researcher also suggested that it may be useful to develop a new vocabulary for the developing forward-looking conservation paradigms, rather than trying to stretch the meanings of terms that are inherently backward looking.

The study has been published with a title “Restoration, Reintroduction, and Rewilding in a Changing World” in *Trends in Ecology & Evolution*.

Period	Last interglacial c. 120 000 BP	Early holocene c. 6000 BP	Historical period 100–500 BP	The future 2030–2100
Land- scape	Diverse, abundant megafauna, more open habitats 	Extensive closed forest, restricted open habitats 	Less forest cover, low intensity agriculture 	Expanding forest cover, restricted open habitats 
Action	Introduce taxon substitutes for extinct taxa	Reintroduce extant large vertebrates	Restore traditional land management	Restore? Reintroduce? Rewild?

Historical and ecological continuity

Trends in Ecology & Evolution

Possible conservation baselines in Europe

## Medium-sized seeds have highest dispersal success by rodents

Researchers from XTBG and Institute of Zoology (IOZ) proposed a conceptual model to predict the dispersal success (i.e. seedling establishment) based on their



Seed fate pathways of the 8,460 tagged seeds of *Pittosporopsis kerrii* after seed placement at seed stations.



A scatter-hoarding rodent disperses seeds.

size in order to further understand how seed size affected seed fate at each stage, and subsequent dispersal success. They divided the dispersal process into two stages as pre-removal (at seed station or under parent tree) and post-removal (removed from seed station or from parent tree).

The researchers investigated the effects of seed size (measured as seed mass) on the seed fates from seed release to seedling establishment of a dominant plant *Pittosporopsis kerrii* (Icacaceae) dispersed by scatter-hoarding rodents in the Xishuangbanna tropical forest, Yunnan, southwest China over a five-year period. They aimed to test the hypothesis that large-sized seeds would have highest dispersal success because small-sized seeds are more likely predated while large-sized seeds are more likely dispersed. They further tested whether medium-sized seeds would have the highest dispersal success, due to differential rodent foraging preferences on seed size across different seed dispersal stages.

They found that seeds experienced conflicting pressures at pre- and post-removal stage. Small-sized seeds were more frequently eaten at early dispersal stage, while large-sized seeds were more likely to be eaten and pilfered (or larder hoarded) at late dispersal stage, which resulted in highest dispersal success of medium-sized seeds.

The study entitled “Differential foraging preferences on seed size by rodents result in higher dispersal success of medium-sized seeds” has been published in *Ecology*.

## Origin of Hainan Island

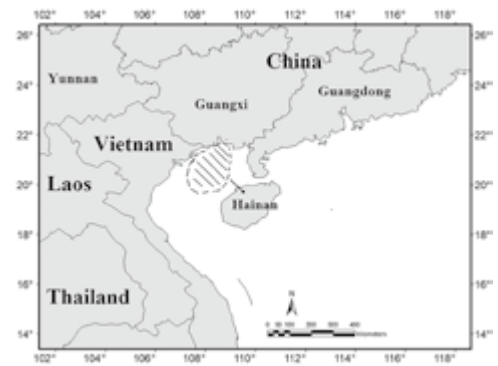
Both the continental or island origin of Hainan, and the Indo-Malaysian or East Asian affinity of its flora, are debatable. In this study, 196 families, 1283 genera and 3894 species of Hainan plants were recognized. Patterns of seed plant distribution were quantified at the generic and the family levels. The floras of Vietnam, and the adjacent Guangxi and Guangdong provinces of mainland China, were compared with Hainan. The results showed that the flora of Hainan Island is dominated by families and genera with tropical distributions. Among its floristic elements, tropical Asian distributions make up 23.85% of the total flora,

while East Asian distributions contribute only 3.74%. There are only 7 genera and c. 10% of species endemic to Hainan Island. The Hainan flora has strong similarities to the flora of Vietnam at the family and the generic levels, and also to the flora of Guangxi, but less with the adjacent Guangdong province. The main conclusions are: Hainan’s flora is tropical in nature with a strongly tropical Asian





affinity, and it has very low endemism at the generic and species levels, which implies a continental origin. We conjecture that Hainan Island could have been adjacent to northern Vietnam and the Guangxi at least in Eocene. This suggestion is supported by palaeobotanical, palaeomagnetic and volcanism studies. The article was published as Zhu, H. 2016. Biogeographical evidences help revealing the origin of Hainan Island. *PLoS ONE* 11(4): e0151941. doi:10.1371/journal.pone.0151941



Conjecture the origin of Hainan Island

## Key Laboratory of Tropical Forest Ecology

### Asian honey bees use vibrational “stop signals” when attacked by large Asian hornets

Alarm communication is a key adaptation that helps social groups resist predation and rally defenses. The Asian honey bee species, *Apis cerana*, are attacked by formidable predators, giant hornets, at food sources and at their nests. *Apis cerana* is an excellent model for studying the effects of predator threats on colony signaling, because these bees require a coordinated defense against common hornet predator.

In cooperation with Prof. James C. Nieh from University of California, Prof. TAN Ken and his team of XTBG observed how Asian honey bees were attacked by hornets during foraging and at the nest. The researchers tested if workers would produce stop signals in both situations. They then hypothesized that predators posing a greater threat to individuals or the colony would elicit stop signals with graded changes in duration, frequency, or both.

The researchers tested the behavior of three *A. cerana* observation colonies by using tethered hornets to attack free-flying foragers trained to a rich sucrose

solution feeder or bees at the nest entrance. They tested only one colony with one treatment at a time: large hornet, small hornet, or control. They also video recorded bee behaviors inside the nest and recorded bee sounds with a directional electret microphone. The study showed that the Asian honey bee had evolved an alarm signal, the stop signal, which warned nestmates of danger. The stop signal consisted of a brief vibrational pulse that encoded information about the danger level in signal frequency and the danger context in signal duration. In the functionally referential alarm signal system, individual signals were altered according to danger context (pulse duration) and predator type (fundamental frequency).

When attacked by hornets, Asian honey bees significantly increased the production of a foraging-context stop signal that inhibited waggle dancing according to predator danger level. Attacks by hornets upon the nest entrance elicited distinctive stop signals that inhibited forager departure from the safe nest. When



An individual honey bee responds to attack by hornet. (Image by TAN Ken)



Large hornet attacks honeybees at the nest. (Image by TAN Ken)

peer bees received signal, they would stop and escape danger.

The study provided the first evidence, in a social insect, of a functionally alarm signal and demonstrated a new level of sophistication in bee communication.

The study entitled “Honey Bee Inhibitory Signaling Is Tuned to Threat Severity and Can Act as a Colony Alarm Signal” has been published in *PLoS Biology*.

## Interaction between alpine ginger and tabanid fly leads to local adaptation

Dr. Babu Ran Paudel, a Nepalese postdoc of XTBG, and his supervisor LI Qingjun examined the interaction between an alpine ginger *Roscoea purpurea* (Zingiberaceae), and its obligate pollen vector, *Philoliche longirostris* (Diptera: Tabanidae). Their preliminary field observations indicated that inflorescence height, floral display area, and corolla tube length of *R. purpurea*, as well as proboscis length of *P. longirostris*, varied across the wide range of habitats in which the populations occur.

The researchers documented the pattern of trait variation in *Roscoea purpurea* and *Philoliche longirostris* across five populations. At each site, they quantified pollinator-mediated selection on floral display area, inflorescence height and corolla length of *R. purpurea* by comparing selection gradients for flowers exposed to natural pollination and supplemental hand pollination. The researchers also examined the reciprocal selection between *R. purpurea* and *P. longirostris* at two sites via the relationship between proboscis length and nectar consumption (fly benefit) and corolla length and pollen

deposition (plant benefit).

The researchers found consistent, significantly positive relationships between plant fitness and corolla tube length at all sites. The corolla tube length was correlated with local fly proboscis length among the five sites. There was strong linear selection imposed by pollinators on corolla tube length at all sites, but no consistent relationship of fitness to inflorescence height or floral display area. They also found that selection between corolla length and proboscis length was reciprocal. The study showed that obligate specialized pollination in *R. purpurea* allowed pollinator-mediated selection through female function to influence the evolution of corolla tube length. In turn, tube length appeared to impose selection pressure on the pollinator's proboscis length, thus creating a coevolutionary interaction between *R. purpurea* and *P. longirostris*. The results suggested that the reciprocal dynamics of the interaction occurred locally in individual populations, leading to a mosaic of local adaptation. The study entitled “Coevolutionary elaboration of pollination-related traits in an alpine ginger (*Roscoea purpurea*) and a tabanid fly in the Nepalese Himalayas” has been published in *New Phytologist*.



(a) Flowering individual of *Roscoea purpurea*.  
(b, c) Reconstruction of the interaction between *Philoliche longirostris* and *R. purpurea* using captured flies.  
(d) Measurements of floral display dimensions in *R. purpurea*.  
(e) Proboscis length measurement for *P. longirostris*.  
(f) Corolla tube length measurement in *R. purpurea*.  
(Images by Babu Ran Paudel)





## Rubberagroforestry system enhances water utilization in plants

Prof. LIU Wenjie and his team conducted a study to test whether interplanting could improve the water use of rubber trees in four types of promising agroforestry systems (i.e. rubber with tea, coffee, cocoa and *F. macrophylla*). They investigated the interspecific and intraspecific differences and variation in agroforestry systems among seasons in order to realize the beneficial effects of intercrops on rubber plantation with respect to water use.

The study found that the agroforestry systems (rubber with tea and *F. macrophylla*) maintained much more soil water than rubber monoculture systems. The agroforestry systems reduced soil moisture evaporation via undergrowth coverage and can thus greatly conserve soil water and helped maintain local microclimatic stability, despite in face of the adverse factors. To avoid intense competition with the interplanted species for water, rubber trees expanded their water absorption zone to the deep soil layer. Interplanting could improve the water use efficiency and productivity of rubber tree via species interaction. These results confirmed that tea and *F. macrophylla* are appropriated for intercropping with rubber trees when considering water sharing and water management and provided a practical analysis of water use benefits from rubber agroforestry system during drought stress.

The study has been published in “*Journal of Applied Ecology*”, “*Agriculture, Ecosystems & Environment*” .



*Hevea-Flemingia agroforestry system in Xishuangbanna*

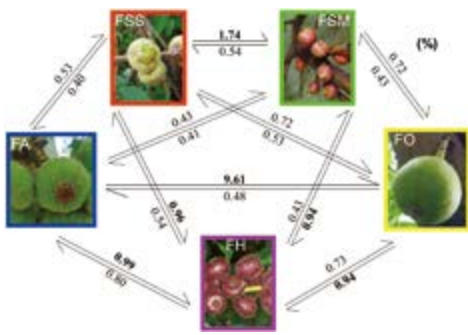


*Monoculture rubber plantation in Xishuangbanna*

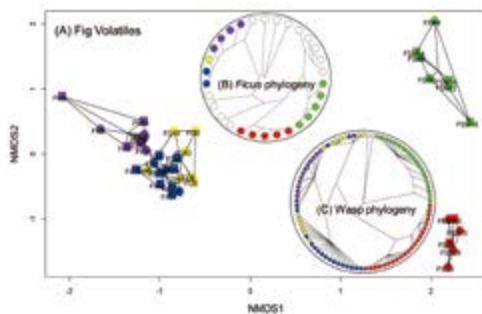
## Pollinator sharing and gene flow among closely related sympatric dioecious fig taxa: The pattern and causation

Dr. WANG Gang and Prof. CHEN Jin collaborated with Prof. Charles H. Cannon (The Morton Arboretum), using five sympatric dioecious fig taxa and their pollinators, examined the degree of pollinator sharing and inter-taxa gene flow. They experimentally tested pollinator preference for floral volatiles,

the main host recognition signal, from different figs. All five fig taxa shared pollinators with other taxa and gene flow occurred between fig taxa within and between sections. Floral volatiles of each taxon attracted more than one pollinator species. Floral volatiles were more similar between closely related figs, which experienced higher levels of pollinator sharing and inter-taxa gene flow. This study demonstrates that pollinator sharing and inter-taxa gene flow occurs among closely related sympatric



Percentage pairwise migration rates for five sympatric morphologically distinct fig taxa estimated in BayesAss. The result suggested a common inter-taxon gene flow among sympatric closely related figs.



(a) Non-metric multidimensional scaling of receptive floral volatiles of five fig taxa based on Bray-Curtis dissimilarity index (stress = 0.081). (b) *Ficus* phylogeny and (c) fig wasp phylogeny were included. The result suggested higher volatiles similarity and higher pollinator sharing level among closer figs.

dioecious fig taxa and that pollinators choose the floral volatiles of multiple fig taxa. The evolutionary relationships between plant species and their obligate pollinator vary among different obligate pollination systems. However, plants in all such systems mainly depend on specific floral volatiles for establishing relatively strict but not absolute pollinator specificity (thus pre-zygotic isolation) among sympatric plant species. It is likely that a certain degree of pollinator sharing and gene flow among sympatric closely related plants also widely exists in those obligate pollination systems. How the frequency and extent of hybridization contributes to the diversification of the two partners in these co-evolutionary relationships will be the next important question to address. The result has been published with a title “Pollinator sharing and gene flow among closely related sympatric dioecious fig taxa” in *Proceedings of the Royal Society B*.

## Conspecific negative density dependence and habitat filtering simultaneously influence seedling survival

Prof. CAO Min and his team of XTBG used a population dynamics dataset of 10,316 seedlings for 269 woody plant species for four contiguous one-year census intervals in the 20-ha Xishuangbanna tropical seasonal rainforest dynamics plot in SW China. Using generalized linear mixed models, they explored the relative importance of CNDD, PNDD and habitat filtering for seedling survival.

The researchers built models of seedling survival dependent on the densities of conspecific and heterospecific neighbors and on the phylogenetic dissimilarities between heterospecific neighbors and focal seedlings. Each of those models was built without and with habitat variables to determine the degree to which habitat filtering affected the prevalence of negative density dependence.

They wanted to test whether scaling the effects of neighbors by their phylogenetic distances improved model fit. They also wanted to see what the relative importance of CNDD, PNDD and habitat filtering was and how habitat filtering affected the detectability of CNDD and PNDD.

The results showed that CNDD and habitat filtering simultaneously influenced seedling survival. Replacing heterospecific neighbor densities with phylogenetic diversity indices improved survival models.





Taking habitat variables into account elucidated more clearly the negative impacts of conspecific neighbors (seedlings + adults) on seedling survival, and made the species-specific negative effects of conspecific neighbor densities generally stronger. Their study system showed the opposite effect with respect to PNDD. CNDD and habitat filtering both had vital influences on seedling dynamics and the observed effects of conspecific neighbors were the result of an interaction between them.

The study entitled “How does habitat filtering affect the detection of conspecific and phylogenetic density dependence?” has been published in *Ecology*.



*The 20-ha forest plot in Xishuangbanna*

## Clonal epiphytes possibly adapt to forest canopies by resource sharing

In a previous study, Prof. LIU Wenya's team of XTBG selected one clonal, facultative, epiphytic fern to test effects of physiological integration in both epiphytic and terrestrial habitats in the dry season in a subtropical montane moist forest. They found that clonal integration contributed greatly to survival and growth of a clonal, facultative, epiphytic fern. However, it is still unknown whether clonal integration also plays an important role in dominant epiphytes and during the wet season.

The researchers further conducted two field experiments, one on individuals

(single ramets) and another on groups (several ramets within a plot), with severed and intact rhizome treatments (without and with physiological integration), on two dominant epiphytes (*Polypodiodes subamoena* and *Lepisorus scolopendrium*) with divergent traits in a wet season in a subtropical montane moist forest in Southwest China. They aimed to test whether clonal integration was a general strategy for clonal epiphytes to adapt to forest canopies. They asked whether clonal integration increased survival and growth of dominant epiphytes during the wet season when water stress was seemingly weak. They then asked whether the effect of clonal integration on survival and growth differed between the two epiphytes with divergent traits.

Both individual and group experiments showed that severing rhizomes decreased survival and growth of the two dominant epiphytic ferns in the wet season, supporting the hypothesis that clonal integration (resource sharing) contributed to performance of epiphytes. The results indicated that clonal integration (resource sharing) may have been selected for as a general trait for clonal epiphytes to adapt to the harsh and heterogeneous epiphytic habitats.

The study entitled “Survival and Growth of Epiphytic Ferns Depend on Resource Sharing” has been published in *Frontiers in Plant Science*.



*Two dominant epiphytic ferns in forest canopies*

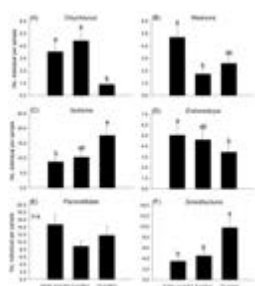
## Functional redundancy among Collembola species limits strength of spider-initiated trophic cascades

Prof. YANG Xiaodong and his team of XTBG manipulated the densities of *Macrothele yunnanica*, a web-building spider species dominant with regard to biomass and density in the tropical forest floor of Xishuangbanna, southwest China. They attempted to illustrate direct effects of *M. yunnanica* density on different Collembola species in a tropical forest floor and the trophic cascade effects of *M. yunnanica* on litter decomposition rates. They also wanted to see the role of functional redundancy within Collembola group in mediating cascading effects of *M. Yunnanica*.

The researchers found that the annual mean decomposition rate (K value) across the three spider treatments was not significantly different, indicating that spider treatments had no cascading effects on decomposition. Although community composition

changed throughout the course of the experiment, litter decomposition was not affected by those changes.

The study showed that although spider treatments changed Collembola community composition, those changes did not cascade into changes in litter decomposition in litter bags with coarse mesh (2 mm), which was consistent with functional redundancy. The results supported the hypothesis that functional redundancy among Collembola species may weaken the strength of spider-initiated cascading effects. Consequently, changes in Collembola diversity occupying the same trophic level may not significantly alter ecosystem function in tropical forest-floor ecosystems. The study entitled “Functional redundancy dampens the trophic cascade effect of a web-building spider in a tropical forest floor” has been published in *Soil Biology and Biotechnology*.



Effects of different spider treatments on the density of main groups of Collembola in litter samples. (A) *Onychiurus*, (B) *Neanura*, (C) *Isotoma*, (D) *Entomobrya*, (E) *Paronellidae*, (F) *Sminthurinus*. Data are expressed as mean  $\pm$  s.e. Means with different letters are significantly different ( $P < 0.05$ ) and n.s. indicates no significance ( $P > 0.05$ ). Note that y-axes have different scales.

## Conservation lags in growth of corresponding authorship from tropical countries

Researchers from XTBG investigated static time periods, with comparison to fields other than conservation, and data on acceptance rates through an analysis of public patterns in SCImago ([www.scimagojr.com](http://www.scimagojr.com)). They compared conservation to nine randomly selected other fields between 1996 and 2013, reviewed literature of conservation publications over a longer time series

(1980 to 2012), and analyzed acceptance rates in 12 conservation journals (2009 to 2012), broken down by the country of the institutions where the corresponding authors worked.

Their data analyses showed that in the increase over time in the contribution of corresponding authors from non-high income countries, conservation lagged behind other fields. The contribution of corresponding authors from low income countries had actually declined over 30 years. Changes in journal policy, such as having regional editors, providing editing assistance, waiving fees, could provide short-term correction to that trend,





and help ameliorate some disparity between regions. More fundamental changes could be made if conservation funding targeted tropical institutes of higher education, particularly their

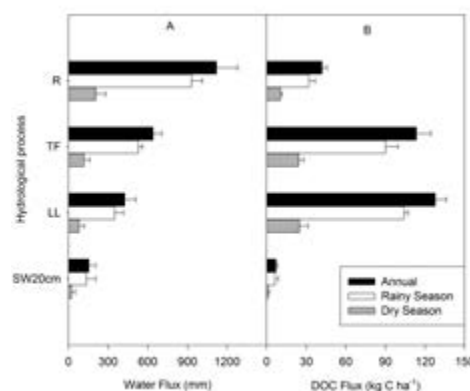
conservation science programs that stress research as well as practice.

The study entitled “Increasing geographic diversity in the international conservation literature: A stalled process?” has been published in *Biological Conservation*.

## Dissolved organic carbon influences soil respiration in tropical forest

Prof. ZHANG Yiping and his team of XTBG investigated the relative contribution of hydrologically transported DOC to soil respiration (SR) in a rainforest in Xishuangbanna compared with the contributions of soil temperature and moisture. They determined the soil respiration, heterotrophic respiration (HR), and DOC fluxes in the rainfall, throughfall, litter leachate, and surface soil water (0–20cm depth). They then compared the seasonality of  $\delta^{13}\text{C}_{\text{DOC}}$  in each hydrological process, and  $\delta^{13}\text{C}$  in leaves, litter, and surface soil, and analyzed the throughfall, litter leachate, and surface soil water (0–20 cm) effect on soil respiration.

The results showed that the surface soil was a sink for the DOC transported by hydrological processes, and that HR and SR were sensitive to the DOC flux through these processes. Soil water (0–20 cm) was the most sensitive indicator of SR and soil-water DOC flux was the second. These two exceeded the sensitivity of the soil temperature, soil water content, and other water flux, and DOC flux along all the hydrological processes.



Amount of water (A) and DOC flux along the hydrological processes in the tropical rainforest at Xishuangbanna, southwest China.

The DOC transported by hydrological processes thus played a more important role in the SR processes.

The study entitled “Hydrologically transported dissolved organic carbon influences soil respiration in a tropical rainforest” has been published in *Biogeosciences*.

## Communicating with seniors helps adolescents better understand local climate change

Ms. HU Sifan and her supervisor Prof. CHEN Jin specifically developed a curriculum to test two popular methods of environmental education: place-based and intergenerational learning. They developed a modified Theory of Planned Behavior (TPB) model where attitude was refined from attitudes towards particular

environmental issues as uncertainty and concern about climate change, and risk perception of local vulnerability to climate change. Based on the theoretical framework, they introduced a new educational program for climate change that included inviting adolescents (aged 10–13) to communicate with seniors (aged  $\geq 60$  years) in focus groups to discuss the local climate during the past several decades.

They found that descriptions of trends and extreme climatic

events from local seniors were generally consistent with local meteorological data, which supported the hypothesis that climate change could be observed and perceived by individuals in their own lifetimes through local extreme weather events. They also found that the seniors in rural China had noticed detailed climate changes variations, which supported the hypothesis that perceptions about climate change would improve in adolescents who communicated with local seniors. The adolescents' uncertainty about climate change exhibited significant change after the program. The shift in adolescent concern and perceived behavioral control translated into greater willingness to support climate change mitigation.

The study showed that place-based strategies for climate change education had considerable potential to render the abstract concrete for helping adolescents understand global issues. It provided an effective communication strategy for climate change education by inviting adolescents to communicate with seniors in

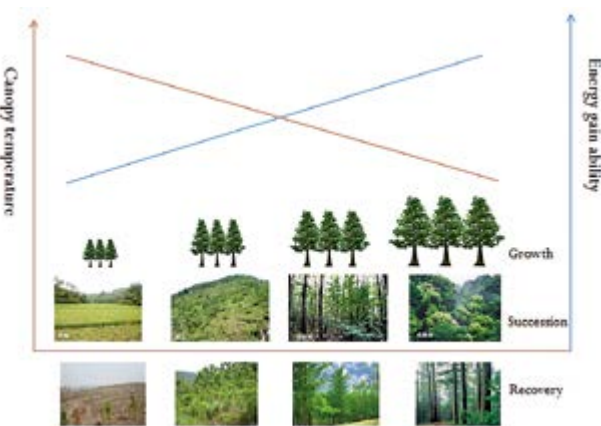
focus groups on local climate.

The study entitled "Place-based inter-generational communication on local climate improves adolescents' perceptions and willingness to mitigate climate change" has been published in *Climatic Change*.



5-min verbal group report after the interaction.

## Ecosystems gain more radiation while lowering their surface temperatures



Ecosystem succession

Researchers from XTBG used the radiation balance of ecosystems to test whether ecosystems tend to gain more radiation while becoming cooler during maturation or recovery. They also wanted to identify an appropriate indicator to warn of or evaluate ecosystem degradation.

They found that the maximum daily air temperature at the canopy level decreased, energy gain, net radiation, and thermal response number increased with vegetation growth, succession, and recovery. The results support the hypothesis that terrestrial ecosystems tend to gain more solar radiation, while maintaining lower and more stable surface temperature, during their natural development.

The study empirically verified the MEDT across multiple chronosequences in different climate zones.

The study entitled "The Cooling Trend of Canopy Temperature During the Maturation, Succession, and Recovery of Ecosystems" has been published in *Ecosystems*.





## A new fossil species of *Celastrus* found in SW Yunnan

Prof. ZHOU Zhekun and his team found compressed and fossil leaves of *Celastrus* in Sanzhangtian (24°06' N, 101°13' E), Zhenyuan, Yunnan, China. Fossil leaves from the middle Miocene of Zhenyuan were pinnate and petiolate, and had semicraspedodromous secondary veins with apically elongated arches and theoid teeth with a clear, deciduous seta.

The researchers observed and photographed the fossil leaves with a Nikon D700 camera and a stereo microscope. They then compared the fossil leaves with specimens representing 23 extant species and one subspecies. They assigned the leaves from Zhenyuan to a new species and named it as *Celastrus caducidentatus* Liang XQ et ZK Zhou.

The researchers also reviewed its relationship to extant species in order to discuss its palaeobiogeographic and palaeoclimatic implications. Based on the nearest living relative approach, the presence of fossil *Celastrus caducidentatus* suggested that

Zhenyuan had a warmer and more humid climate in the Middle Miocene and that ancestors of *C. paniculatus* probably occurred in East Asia. The results showed that plant migration occurred between eastern Asia and North America via transpacific dispersal in the geological past.

The study entitled “A new *Celastrus* species from the middle Miocene of Yunnan, China and its palaeoclimatic and palaeobiogeographic implications” has been published in *Review of Palaeobotany and Palynology*.

## Rock outcrops play positive hydrological role in redistributing water to nearby soil patches

Prof. SHEN Youxin and his student collected precipitation water and runoff water on the surface of carbonate outcrops in Shilin in southwestern China for 1 year. They aimed to determine the amount of water received by rock outcrops and subsequently the amount exported to nearby soil patches in different seasons and in different karst ecosystems (a rock desertification ecosystem, an anthropogenic forest ecosystem, a secondary forest ecosystem). They then wanted to assess the ecological significance of the water output. They used a rock emergence ratio of 30 and 70 % ground surface to evaluate the significance of runoff water, since 30 % is the lowest criterion for rock desertification.

The study showed that a large amount of input water was received by rock outcrops and 41-49% of it was transferred to nearby soil patches. The result indicated more than half of

the water received by rock outcrops was channeled to other places, where it played various roles. The ratio of water export to water input varied slightly among the three systems. The researchers also found that a large rock outcrop emergence ration, such as 70%, would result in a sharply increased funnel effect toward nearby soil patches.

The study entitled “Rock outcrops redistribute water to nearby soil patches in karst landscapes” has been published in *Environmental Science and Pollution Research*.

## Key Laboratory of Tropical Plant Resource and Sustainable Use

### Methyl 3-(4-hydroxyphenyl) propionate affects root development

Prof. XU Jin and his team of XTBG reported that the MHPP acted as an important regulator of the root system architecture (RSA) by inhibiting primary root (PR) elongation and promoting lateral root (LR) formation in *Arabidopsis* seedlings by regulating the auxin levels in the root tip and modulating meristematic cell division potential.

The researchers found that MHPP inhibited PR elongation while increasing LR number, thereby modulating the RSA. MHPP improved nutrient element accumulation in plants and inhibited PR elongation by increasing auxin accumulation via increased expression of auxin biosynthesis-related genes. PAT was responsible for the modulation of PR growth in MHPP-treated seedlings.

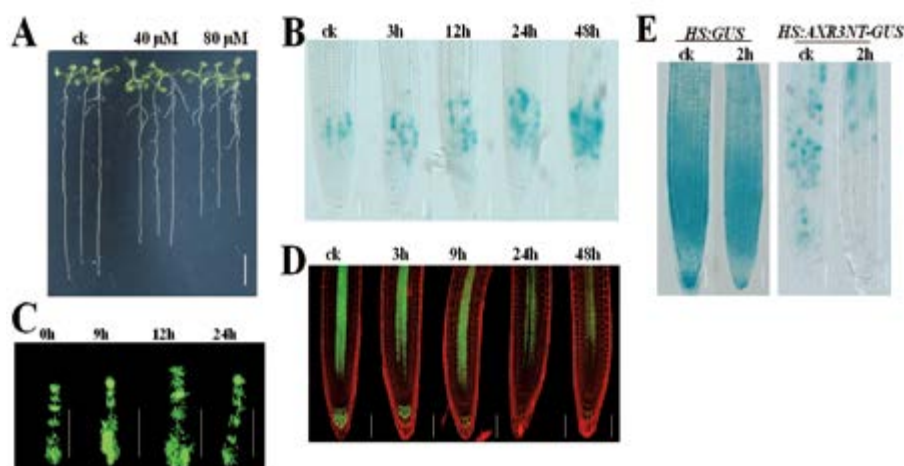
They further found that exogenous MHPP increased the levels of auxin signaling by promoting the expression of the indole-3-acetic acid (IAA) biosynthesis-related

genes, increasing auxin perception via the destabilization of Aux/IAA, and significantly repressing the expression of PIN4 in root tips. Moreover, MHPP-induced nitric oxide (NO) production promoted an increase in reactive oxygen species (ROS) accumulation in root tips. Inhibition of NO/ROS accumulation ameliorated the MHPP-induced reduction in primary root growth. They also revealed that MHPP significantly induced the accumulation of glucosinolates in roots.

Based on the results, the researchers concluded that MHPP inhibited PR elongation by regulating the levels of auxin expression, transport, and signaling in roots and consequently altering root meristematic cell division potential, and the NO/ROS pathway was involved in those processes. In addition, treatment with MHPP increased nutrient element uptake and plant defense-related metabolite accumulation in roots.

The results showed that MHPP modulated plant growth, development, and stress tolerance by inducing morphological and physiological changes in roots.

The study entitled “The nitrification inhibitor methyl 3-(4-hydroxyphenyl)propionate modulates root development by interfering with auxin signaling via the NO/ROS pathway in *Arabidopsis*” has been published in *Plant Physiology*.



MHPP modulated plant growth and development by inducing morphological and physiological changes in roots.







## ***Arabidopsis* WRKY57 transcription factor confers drought tolerance to transgenic rice plants**

Drought is a critical abiotic stress that severely restricts crop production. Under drought-or salt-stress conditions, plants accumulate reactive oxygen species (ROS). WRKY transcription factors belong to a large family that functions under a variety of abiotic stresses. In a previous study by Prof. YU Diqui and his team of XTBG, the researchers demonstrated that overexpression of *AtWRKY57* significantly conferred drought tolerance in *Arabidopsis*.

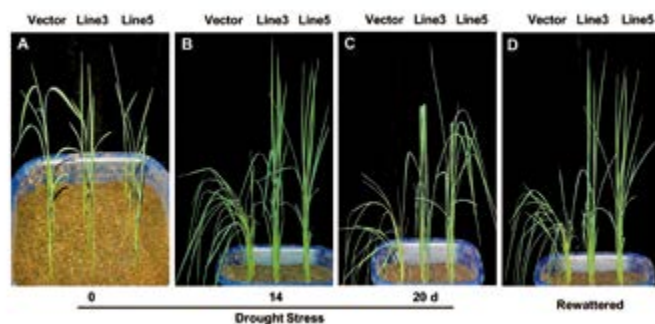
The previous study gave them a hypothesis that the improvement of plant drought tolerance might be realized through gene manipulation approaches. To explore whether *AtWRKY57* played an important role in improving the agronomic traits through gene manipulation approaches, the researchers introduced this gene to rice and evaluated the role of *AtWRKY57* in transgenic rice after drought stress. The drought-tolerance phenotype of *AtWRKY57* transgenic rice plants were the result of a collection of physiological indexes observed in the over-expressing

plants. *AtWRKY57* overexpressing plants displayed higher survival rates most likely because the water loss was reduced in these plants compared to control plants under drought conditions.

They also found that the transcript levels for several stress-tolerant genes were more elevated in *AtWRKY57* transgenic rice than in control plants under drought-stress conditions. The enhanced capability to scavenge ROS was important for *AtWRKY57* overexpressing transgenic rice plants to tolerate drought stress.

Their results provided evidences that overexpressing *AtWRKY57* also increased the tolerance to salt and PEG stresses, demonstrating that this is a potential candidate gene for crop improvement.

The study entitled “Heterologous Expression of *AtWRKY57* Confers Drought Tolerance in *Oryza sativa*” has been published in Frontiers in *Plant Science*.



*Overexpressing AtWRKY57 enhanced drought tolerance in rice (Image by JIANG Yanjuan)*

## A process for simultaneous production of furfural and hydrolyzable cellulose developed

Researchers from XTBG chose sugar cane bagasse (one of the commonly used biomass in furfural industry) as raw material for one-pot production of furfural and cellulose-enriched residue using  $\text{AlCl}_3$ ,  $\text{FeCl}_3$  and  $\text{HCl}$  as catalysts. They studied the degradation of sugar cane bagasse in a single aqueous system and in a 2-methyltetrahydrofuran (MTHF)/aqueous  $\text{AlCl}_3$  biphasic system. Their aim was to develop a process for the simultaneous production of furfural and easily hydrolyzable cellulose.

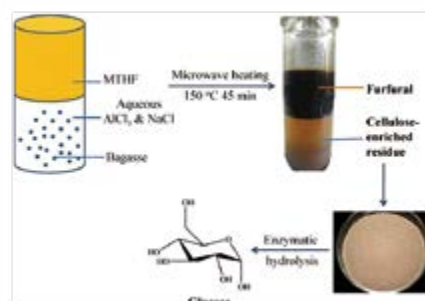
They found that conversion of bagasse in aqueous solution with  $\text{FeCl}_3$  and  $\text{HCl}$  benefited furfural 1 production from hemicellulose but degraded cellulose seriously.  $\text{AlCl}_3$  was more suitable to co-produce furfural and cellulosic residue from bagasse.

Under the best conditions (9 mL MTHF, 9 mL water, 0.1 M  $\text{AlCl}_3$ , 150 °C, 45 min and 10 wt%  $\text{NaCl}$ ), furfural yield of 58.6% was obtained while more than 90% of glucan was maintained in the residue.

After cycles, the organic phase was decanted and distilled to separate furfural and lignin and got purified MTHF. Lignin

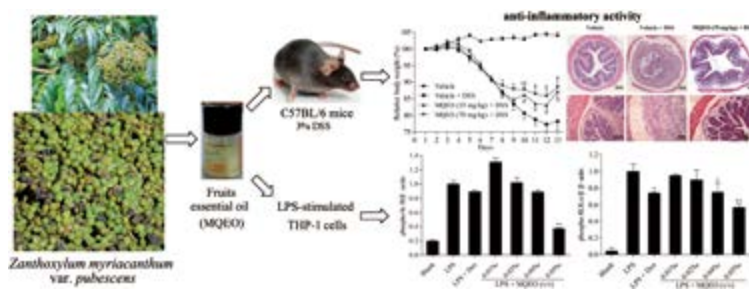
and furfural concentrations in the aqueous phase were low, they tended to solubilize in the organic phase. After many cycles, the aqueous phase could be purified by extraction with organic phase.

The study entitled “Coproduct of Furfural and Easily Hydrolyzable Residue from Sugar Cane Bagasse in the MTHF/Aqueous Biphasic System: Influence of Acid Species,  $\text{NaCl}$  Addition, and MTHF” has been published in *ACS Sustainable Chemistry & Engineering*.



## Essential oil of Maqian useful for treatment of intestinal inflammation

Researchers from XTBG investigated the anti-inflammatory effect in vivo against dextran sulfate sodium (DSS)-induced intestinal inflammation in mice and explored related mechanisms with the THP-1 cell line. Their aim was to investigate the anti-inflammatory effect of Maqian as potential candidate for the treatment of intestinal inflammation.



Essential oil of maqian fruits possesses anti-inflammatory activity





The results demonstrated that the essential oil from fruits of Maqian possessed healing activity against DSS-induced intestinal inflammation in mice. The anti-inflammatory effect was through inhibiting the overproduction of inflammation mediators and may be associated with Toll-like receptors (TLR) 4 mediated nuclear factor- $\kappa$ B signaling

pathway. Their results also supported the traditional use of Maqian against digestive disorders and suggested its fruits essential oil might be a useful therapy for the treatment of human inflammatory bowel disease.

The study entitled “Protective effect of the essential oil of *Zanthoxylum myriacanthum* var. *pubescens* against dextran sulfate sodium-induced intestinal inflammation in mice” has been published in *Phytomedicine*.

## XTBG scientists won Yunnan Provincial Natural Science Award 2016

The award ceremony for the “Yunnan Science & Technology Prize 2016” was held in Kunming. Among the prize winners, Dr. YU Diqu and his team of XTBG were honored with the first prize of Yunnan Provincial Natural Science Award. They were awarded for accomplishing the project entitled “Mechanism of plant microRNA regulating nutrient metabolism and morphogenesis”. Dr. PENG Yanqiong and her team were honored with the third

prize of Yunnan Provincial Natural Science Award. They were awarded for accomplishing the project entitled “The mechanism of behavioral ecology of fig-wasp coexistence”.

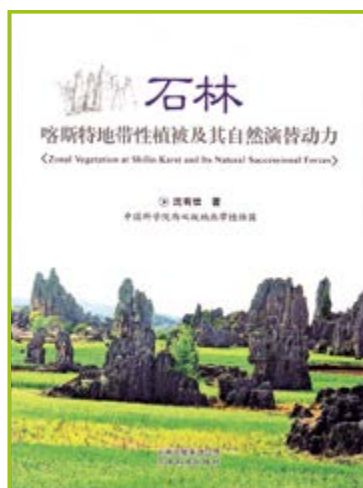




## New books

The popular science book: *Romance Between Huge Fig trees and Tiny Fig Wasps* has been published. Prof. PENG Yanqiong and YANG Darong have researched fig trees and fig wasps more than ten years, accumulated some scientific stories and collected a lot of photos about fig trees and fig wasps. They sorted out materials wrote and about two years, and finally published the popular science book named *Romance Between Huge Fig trees and Tiny Fig Wasps*, which was funded by National Natural Science Foundation of China (No.3112002) and XTBG.

The mutualistic relationship between fig trees (*Ficus* spp., Moraceae) and their pollinating fig wasps (Hymenoptera, Agaonidae) is well known. It is obligate and species specific, and there are about 800 *Ficus* species in the world. The book firstly introduced all kinds flowers, especially syconium (fig) and the wonderful world inside the figs, also involving in amazing strangling fig trees and one-tree forest phenomenon, as well as all kinds of animals associated with figs, such as birds, gall midges, ants and fig wasps. Finally, the interactive relationship between animals and fig trees was written to be attractive stories with scientific, easy understanding and humorous style. The authors exhibited the romance between fig trees and fig wasps to the readers and hope that more people would love nature and life sciences.



*Zonal Vegetation at Shilin Karst and Its Natural Successional Forces* by Prof. SHEN Youxin was published by Yunnan Science Press in 2016. There are 3 parts, 11 chapters in this book. In part 1(Chapter 1-4), the book presents the community study results of zonal vegetation of SEBF, giving focus on propagule bank that can drive succession and regeneration, seed input and seedlings recruitment. In part 2(chapter 5-8), the book presents the vegetation changing history, community feature of composition, propagule bank and soil after degradation. In part 3(chapter 9-11), the book presents the limitation of propagule and environment factors for secondary succession of zonal vegetation, effect of propagule bank from higher successional stage community on lower successional stage community, and then to give suggestions on zonal vegetation restoration. Study on zonal vegetation successional, on its restoration forces after degradation can provide scientific base to restore forest similar to the old zonal ones. United Nations Educational, Scientific and Cultural Organization (UNESCO) will revalidate each Geo-park around the world for every 4 years. The revalidation report composed by UNESCO experts will be an important indicator of qualification. Shilin Geo-part was revalidated at 2016 again, and this book was the key document of scientific research, to support the revalidation.





## Improvement of Research Facility

### Further construction and perfection of molecular platform

In order to solve the problems in aspects of nucleic acid extraction and analysis, sample pretreatment, analysis of chromosome and cell and gene sequencing, the Molecular Biology Experimental Platform of central laboratory purchased nine molecular instruments from domestic and foreign instrument company in 2016, such as Automatic bead extraction system (VERSA GENE 1100), Automatic pipette work station (epMotion5070)-linkage PCR instrument (Mastercycler nexus gradient; Mastercycler nexus eco), Low temperature and vacuum concentrator (ScanSpeedMiniVac Beta), The ultrafine amount spectrophotometer (Nanodrop one), Automatic

focusing acoustic wave genome shearing instrument (M220), Nucleic acid preparation electrophoresis apparatus (Blue Pippins), Gene library preparation system (Neoprep), Chromosome karyotype automatic analysis system (Beion V4.20) and Cell counter (Multisizer 3). These instruments will make nucleic acid extraction and purification, gene library preparation and PCR system establishment automate and standardize, solve the problems in rapid sample concentration, DNA fragmentation and objective DNA fragment separation, and make chromosome karyotype automatic analysis, cell counts, diameter and surface area analysis become possible. These instruments together with existing molecular ones broaden functions of molecular platform, provide hardware support for efficient molecular experiments, and significantly raise service quality of gene sequencing.



*New molecular biological instruments*



## Extension and Improvement of the Environmental Control Function of the Phytotron

The project of “The Extension and improvement of the environmental control function of the phytotron” has been completed in the Central Laboratory in September, 2016. This project is supported by the Instrumental Function and Technique



*Fluorescent lamp room of the improved Phytotron*



*Sodium lamp and metal halide lamp room of the improved Phytotron*

Development Program of CAS.

The Phytotron consists of 8 chambers, 6-10 m<sup>2</sup> each. They can be manually controlled to simulate microclimatic changes by changing three parameters: temperature, humidity, and light. The improved phytotron was customized to supply wind from the floor level, which is more stable and even has more coverage than wind supply from the roof or walls, as well as avoids blowing plants directly. To meet different experiment requirements simultaneously, multiple types of light sources (such as white and yellow fluorescent lamps, sodium lamps, and metal halide lamps) were mounted in different chambers, and light intensity can be adjusted. The ultrasonic humidifiers were employed for precisely controlling humidity. So far, multiple research groups have used these climate chambers to carry out scientific experiments in ecology, resource plant biology, molecular biology, and other research fields.

## Establishment of the smart card system of the SAMP in the Public Technology Service Center

In June 2016, the smart card system of the Sharing of Apparatus Management Platform (SAMP) of CAS was established in the Public Technology Service Center. The system includes two card servers and more than 40 card readers for each large instrument. The system can collect instrument operation and maintenance data, and automatically upload them to SAMP. The system can not only standardize the management of large instruments, 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 smart card system of the SAMP*





## The Public Technical Service Center of XTBG achieve good results in the 2016 assessment by the Academy of Sciences

In the October of 2016, the public technical service center of XTBG



*The Public Technical Service Center of XTBG achieve good results in the 2016 assessment by the Academy of Sciences*

participated in the assessment and evaluation by the Bureau of Facility Support and Budget, Chinese Academy of Sciences. Because of the unique value in the supporting the scientific research in the tropical biological field of XTBG, the center passed the assessment and ranked sixth among fourteen public technical service centers in the life science field in CAS. The assessment contents mainly include: construction objectives, platform construction, technical support team construction, performance and contribution, the management system and operation mechanism, and so on. In the next five years, the center will obtain stable operational funding support from the CAS.

## XTBG English website ranks second among CAS institutes

According to an evaluation by the Bureau of International Cooperation of CAS, the English website of XTBG ranks second among 117 institutes for two consecutive years. The indices for English website evaluation include posts on CAS website, page views, page updates, and accuracy of the websites. Over the past two years, XTBG English website is second only to Shanghai Institutes for Biological Sciences.

English website is a showcase to exhibit research of XTBG scientists to the public, peer researchers, and reporters, etc. It is a window and acts a media tool to let others know XTBG. We follow the criteria of timeliness, freshness, importance, prominence, and relatedness to try to make the website readable and reliable.



XTBG English website

*XTBG English website ranks second among CAS institutes*

# Conferences and Symposia

## 2016 Annual Conference of XTBG

The 2016 Annual Meeting for XTBG is the premier conference for more than 200 students, scholars, and researchers. On December 2-3, scientists, researchers, and students gathered together at the XTBG headquarters for two days of presentations, discussion, and communication. At the annual conference, 28 principal investigators presented the research progress of their groups respectively, 25 young researchers and students presented their work. 36 poster presentations were also available.

On behalf of the two key laboratories and conservation center respectively, Prof. TAN Ken, Prof. YU Diqui, and Prof. LI Jie made plenary presentations on the first day. With members of the XTBG Academic Committee as judges, the presentations by young researchers were evaluated. The best presentation winner prize went to Dr. LIANG Gang.

“The annual conference is held to promote and strengthen the academic exchange and interaction, invigorate academic atmosphere, accelerate the growth of young scientific researchers of XTBG” said Prof. CHEN Jin at the opening ceremony.

“It is our first try. From this year on, the first Friday and Saturday

of each December will be the date to hold the annual conference of XTBG” added the director of XTBG.



*The 2016 XTBG Annual Conference*



*Group photo*

## Sustainable Rubber Conference held at XTBG

On October 17, researchers, experts and local people from 16 countries gathered together at XTBG for attending the four-day Sustainable Rubber Conference, whose goal is to share information in a multi-disciplinary, multi-stakeholder setting with a view to promoting environmentally friendly and socially responsible rubber cultivation. With presence of 120 people, the conference covered 8 keynote speeches, 46 session presentations, and 24 poster presentations. The conference provided a platform to facilitate communication among researchers, government agencies and industry groups



*Sustainable Rubber Conference*



concerned with the sustainability of rubber cultivation, seeking a sustainable future for rubber smallholders.

Large expansion of rubber cultivation has been realized through the conversion of natural forests to monoculture plantations, which caused loss of biodiversity, impaired provisioning, reduced soil health, increased erosion and increased greenhouse gas emissions.

Prof. CHEN Jin, director of XTBG, addressed the opening of the conference. He said that smallholders today account for more than two thirds of rubber plantations in Asia. We need right policies to gain sustainable development. “With the right policies in place, local governments can help these farmers to grow rubber in an environmentally and socially responsible way”

added CHEN Jin.

Researchers and experts presented their understanding onland-use change and ecology of rubber plantations, rubber agroforestry, modeling of climate change impacts, socio-economics of rubber-dominated landscapes, etc. They then discussed possible future for the future of rubber smallholders.

The conference established a platform to promote the development of socially responsible and environment-friendly rubber plantations across the industry.

## **Sino-Thai scientists gather to discuss “Biodiversity: Secure our Future”**

Over 60 scientists and scholars from China and Thailand gathered together at XTBG during November 21-23 to discuss “Biodiversity: Secure our Future”, which is the general theme of the Fourth Workshop on Science and Technology Cooperation-Biodiversity.

The workshop is aimed to continue and strengthen the cooperation on scientific research between China and Thailand, the CAS and the Thailand Research Fund (TRF).

CAS vice president ZHANG Yaping, Ms. Sompong Klaynongsruang of the TRF, and XTBG director CHEN Jin addressed the opening ceremony. They hoped the workshop provide a platform for strengthening the existing collaboration, to share the knowledge, experiences and practices on the research and development in the areas of biodiversity conservation and bio-resources

sustainable use, and to brainstorm the cooperation mechanisms for enhancing the new cooperative research projects.

The scientists had deep discussion and communication on biodiversity monitoring and documentation; agro-biodiversity and environmental friendly agriculture; utilization of biodiversity compounds from biodiversity; and biodiversity conservation at Anthropocene era. They visited the Bubeng station of the Xishuangbanna Tropical Rainforest Ecosystem Station and experienced the forest canopy crane. They also visited the Central Laboratory within the garden.



*The opening ceremony*



## 2016 Annual Meeting of Key Lab of Tropical Forest Ecology held



*Participants pose a photo*



*Consultation meeting*

The 2016 Annual Meeting of the CAS Key Laboratory of Tropical Forest Ecology and its academic meeting was held on December 28-29 in XTBG. On behalf of the lab, Prof. CHEN Jin reported on the research outputs achieved in 2016. Members of the academic committee fully endorsed the research over the past year and put forward some valuable suggestions for the laboratory.

Members in the academic committee and invited specialists discussed the lab's work report and seminars. They fully affirmed the achievement output, team building, and lab management. They proposed specific suggestions regarding research directions, cultivation of young and middle-aged academic leaders, construction of innovation team, exchange and cooperation, and independent innovation capability.

Young researchers and graduate students (in total 24 people) presented their research work, which covered all research fields of the key lab. Prof. CHEN Jin conferred certificates to award winners for their presentations. Chemical Ecology Group was selected as the excellent research group of the key lab in 2016.

## XTBG presents at Conservation Asia 2016

This year's Conservation Asia meeting at the National University of Singapore took place between the 28<sup>th</sup> of June and the 3<sup>rd</sup> of July and represented a joint meeting between the Asian section of the Society of Conservation Biology and the Asia-Pacific chapter of the Association of Tropical Biology and Conservation. The meeting was attended by around 560 people, with around 450 presentations. XTBG researchers Richard Corlett organized a symposium on “Reducing the Biodiversity Impacts of Infrastructure Development in the Tropics” and Alice Hughes organized two symposia on “Asian Karst Conservation” and “Transboundary Protected Areas in South China Border Areas: Challenges and Prospects”.

In addition we had 22 presentations from 15 XTBG researchers and recent students. Alice Hughes organised 21 capacity building



*XTBG participants at ATBC 2016.*



events in three different formats at Conservation Asia involving over 250 of the delegates. These sessions included extended workshops on advanced statistics and spatial analysis lead by Kyle Tomlinson and Alice Hughes respectively, in addition to a further 7 workshops, 11 skills sessions and mentoring. Several XTBG students also attended the extended workshops including

HU Sifan and GUO Wei with several XTBG researchers remaining in the university for several days following the conference to conduct collaborative research with local researchers including CUI Qinglan on Pollination and Gabriel David on passerine migration.

## **XTBG participates in 7<sup>th</sup> International Workshop on Desiccation Sensitivity and Tolerance across Life Forms**

The 7<sup>th</sup> International Workshop on Desiccation Sensitivity and Tolerance across Life Forms was held from January 11-15<sup>th</sup>, 2016 in the Aquila Private Game Reserve, South Africa. The workshop



*Participants pose a group photo*

was organized by the University of KwaZulu-Natal- Westville Campus, which brought together 54 representatives from 15 countries from South Africa, France, USA, UK, Netherlands, and China. Dr. WEN Bin and Dr. FU Peili of XTBG participated in the workshop and made presentations.

Dr. FU Peili made an oral presentation entitled “Leaf gas exchange and xylem hydraulic traits of a resurrection plant (*Paraboea rufescens*, Gesneriaceae) and its responses to drought and re-watering”. Dr. WEN Bin presented his study on a poster entitled “Desiccation tolerance and cryotolerance development in intermediate pomelo and grapefruit seeds”. The two presentations aroused interest among participants and brought potential of collaborative research.

## **XTBG participates in international symposium on Yunnan Biodiversity Hotspot Project**

The Sino-German symposium “The Yunnan Biodiversity Hotspot Project – program, objectives, and application” was held in Dresden, Germany, April 02-06, 2016.

The symposium brought together 40 representatives around the world. The symposium was for the joint multidisciplinary “The Yunnan Biodiversity Hotspot Project”. The major objective was to discuss the outline and content of the preproposal which has to be submitted to the German and Chinese National Science



*Group photo.*

Foundations, respectively (DFG and NSFC) in summer 2016.

Prof. ZHOU Zhekun made an over presentation entitled “Evolution and extinction of some plants and their response to Asia Monsoon climate”. Dr. SU Tao presented “Selected Neogene

floras of Yunnan in the project”. Then Alice Hughes talked about “Understanding changing patterns of diversity in Yunnan and beyond”.

During the symposium, a Letter of Cooperation Intent was signed between XTBG and Frankfurt Senckenberg Research Institute and Nature Museum of Germany. The two sides aim to enhance cooperation in scientific research, personnel exchange and science communication.

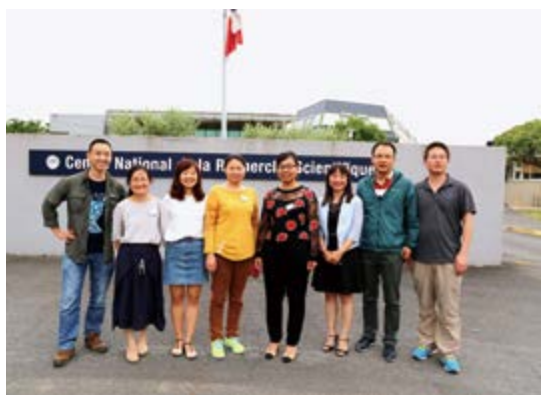
## XTBG presents at 7<sup>th</sup> International Canopy Conference

The 7<sup>th</sup> International Canopy Conference was held in University of Roehampton, UK during August 21-26. It brought together researchers from a wide range of disciplines, united by the environment in which they gather data to answer key biological questions. Researchers from 16 countries and regions participated in the conference and communicated on latest research progress in canopy forest sciences. Prof. LIU Wen Yao and his team members and Dr. Akihiro Nakamura of XTBG presented their research work at the meeting.

The themes of the conference were “experimental approaches to understanding canopy organisms and processes”; “beta diversity in canopy communities”; “biosphere-atmosphere interactions”; and “research across the globe”.



*XTBG participants at the 7<sup>th</sup> International Canopy Conference*



*XTBG participants at the IXth International Fig Symposium*

## XTBG participates in IXth International Fig Symposium

The IX International Fig Symposium was held at the Conference hall of the National Center for Scientific research (CNRS) in Montpellier, France from June 15-18. The symposium brought together researchers on figs worldwide. Six young research fellows of XTBG participated in the meeting and presented their research work. Afterwards, XTBG researchers communicated with international colleagues and discussed cooperation points.





## XTBG participates in 6<sup>th</sup> International Orchid Conservation Congress

The 6<sup>th</sup> International Orchid Conservation Congress (IOCC) was held in Hong Kong during May 16-20. IOCC6 provided a forum for the world's orchid scientists and conservationists to share their knowledge, experiences and views on how to bridge this gap. It attracted more than 150 representatives engaged in orchid study and conservation.

This is sixth meeting in the IOCC series. Previous congresses were held in Perth, Australia (2001), Sarasota, USA (2004), San José, Costa Rica (2007), Hluboka, Czech Republic (2010) and La Réunion, France (2013). IOCC6 will be held in conjunction with the 12th International Symposium on the Diversity and Conservation of Asian Orchids. First held in Japan in 2005, this series of meetings has since been hosted in Japan (2006–2010), South Korea (2011 and 2015) and China (2012–2014).



*Ms. Zhang Wenliu wins prize for presentation*



*Group photo.*

## XTBG Seminar Program

Since its establishment in 2010, the XTBG Seminar Program has conducted more than 281 seminars, with new speakers virtually every week in 2016. A total of 51 talks were given by speakers from the USA, the UK, Australia, India and 11 other countries. Prof. Michael Lynn Arnold, the distinguished research professor,

university of Georgia, Dr. Edward Allen Herre of Smithsonian Tropical Research Institute, Dr. Florian Maderspacher, the senior editor of *Current Biology* 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 DUAN Qiwu



Facts:

1. Total number of accession: 21,052
2. Total number of species: 11,798
3. Total number of unidentified species: 4,433
4. Total number of species from wild: 6,770
5. Number of accession collected in 2016: 1,110
6. Number of species collected in 2016: 1,092

## Updated version of plant list of XTBG issued

Comprehensive review and correction have been made on the plants list of XTBG this year. After four proofreading, we have revised a large number of nonstandard botanical names and suspicious species and have completed the proofreading of botanical names. 500 revised plant lists have been compiled and printed, making plant management scientific and standard, which conforms to the developing change of classification discipline. The updated version of the plant list includes 8292 species belonging to 2100 genus of 265 families, which contains 206 species pteridophytes belonging to 73 genus of 28 families, 95 species gymnosperm belonging to 28 genus of 11 families and 7991 species angiosperms belonging to 2009 genus of 226 families.



Plant Lists

## Plant introduction and endangered plant ex-situ conservation



Plant Introduction

1,116 species were introduced to XTBG in 2016, among which 810 were domestic, mainly from south Yunnan. Among the species introduced from south Yunnan, 26 species were on the list of "Plant zero extinction program", they are endangered or critically endangered in Xishuangbanna, such as *Hoya chinghuangensis*, *Milusa bannaensis*, *Pilea pseudonotata*, *Elatostema tenuicaudatum*, *Argyreia fulvovillosa*. 306 species were introduced abroad, mainly from Southeast Asian.





## Plants show adds seasonal attraction of the garden

For the third time since 2014, a natural orchid show transforms the Shade Plant Garden of XTBG into a spectacular world flower from April 11 to May 3. The orchid show features spectacular exhibits showcasing beautiful, fragrant, and interesting orchids in full bloom. Such orchid species as *Vanda coerulea*, *Cymbidium lancifolium*, *Paphiopedilum malipoense*, *Paphiopedilum armeniacum*, *Paphiopedilum micranthum*, etc. are on show. The orchid show aimed at raising conservation awareness and calling more people to participate in protecting wild orchid species.

From July 1 to August 31, a lotus flower festival or “lotus month” was held in XTBG. The exquisite fragrance of the lotus was a feat to visitors. The king lotus with huge leaves which can bear a weight of about 70 kilograms gave visitors unforgettable experience.

During the spring festival, you can see 50 succulent plants from



orchid show

40 genera in 8 families on show at the Distinctive Plant Collection of XTBG. The ability of succulents plants to endure drought is reflected in the

succulent stem/leaf condition where water is stored.

*Amorphophallus virosus* N. E. Br (also called corpse flower) comes to flowers in the rainy season in Xishuangbanna. Hundreds of corpse flowers became blooming at the Distinctive Plant Collection of XTBG, which is eye-catching to visitors. Science popularization plates make it easy for visitors to have a better understanding on this plant.



lotus month



*Amorphophallus virosus* N. E. Br

## The second training course on gardening and horticulture 2016 completed

The Second Training Course 2016 on Gardening and Horticulture came to a successful end on September 26, with 67 trainees obtained professional

qualification certificate. The 40-day course from August 22 to September 26 was mainly designed for students from Puer College.

The 40-day curriculum consisted of lectures, filed practices,



demonstration, study tours, discussion and final tests. The courses mainly include application of flowers and horticultural art; flower production and cultivation management; pest control of plants in garden; nursery gardening; and ornamental plants.

Building on over 20 years of professional horticulture training at XTBG, the course has been designed to give trainees a solid founding in horticultural techniques.

XTBG was designated as an Occupational Skill Testing Authority by the Department of Labor and Social Security of Yunnan Province in 1997. Since then, XTBG has hosted training course on gardening and horticulture each year, by making full use of its advantages in landscape planning and designing, horticultural cultivation, seed storage, plant protection, forest science, etc.

This is the 23rd training course on gardening and horticulture and the second of its kind in 2016.



*Understanding pest control in the field*



*Test on theory study*

## **New progress has been made in the micropropagation of endangered plants**

Propagation conservation has been primarily made on arethusa. 15 seedlings of arethusa sterile propagule have been obtained through vitro propagation, and nearly 100 thousand bundles/ strains of 9 species arethusa have been put into hardening-seedling phase. A technological package from asepsis sowing to hardening-seedling has been successfully explored through *arundina graminifolia*, some vitro propagation seedlings has been put forth their blossoms, and 200 bundles has come out nursery seedling to planting in the specialized garden. Some arethusa like *Spathoglottis augustorum* and *Phaius tankervilleae* have been sowed and transplanted seedlings successfully, and some species have bloomed, providing a convenient and efficient way to propagation c. By doing this, the micropropagation has laid a solid foundation for the show and conservation of arethusa.

Micropropagation has been made on conservation plants such as *Isoetes orientalis*, *christensenia assamica* and tropic ornamental plants like *platycerium wallichii*, spores have germinated and can be put into transplantation phase.



*Arundina Graminifolia*



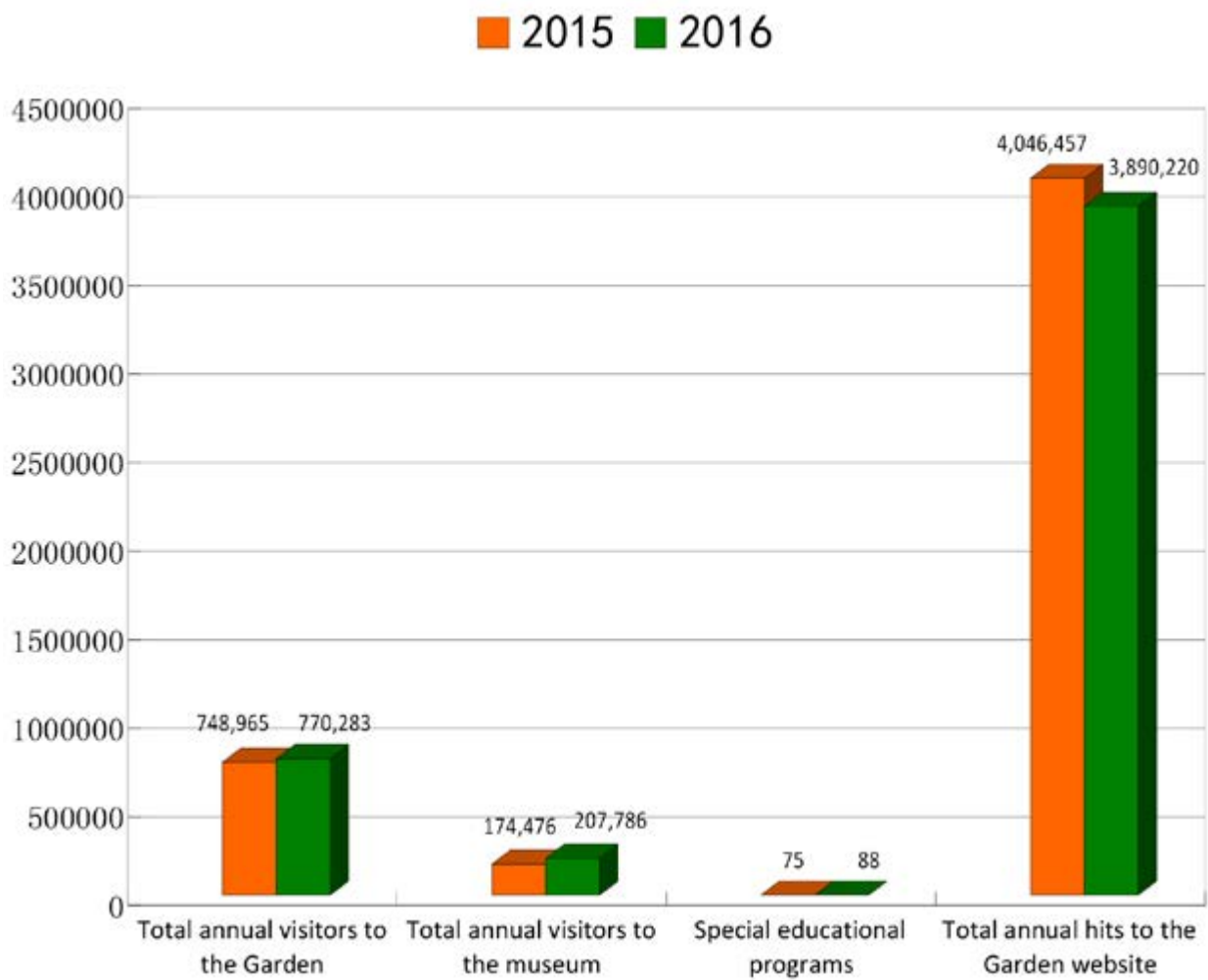
# Public Education

A group of students, seen from behind, are walking across a wooden suspension bridge in a lush green forest. The students are wearing backpacks and colorful jackets. The bridge has green metal railings and is surrounded by dense foliage. The scene is captured from a low angle, looking down the length of the bridge.

Photo by ZHAO Jiangbo



Facts:



## The 1<sup>st</sup> Luosuo River Science Education Forum Held in XTBG

Hosted by Bureau of Science Communication Chinese Academy of Science, Department of Policy, Regulation and Supervision at Ministry of Science and Technology, and Chinese Union of Botanical Gardens, the first Luosuo River Science Education Forum was held on August 11 and 12 by XTBG, Chinese Academy of Science, featuring "Collaboration and Innovation-- exploring new paths for science education." The forum included three keynote speeches and five sub-forums: New National Trends on Science Education, Citizen Science and Biodiversity Protection, Science Education and Inquiry-based Learning, New Media's Influence on Science Communication, and Addressing Nature-deficit Disorder with Nature Education and Nature Immersion. Present at the forum were more than 120 delegates from Chinese Academy of Science, Ministry of Environmental Protection, China Association for Science and Technology, science museums,

museums and various civil educational organizations across the country. The proceedings (in Chinese) of the forum are now available online for the public. <http://m.xtbg.cas.cn/kpbd/201612/P020161230584484350187.pdf>



*Communicating during the Luosuo River Forum*

## XTBG's Endeavor to Bridge Art and Science

September 28, 2016, XTBG held the "Art Meets Science" Tropical Rain Forest Chinese Painting Exhibition and Symposium. The exhibition continues all the way to February 5, 2017. On display are 128 paintings by more than 100 artists from all over the country. The vivid paintings, well received by visitors, mostly



*BAI Chunli (L2) visit the Art Exhibition*

feature such tropical life as orchids, Roxburgh fig trees, banana trees, Asian taros, and peacocks. The exhibition has become a good window for XTBG in showing its work in combining art and science, which was applauded by academician BAI Chunli, the president of Chinese Academy of Science, during his inspection visit at XTBG. During the exhibition, XTBG also invited several visiting artists to three workshops organized for youth and children, in order to increase their understanding and improve their skills on Chinese painting.

July to September, "Beauty of Orchids" painting exhibition, an initiative to protect orchids, toured across the country, from XTBG to Wuhan Botanical Garden, South China Botanical Garden, and Shenzhen Fairy Lake Botanical Garden. For the exhibition, there were over 40 paintings in total by Turkish artist Işık Güner, and Chinese artists HE Ruihua and ZHANG Lan. The paintings, from a scientific point of view and with artistic techniques, convey to the public the threat of wild orchid over-collection, and call for raising the awareness of their protection.



## Success of XTBG's 1<sup>st</sup> Youth Science Festival

May 21 to 27, 2016, XTBG held its first Youth Science Festival, in an attempt to increase the communication between scientific researchers and the public, especially researchers and local middle school students. With 61 well-made scientific posters and various instruments, 54 researchers introduced their research projects to visitors through presentation and different hands-on activities. The festival was well received not only onsite but online. The topics microblogged during the festival received three million views. In addition, the festival also gained the 2016 National Environmental Protection and



Poster for the Science Festival

Science Communication Base Special Support. While the festival targeted general visitors, it also reached out to local community in Xishuangbanna, by creating an opportunity for middle school students to communicate with scientists in a face-to-face manner. In a post-festival interview, the

students explained that, through the festival, they found how interesting science could be, and that they realized scientific research is not merely lab work, but exploration out in nature as well.



Students reading posters of Science Festival



Students observing figs at Science Festival



Photo by CUI Qinglan



## XTBG's Refined Training Series

As one of the focuses of XTBG's 13<sup>th</sup> Five-year plan, training series had gone through a process of refinement in 2016. XTBG continues its existing programs, e.g. Advanced Fieldcourse for Ecology and Conservation, Meta-Analysis Workshop in Ecology and Conservation, and 40-day



*Group photo of the training course for Nature Teacher*

horticulture training program. At the same time, XTBG also launched new programs, such as Nature Interpretation Training for tour guides in Xishuangbanna national parks and nature reserves, and Environmental Education Training for science teachers in Xishuangbanna elementary schools. Other than the implementation of the programs, time and effort have also been put into pre- and post-program trainee surveys, which we believe is essential for bettering the training series.

## Various Media Publicity

XTBG continued to show in 2016 its well established image through such platforms as traditional media and the Internet. In January, as part of the "Central media's visits in Chinese Academy of Science," XTBG's most recent research progress, rainforest canopy crane observation system, and native species full coverage protection plan were heavily reported by China Central Television, Xinhua News Agency, China News Service, China Daily, and China Youth Daily. The reports were later republished by other major media. With all added up, 340 reports were produced. In addition, XTBG had established a collaborative relationship with central and local television stations. China Central Television's program "Is it true?" had 6 episodes

in total shot in XTBG in 2016, which were applauded across the country. On the Internet, XTBG's official website had been regularly updated, including 916 news posts, of which 226 were republished by Chinese Academy of Science's Chinese website. Among the 226 news posts, two were headlined, i.e. Vice-premier LIU Yandong Visited XTBG, and Scientists Decoded Bee's Audible Alarm Signal. XTBG had also been active on social media platform. In 2016, it delivered 641 original microblog posts to its 191,000 followers, and 139 WeChat posts to its 10,827 followers. The posts include reports and updates about XTBG's major events, scientific research, horticulture, and daily activities, making XTBG more and more influential among the public.



*Programma of Is it True*



## A Joint Exhibition in Guizhou Science Museum



*Opening Ceremony at Guizhou Rainforest Exhibition*

July to September, 2016, XTBG, Guizhou Science Museum and Guizhou Botanical Garden jointly held the “Xishuangbanna Rainforest Plant Science Outreach Exhibition.” Based upon Xishuangbanna rainforest’s natural landscape, plants, animals, biodiversity, harmonious development between human and nature, and the custom and culture of local minorities, the exhibition opened a window, with multi- perspective introduction of rainforest plant and animal resources, a window for the public to explore the wonder of rainforest, biodiversity, and the spectacular life of plant and animal kingdom. As part of the exhibition, Guizhou Botanical Garden also showed Guizhou’s rich plant resources and the enigmatic custom and culture of its local minorities. Guizhou Daily, Guizhou Evening News, and Guizhou Metro followed and covered the whole exhibition.

## The 1<sup>st</sup> Xishuangbanna Youth Nature Notes Contest

March to September, 2016, XTBG and Xishuangbanna National Nature Reserve together held the 1<sup>st</sup> Xishuangbanna Youth Nature Notes Contest. Students from 15 schools joined the contest, including several schools near the border of the country. The contest was strongly supported by students, teachers, and schools. The contest committee received over 500 entries, among which 50 stood out, including 5 first prizes, 10 second, 15 third, and 20 honorable mentions. Three schools were also awarded Excellent Organizer. They were Xishuangbanna Yunjinghong Elementary School, Mengla County First Middle School, Menglun Town Central Elementary School. After the contest, XTBG also organized a summer camp for the contest winners, as an encouragement for their further exploration in nature notes and nature itself.



*First prize of Nature Note Contest*



# Partnership

*Photo by CUI Qinglan*



## Domestic

### XTBG becomes experiment and training base of Yunnan University

According to a Memorandum of Understanding (MoU) signed between XTBG and School of Ecology and Environmental Science of Yunnan University, XTBG has become Experiment and Training Base of ecology and environmental science of Yunnan University.

The MoU was signed after meetings of the two sides on April 8. As representatives of the two sides, XTBG director CHEN Jin and Prof. DUAN Changqun signed the MoU and unveiled the plate of the experiment and training base at the Key Laboratory of Tropical Forest Ecology.

As the MoU stated, the two sides will give full play to each other's advantages and reach win-win situation. The experiment and training base will be a center for practical teaching, experimental field, and supporting platform for students' extracurricular scientific activities.



*Meeting of the two sides*



*Prof. Duan Changqun (L1) and Prof. Chen Jin (R2) unveils the plate*

### XTBG signs cooperation agreement with Guangxi University

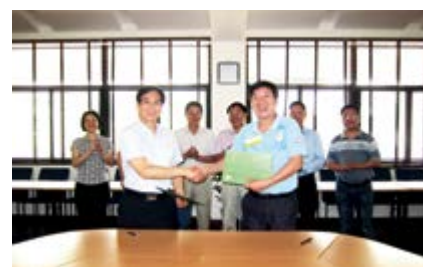
A cooperation agreement was signed between XTBG and Guangxi University on May 6. As representatives of the two sides, XTBG Director CHEN Jin and Guangxi University Principal ZHAO Yanlin respectively signed their names on the agreement at the headquarters of XTBG. XTBG and Guangxi University intend to engage in educational and scientific cooperation on matters of mutual interest and concern. Based on the principle of "resource sharing, taking advantages of each other's strength, and cooperation to achieve mutual benefits", the two sides will conduct strategic cooperation. They will cooperate in setting up experiment

base in XTBG, jointly cultivating elite students, application key research programs, etc. They may also organize joint seminars, conferences, and other professional meetings.

After signing agreement, Principal ZHAO Yanlin and his companions visited the 20-ha forest plot, herbarium, seed bank, central laboratory, and some living collections of XTBG.



*The two sides have a discussion meeting*



*Prof. CHEN Jin (R) and principal ZHAO Yanlin (L) sign agreement*

# International

## Myanmar

Academician ZHANG Yaping, vice president of Chinese Academy of Sciences, headed up a delegation to Myanmar during March 22-26, at the invitation of the Ministry of Environmental Conservation and Forestry. Prof. CHEN Jin, director of XTBG, accompanied the tour. The tour was to renew a MoU between XTBG and Myanmar Ministry of Environmental Conservation, and to unveil the completion of the laboratory building of the CAS-SEABRI. The two sides held a meeting to discuss topics of common concern for future cooperation. Mr. Nyi Nyi Kyaw of Myanmar spoke highly of joint field investigations and biodiversity conservation work in norther Myanmar. A new insight was brought into the rich and unique biodiversity in Myanmar. Some new species have been discovered. The joint work also contributed to team building of plant taxonomy and field investigations of Myanmar. Prof. ZHANG Yaping expressed gratitude to Myanmar for their support in laboratory building restoration. More cooperation and joint work are expected to be conducted by the two sides. By the platform of CAS-SEABRI, more people will be involved in biodiversity conservation.

A new MoU was signed between XTBG and Myanmar Ministry of Environmental Conservation on March 25.

At the unveiling ceremony of the laboratory building, Prof. ZHANG Yaping said that the CAS-SEABRI will become an internationally recognized research institute by hard work of scientists from the two sides.

Afterwards, the CAS delegation visited the National Kandawgyi Botanical Gardens (Maymyo Botanical Garden) of Myanmar and talked with the staff. Prof. CHEN Jin said that XTBG would like to provide training on plant taxonomy, gardening and horticulture techniques for young staff members of the Maymyo Botanical Garden.



*Prof. CHEN Jin speaks at the opening ceremony of research building*



*CAS delegation was warmly welcomed*



*MoU signed*



*Ribbon cutting of the opening ceremony*





## France

Prof. Bruno David, director of NMNH Paris, the French National Museum of Natural History, paid a visit to XTBG on September 29-30. A MoU was signed between the two sides.

According to the MoU, the two sides are to cooperate in studies of tropical ecology, plant taxonomy, phylogenetics, biogeography, biodiversity conservation, interaction

of plants and animals, paleoecology. Cooperation also includes joint workshops and seminars, exchanges of plant specimens, visits of scientists, museum development, public education, and horticultural training, etc.

As representatives of the two sides, Prof. CHEN Jin and Dr. Bruno David signed the MoU.

During his stay in XTBG, Prof. Bruno David delivered a lecture entitled "Get involved in the protection of biodiversity". He talked with related scientists and visited the Paleoecology laboratory, research facilities, and living collections.



*At the Paleoecology lab*



*MoU signed between NMNH Paris and XTBG*

*Photo by CUI Qinglan*



Annual Report 2016





# Talent Training and Team Building

Photo by DUAN Qi-Wu



# Postgraduate Education

## Excellent Doctorial Dissertation Awards

Dr. CHEN Ya-Jun's doctoral dissertation which entitled "The water-use characteristics of tropical lianas and the comparison with co-occurring trees" was enlisted of CAS Excellent Doctorial Dissertation of 2016. And his supervisor Prof. CAO Kunfang was honored of "Outstanding Graduate Tutor Award, CAS". The doctoral thesis entitled "Disentangling mechanisms underlying tree

species coexistence: integrating phylogenetic and functional dimensions" by Dr. YANG Jie has been enlisted in the 2016 Provincial Excellent Dissertations of Yunnan. Prof. CAO Min, supervisor of YANG Jie, won honor of "Excellent Supervisor of Yunnan Province".



CHEN Yajun



YANG Jie

## Dr. ZHANG Fan and MENG Hong-Hu receive CAS President Award

Dr. ZHANG Fan and MENG Honghu of XTBG were on the list of laureates for 2016 CAS President Award. During his studies in XTBG, ZHANG focused on studies of the efficient conversion and utilization of plant resources cleaning. He has got his research results in such journals as *Green Chemistry* and other international journals. MENG focused on studies of plant evolution and

biogeography. He has got his research results in such journals as *BMC Evolutionary Biology* and other international journals. The President Awards are the top honor for graduate students at CAS.



ZHONG Fan



MENG Honghu

## Graduation Ceremony 2016



*Outgoing graduates pose a photo*



*Outgoing graduates plant a tree for memory*



*Graduates and teachers pose a photo*

The 2016 graduation ceremony and degree awarding was held on June 16. Eighteen students were conferred with doctoral degrees and thirty students were granted with master degrees. The graduation ceremony and degree awarding was presided over by XTBG CPC Secretary LI Hongwei. In his address Prof. CHEN Jin, director of XTBG, sent congratulations to graduates on their successful completion of studies. Dr. ZHANG Fan and MS. WU Junen, graduate representatives, reviewed their life in XTBG, and expressed their heartfelt gratitude to their teachers. Prof. CHEN Jin moved the caps of every graduate to the right place. A tree of *Aesculus assamica* Griff. was planted for memory in front of the student's apartment.





# Talent Training

## Advanced Fieldcourse in Ecology and Conservation - XTBG 2016

From 10 October to 20 November 2016, XTBG held the Advanced Fieldcourse in Ecology and Conservation- XTBG 2016 (AFEC-X 2016). In total, 79 students and young researchers from 27 organizations in 11 countries applied for the course, and finally 39 applicants from 20 institutions in 10 countries were accepted.

The six-week fieldcourse includes four components: lectures and practicals, field trips, independent projects and symposium. During the whole course, 37 XTBG staffs and students were teaching and assisting the course. Professor Richard Corlett, Alice Hughes, Kyle Tomlinson and Akihiro Nakamura were the core instructors. LIU Jingxin was the coordinator.

The topics during the course include: conservation ecology, species distribution modelling workshop, climate change, invasion ecology, soil ecology, canopy ecology, insect sampling, bat ecology, plant functional traits, vegetation sampling, R statistics, experimental design workshop, eco photography, citizen science, scientific writing, PPT and speech skills, thermo-

camera, camera trap, drone, and smartphone app use. All lectures were followed by a practical or demonstration. In addition, the students had a one-day trip to Xishuangbanna National Nature Reserve to visit the 20 ha dynamic plot, the canopy crane and canopy corridor.

Eight groups, organized according to the students' interests, carried out seven independent projects in and around XTBG: 1. Competition for light tolerance vs water stress explain tree diversity in limestone Forest; 2. Water balance strategies of pseudobulb-orchids in limestone forest, Xishuangbanna; 3. Bird Community Structure at Xishuangbanna Tropical Botanical Garden; 4. Diversity, abundance and distribution of land snails in Xishuangbanna Tropical Botanical Garden, Southern Yunnan; 5. Colour-cue based training and memory in a jumping spider- *Siler semiglaucus* (Aranaea: Salticidae); 6. Pollination-induced petal senescence in two species of orchids; 7. Assessing the co-occurrence of carnivores in three XTBG habitats using camera traps; 8. How local rubber farmers in Menglun town perceive impacts of rubber plantation? 9. Does liana affect arboreal ant diversity?

On Nov. 20, 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 Kyle Tomlinson, Mareike Roeder, ZHANG Mingxia, Aki Nakamura, YANG Xiaodong, FAN Zexin, LIN Hua, and CHEN Hui. The best research project award went to "Colour-cue based training and memory in a jumping spider- *Siler semiglaucus* (Aranaea: Salticidae)" completed



Trainees pose and photo of "AFEC"



Trainees and teachers pose a photo

by Ms. LUO Yuying from University of Hong Kong, Mr. Ade Prasetyo Agung from Andalas University in Indonesia and Mr. Dissanayake Mudiyanse Naveen Jayalal Dissanayake from Kunming Institute of Botany CAS. 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 2016 for Outstanding College Students completed

The 2016 XTBG Excellent University Students Summer Camp was held successfully from August 1 to 7. 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. 47 outstanding students from 30 universities gathered together at XTBG headquarters and enjoyed the summer camp.

At the opening ceremony of summer camp on August 1, the campers sang the XTBG song “Our Garden, Our Home” in chorus. 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 get happiness and experience success through the visit, study, communication and other activities to approach and understand XTBG.

Academic salon, laboratory tours, field trips, touring XTBG in the night, volleyball contest all provided the campers pleasant, practical, and meaningful experiences. Through the summer camp, the students have strengthened their understanding of botanical and ecological studies and had a better standing of XTBG. Some of them are expected to have further studies at XTBG.

On August 7, the closing ceremony was held. Prof. LIU Wen Yao and CHEN Jianghua issued certificates of completion for the students.

The holding of 2016 Excellent Students Summer Camp aims at promoting the exchange of ideas among the students, strengthening their understanding of botanical and ecological studies



*Li Hongwei delivers an opening speech*



*Campers and teachers pose a photo*





## CUBG Environmental Education Training Course 2016 a success



*Prof. CHEN Jin introduces training course*



*Prof. Joe E. Heimlich teaches at the course*



*Trainees and teachers pose a photo.*

The two-week CUBG Environmental Education Training Course 2016 came to a successful end on August 15, which is marked by 8 interesting oral presentations by trainees. 27 trainees involving environmental education from botanical gardens, non-governmental organizations (NGOs), and universities got certificates of completion from Prof. CHEN Jin.

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

The training course consisted of lectures on theories of environmental education, research methods, statistical analysis, literature comprehension, small research projects, etc. Prof. CHEN Jin, director of XTBG and current chairman of CUBG, delivered lectures and guided the participants to studies through the whole two-week course. The course provided the participants a new insight into carrying out public education in botanical gardens. The trainees were divided into 8 small groups to raise scientific questions, design experiment, collect data, and analyze data. They presented their results to expert panel on August 15. The presentation entitled "How botanical garden experience affects knowledge gain?" was evaluated as the best one among the 8 presentations. The presentations by the trainees were exciting and won praise from the training specialists, which marked the training course a success.



*Photo by CUI Qinglan*

# Team Building

## 9 Scientists of XTBG were approved by CAS “Light in Western China” Project

After the approval of CAS Personnel Bureau, 9 scientists in XTBG (Dr. SUN Yongshuai and WANG Bo who won “A category”, Dr. GAO Xiaoyang, MENG Honghu, SONG Yu, XU Guorui, ZHANG Shubin and ZHAO Baolin won “B category” and XU Peng won “talents introduction”), were approved by CAS “Light in Western China”

project, in total of 3.4 million Yuan.

By the end of 2016, 94 scientists in XTBG had received funding from the “Light in Western China” project, totaling 15.64 million Yuan.

## New members of Youth Innovation Promotion Association,CAS

Dr. SU Tao, Dr. ZHANG Fang and Dr. LI Su 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.

## Three postdoctoral fellows received funding from China Postdoctoral Science Foundation

Dr. D Balasubramanian, Dr. Uriel Gélín and Dr. Low Shook Ling of XTBG received funding from China Postdoctoral Science Foundation, in total of 210,000 Yuan.



Uriel GELIN



Low Shook Ling



D Balasubramanian







## Richard Corlett wins China's Friendship Award 2016

The Chinese government on September 29 conferred its Friendship Award on 50 foreign experts from 18 countries working in China, in recognition of their contribution to China's development. Prof. Richard Corlett of Xishuangbanna Tropical Botanical Garden (XTBG) is one of the 50 friendship award winners.

Richard Corlett came to work in XTBG in 2012. He is now a professor and Director for the Center for integrative Conservation at XTBG. His major research interests include terrestrial ecology and biodiversity conservation in tropical East Asia, plant-animal interactions, urban ecology, invasive species, and the impacts of climate change. Much of his research has focused on species survival in degraded tropical landscapes, with the projected impacts of climate change an increasingly

important issue. In addition to numerous scientific papers, he is the author or co-author of several books, including *The Ecology of Tropical East Asia*, published in 2009 by Oxford University Press, and *Tropical Rain Forests: an Ecological and Biogeographical Comparison*, co-authored with Richard Primack, with a second edition published by Wiley in 2011.

The "Friendship Award" is an annual award issued by the Chinese government to honor outstanding foreign experts in China. It was established in 1991.



Richard Corlett at XTBG



Certificate of friendship Award

## XTBG scientists awarded by Yunnan Province

An announcement by the Organization Department of Yunnan Province said that 15 scholars from universities and institutes of the province will be supported by “The distinguished scholars in Yunnan” Program. Prof. YU Diqiu of Xishuangbanna Tropical Botanical Garden (XTBG) is on the name list.

Prof. YU Diqiu is currently chairman of Academic Committee of XTBG. He is a prominent and leading researcher. After coming back from USA to work in XTBG in 2003, he is principal investigator of Plant Molecular Biology Group and focuses on studies of molecular mechanism of interaction between plants and environmental factors, signaling pathways, etc. He has completed important research programs and cultivated a batch of young scientists. His research results have been published in *Proceedings of the*

*National Academy of Sciences of the United States of America (PNAS), The Plant Cell, Plant Journal, Plant Physiology, Molecular Plant, etc.*



## New Young- Scientist Groups were set up



LIANG Gang

In 2016, one Young- Scientist Groups was set up in XTBG. Plant mineral nutrition group focuses on the metal homeostasis in plants. This group uses as *Arabidopsis thaliana* and *Oryza sativa* as model plants in order to decipher the fundamentals of metal homeostasis. Their recent studies identified four key transcription factors which positively regulate Fe deficiency response in *Arabidopsis*. They also used these genes to improve yields and seed Fe concentration of plants grown in calcareous soils. This strategy may pave the way for improving the nutritional quality of crops. Additionally, this group is exploring novel strategies for cleaning up soils contaminated with heavy metals in order to improve safety of crops.





## New postdoctoral fellow recruitment

Ten postdoctoral fellows, Dr. Ana Rita Peres Cardoso Gouveia, Dr. Ravi Kant Chaturvedi, Dr. Mazloom Shah, Dr. Low Shook Ling, Dr. Uriel Jésus Govinda Gélin, Dr. Tristan Raphael Charles-Dominique, Dr. CHEN Zhanqi, Dr. LI Guogang, Dr. ZHAO Dake, Dr. MEI Song, were approved to join XTBG in 2016. Dr. Ana Rita Peres Cardoso Gouveia achieved her Ph.D degree in Imperial College London in 2012, currently cooperates with Prof. QUAN Ruichang of XTBG; Dr. Ravi Kant Chaturvedi, acquired his Ph.D degree in Banaras Hindu University in 2013, currently cooperates with Prof. Kyle Warwick Tomlinson of XTBG. Dr. Mazloom Shah achieved his Ph.D degree in University of Science and Technology of China in 2015, currently works in bio-energy research group. Dr. Low Shook Ling acquired her Ph.D degree in University Malaysia Sarawak in 2015, currently cooperates with Prof. ZHOU Zhekun. Dr. Uriel Jésus Govinda Gélin achieved his Ph.D degree in University of Sherbrooke in 2013, currently cooperates with Prof. Kyle Warwick Tomlinson of XTBG. Dr. Tristan Raphael Charles-Dominique achieved his Ph.D degree in University of

Montreal in 2012, currently cooperates with Prof. Kyle Warwick Tomlinson of XTBG. Dr. CHEN Zhanqi achieved his Ph.D degree in National University of Singapore in 2015, currently cooperates with Prof. QUAN Ruichang of XTBG; Dr. LI Guogang achieved his Ph.D degree in University of Chinese Academy of Sciences in 2016, currently cooperates with Prof. QUAN Ruichang of XTBG; Dr. ZHAO Dake achieved his Ph.D degree in University of Chinese Academy of Sciences in 2012, currently cooperates with Prof. YU Diqui of XTBG. Dr. MEI Song achieved his Ph.D degree in University of Science and Technology of China in 2016, currently cooperates with Prof. HU Yanru of XTBG.



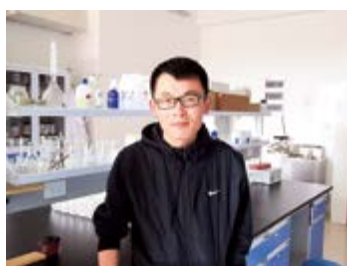
*Ana Rita Peres Cardoso Gouveia*



*CHEN Zhanqi*



*MEI Song*



*ZHAO Dake*



*LI Guogang*



*Low Shook Ling*



*Tristan Raphael Charles-Dominique*



*Ravi Chaturvedi*



*Mazloom Shah*



# Visits

*Photo by ZHU Renbin*



Photo by ZHU Min



## Vice Premier, LIU Yandong

Chinese Vice Premier LIU Yandong was on an inspection trip in southeast China's Yunnan Province in December. She stressed that social causes such as education and healthcare should be pursued to promote development and long-term peace and stability in ethnic border areas. During her trip in Yunnan, Vice Premier LIU Yandong paid an inspection tour to XTBG on December 11, accompanied by CAS President BAI Chunli and local officials of Yunnan. XTBG director CHEN Jin reported the work concerning plant diversity conservation, species protection, development and utilization of plant resources, and public education. He also reported the work of CUBG, contributing to development of botanical gardens nationwide.

The vice premier met XTBG researchers and student representatives. She spoke highly of the development and application of medicinal plants (e.g. Dai medicine) and contribution to local development. She emphasized the significance of ecological civilization and encouraged XTBG to play a bigger role.

She encouraged XTBG researchers to shoot frontiers of science and technology and make more achievements in tropical plants and ecological studies. She emphasized the significance of combining independent research with industrial application, encouraging XTBG to study Dai medicine and traditional Chinese medicine and explore precious plant resources. She also talked about the significance of international cooperation and talent cultivation. She wished XTBG to be a first-class botanical garden in the world by 2020.

The vice premier toured some living collections like Flower Garden, Palm Garden, Distinctive Plant Collection, Aquatic Garden, and Energy Plant Collection. She also visited the Central Laboratory, learning about large apparatus and equipment.



## Chinese former vice premier, HUI Liangyu

Chinese former Vice Premier HUI Liangyu paid an inspection tour to XTBG



on March 6, in the company of provincial and local officials. Mr. LI Hongwei, CPC secretary of XTBG, accompanied the officials to look around the living collections, green stone forest, new research center. They also made field visit at the environmental-friendly rubber plantations. LI Hongwei briefly reported the development of XTBG over the past years and introduced living wisdom of some distinctive plants and tropical rainforest culture.

Former vice premier HUI Liangyu spoke highly of rich biodiversity and beautiful landscape of XTBG. He gave positive comment on species preservation and scientific research, and XTBG's contribution to local development.

## CAS President, BAI Chunli

Prof. BAI Chunli, president of the CAS, accompanied Vice Premier Liu Yandong to inspect XTBG on December 11. He then led XTBG researchers and administrators to learn the speech of LIU Yandong at XTBG, listened to work report, and had cordial talk with scientists and students representatives.

Prof. CHEN Jin, director of XTBG, made a report on "the 13<sup>th</sup> five-year plan and thoughts on future development of XTBG". He also reported work plan of the CUBG.

Prof. BAI Chunli gave positive comments on the work plan and discipline setting of the "One-Three-Five" plans (one positioning, three great breakthroughs and five major development directions). He pointed out that the current major task is to make XTBG a first-class botanical garden in the world by 2020 and think on the indices of first-class world garden.

Recognizing XTBG's achievements in international cooperation, Prof. BAI Chunli encouraged XTBG to play a bigger role in Southeast Asian areas, considering to lead international organizations or to promote major international scientific and technological cooperation projects.

President BAI Chunli urged similar research institutes (three botanical gardens and botanical institutes) to differentiate

development plans and cooperate more to gain coherent development and earn significant influence.

Afterwards, Prof. BAI Chunli toured some living collections and the "3H" apartment for young researchers.





## Former CAS President, LU Yongxiang

Prof. LU Yongxiang, former vice-chairman of the standing committee of the National People's Congress and former president of CAS, paid an inspection tour to XTBG on October 2. During his visit, LU Yongxiang firstly listened to the introduction made by Prof. CHEN Jin, director of XTBG to the major progress recently achieved in scientific research, public education, species, conservation, CUBG, Southeast Asia Biodiversity Research Institute, etc. He was then briefed development goals and reform strategies of XTBG in the 13th five-year plan. The former CAS president laid emphasis on the sustainable development and urged XTBG to take into consideration of the use of big data while picturing a clear blueprint for the future development.

After the meeting, LU Yongxiang visited the Flower Garden, Vine Garden, demonstration shop of Inca peanut (*Plukenetia*

*volubilis*) products, and the central laboratory. He also looked around the Science & Art Collaboration: the Chinese Painting Exhibition of Rainforest.



## Nobel Prize winner, John B. Gurdon



Prof. John B. Gurdon, winner of the Nobel Prize in Physiology or medicine 2012, paid a visit to XTBG on May 27-29. His tour was accompanied by Prof. KANG Yujian, one of the first batch of experts recruited by the Recruitment Program for Young professionals.

Prof. Richard Corlett and Dr. Alice Hughes accompanied the visitors to the Central Laboratory and communicated with the staff. The Nobel Prize laureate had a general understanding on development of XTBG by looking annual reports and communicating with staff members.

Prof. John B. Gurdon and KANG Yujian also visited living collections, tropical rainforest ethnic culture museum, and tropical rainforest within XTBG. They spoke highly of rich biodiversity, beautiful landscape, and management of plant labels.

# Other Visitors

## January

- 3 Prof. Matthew Webster of department of Medical Biochemistry and Microbiology at Uppsala University visited XTBG and gave a talk at XTBG Seminar and agreed to conduct the cooperative study.
- 7 Dr. LV Houyuan from Institute of Geology and Geophysics Chinese Academy of Sciences and Dr. TANG Lingyu from Nanjing Institute of Geology and Palaeontology Chinese Academy of Sciences visited XTBG and discussed the cooperation issues.
- 15 Dr. Samuel Turvey of Institute of Zoology in London visited XTBG , gave a talk at XTBG Seminar.
- 20 Prof. Kyan Staunton of James Cook University in Australia visited XTBG, gave a talk at XTBG Seminar.

## February

- 1 Dr. CHEN Renjye of Kaohsiung Medical University in Taiwan visited XTBG and gave a talk at XTBG Seminar.
- 9 Prof. Achim Braeuning of institute of geography in Erlangen-Nurnberg visited XTBG and conducted academic exchanges.
- 22 Prof. Peter J. Matthews of National Museum of Ethnology in Japan visited XTBG and gave a talk at XTBG Seminar.

## March

- 1 Prof. Waltraud Schulze of Universität Hohenheim in Germany visited XTBG and gave a talk at XTBG Seminar.
- 15 Prof. Jan Šobotník, Czech University of Life Sciences Prague, Prof. David Sillam-Dussès, Université de Paris 13 Nord, Prof. Thomas Michel Daniel Bourguignon, University of Sydney, Prof. Yves Roisin, Vrije University Brussel visited XTBG and conducted academic exchanges.
- 20 Dr. Sven Landrein of Royal Botanic Gardens Kew in Richmond, UK visited XTBG and gave a talk at XTBG Seminar.
- 25 Dr. WEI Fuwen of Institute of Zoology, CAS visited XTBG and gave a talk at XTBG Seminar.

## April

- 10 Prof. Timothy Moermond University of Wisconsin-Madison in USA visited XTBG and gave a talk at XTBG Seminar.
- 13 Prof. Robert A. Spicer of the Open University visited

XTBG and discussed the cooperation issues.

- 18 Prof. Lutze Kunsmann of Senckenberg Museum and Dr. Karolin Morawecz of Senckenberg Museum visited XTBG and conducted academic exchanges.
- 20 Dr. Liang Naisheng of Japan National Institute for Environmental Studies visited XTBG and discussed the cooperation issues.
- 22 Dr. HE Jing of Technology Officer of Genome and Dr. LIU Xuan of Technology Officer of Nature Population visited XTBG and gave a talk at XTBG Seminar.
- 24 Dr. FANG Yunting of Institute of Applied Ecology, Chinese Academy of Sciences visited XTBG and conducted academic exchanges.
- 27 Dr. Paul Gugger of America visited XTBG and discussed the cooperation issues.

## May

- 5 Dr. Clive T. Darwell of Okinawa Institute of Science and Technology Graduate University in Japan visited XTBG and gave a talk at XTBG Seminar.
- 8 Prof. Lutz Kunzmann of Technical University Bergakademie Freiberg in Germany visited XTBG and gave a talk at XTBG Seminar.
- 14 Dr. LI Jun of Guangzhou Institute of Geochemistry, CAS visited XTBG and conducted academic exchanges.
- 20 Dr. John Brent Friesen of University of Illinois at Chicago visited XTBG and gave a talk at XTBG Seminar.
- 26 Prof. XU Zhihong and Prof. Chris Johnson Griffith University in Australia and Syracuse University in USA visited XTBG and conducted academic exchange and cooperation.
- 28 Prof. Ruth Clark of Kew Royal Botanic Garden in UK visited XTBG and gave a talk at XTBG Seminar.
- 29 Dr. Isik Gunner visited XTBG and conducted investigation on orchids.

## June

- 1 Dr. Benjamin Blanchard, University of Chicago visited XTBG as a exchange student.
- 5 Dr. Ian Joseph Davies of eBird Project in USA visited XTBG and gave a talk at XTBG Seminar.
- 10 Prof. ZHAO Jian, Huazhong Agricultural University visited XTBG and gave a talk at XTBG Seminar.





- 15 Prof. Paris Veltsos, University of Lausanne and Prof. MA Wenjuan, University of Lausanne

### July

- 1 Prof. ZHU Jianhua, University of Maryland, College Park in the USA Prof. ZHU Jianhua (University of Maryland, College Park, USA) visited XTBG and gave a talk at XTBG Seminar.
- 8 Prof. WANG Lei, Institute of Botany, Chinese Academy of Sciences and Prof. WU Jinsong, Kunming Institute of Botany, Chinese Academy of Sciences visited XTBG and gave a talk at XTBG Seminar.
- 15 Prof. Ram Oren, Duke University visited XTBG and conducted academic exchange and cooperation.
- 20 Prof. SUN Jianzhong of Jiangsu University visited XTBG and gave a talk at XTBG Seminar.
- 27 Prof. HE Xinhua, University of Western Australia visited XTBG and conducted academic exchange and cooperation.
- 28 Prof. James Nieh, University of California, San Diego visited XTBG as a senior scholar.

### August

- 1 Dr. ZHANG Lifang, Cold Spring Harbor Laboratory, NY, USA visited XTBG and gave a talk at XTBG Seminar.
- 3 Prof. John Grace, University of Edinburgh and Dr. Chiang Po-Neng, Taiwan University visited XTBG and gave a talk at XTBG Seminar.
- 7 Dr. WANG Shengping of North China Electric Power University visited XTBG and gave a talk at XTBG Seminar.
- 10 Dr. Joe E. Heimlich, COSI Center for Research and Evaluation, Lifelong Learning Group, USA visited XTBG and gave a talk at XTBG Seminar.
- 16 Prof. Frans Bongers and Prof. Frank Sterck of Wageningen University visited XTBG and conducted academic exchange and cooperation.

### September

- 1 Dr. Kondo Ming of Hiroshima University visited XTBG and conducted academic exchange and cooperation.
- 16 Prof. Adam Hsu, Chaoyang University of Technology, Taiwan visited XTBG and gave a talk at XTBG Seminar.
- 25 Prof. Madalin Parepa, University of Tubingen, Germany visited XTBG and gave a talk at XTBG Seminar.

### October

- 8 Prof. Randolph Menzel of Freie Universitt Berlin

Germany visited XTBG and conducted academic exchange and cooperation.

- 10 Dr. Martin Jepsen, University of Copenhagen visited XTBG and gave a talk at XTBG Seminar.
- 17 Prof. Calum Brown of University of Edinburgh visited XTBG and conducted academic exchange and cooperation.
- 20 Dr. Katerina Sam, Biology Centre of Czech Academy of Sciences visited XTBG and gave a talk at XTBG Seminar.
- 25 Prof. David Ellsworth of Western Sydney University in Australia visited XTBG and gave a talk at XTBG Seminar.

### November

- 2 Dr. ZHU Jiangof World Wildlife Fund visited XTBG and gave a talk at XTBG Seminar.
- 5 Florian Maderspacher of Current Biology visited XTBG and gave a talk at XTBG Seminar.
- 10 Prof. Chuck Cannon of the Morton Arboretum visited XTBG and gave a talk at XTBG Seminar.
- 15 Dr. Jean-Francois Barczi of CIRAD visited XTBG and gave a talk at XTBG Seminar.
- 25 Dr. Marc-Andre SELOSSE of Museum National Histoire Naturelle in France visited XTBG and gave a talk at XTBG Seminar.
- 27 Prof. Martine Hossaert-Mckey of Centre National de la Recherche Scientifique, Prof. Anne-Geneviève Bagnères of Institut de Recherche sur la Biologie de l'Insecte Centre national de la Recherche Scientifique, Prof. Magali Proffit of Centre National de la Recherche Scientifique visited XTBG and conducted academic exchange and cooperation.

### December

- 3 Dr. Alexey Reshchikov of Sun Yat-sen University visited XTBG and gave a talk at XTBG Seminar.
- 10 Dr. Mike Meredith of BCSS visited XTBG and gave a talk at XTBG Seminar.
- 13 Dr. LI Zongshan of Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences visited XTBG and conducted academic exchange and cooperation.
- 15 Prof. Michael Arnold, University of Georgia and Prof. Evan Siemann of Rice University conducted academic exchange and cooperation conducted academic exchange and cooperation.

A close-up photograph of a pink and yellow flower, possibly a Mimulus, with a green leaf and a fuzzy stem in the background. The flower has five petals, with the upper ones being pink and the lower ones being yellow. The background is dark and out of focus, with a green leaf and a fuzzy stem visible.

# Financial Review

*Photo by ZHU Renbin*



### Income and Expenditure (Million Yuan)

	Categories	FY 2014	FY 2015	FY 2016
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#### INCOME

	Government Grants	46.593	49.974	64.922
	Infrastructure	0	0	0
	Admissions and Services	55.635	82.277	85.688
	Grants for Research	94.619	66.777	79.298
	Miscellaneous	1.047	2.374	3.475
	Sum	197.894	201.402	233.383

#### EXPENDITURE

	Staff Costs	91.370	104.629	132.588
	Maintenance	3.277	4.329	24.097
	General and Admin. Expense	5.059	1.627	6.131
	Infrastructure	0	0	0
	Equipment	48.998	26.256	18.479
	Research and Horticulture	47.797	76.675	48.234
	Miscellaneous	0	0	0
	Sum	196.501	213.516	229.530



Photo by LIU Guangyu



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