The International Symposium on Major refugia of relict trees

Xueyuan Hotel, Shanghai, China
July 7th – 13th, 2019

The International Symposium on Major refugia of relict trees:

Recent Advances in Research and Conservation

Xueyuan Hotel, Shanghai, China

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Co-Organized by:

University of Fribourg, Switzerland

Shanghai Chenshan Botanical Garden (Shanghai Chenshan Plant Science Research Center, Chinese Academy of Sciences)

Supported by:

Natural History Museum Fribourg, Switzerland

National Research Council - Institute of Biosciences and BioResources, Italy

Swedish Museum of Natural History, Sweden

Xishuangbanna Tropical Botanical Garden, CAS, China

Zhejiang University, China

Yunnan University, China

Chongqing University, China

Co-Chair (A - Z)

Prof. Dr. Yonghong Hu	Director, Shanghai Chenshan Botanical Garden, China
Prof. Gregor Kozlowski	Scientific Director, Botanical Garden University of Fribourg, Switzerland

Organizing Committee (A - Z)

Prof. Min Deng	Principal Investigator, Shanghai Chenshan Botanical Garden
Prof. Thomas Denk	Curator, Swedish Museum of Natural History, Sweden
Dr. Giuseppe Garfi	Senior Researcher, National Research Council - Institute of Biosciences and BioResources, Italy
Prof. Yingxiong Qiu	Director, Ecological Research Institute, Zhejiang University
Prof. Cindy Q. Tang	Professor, School of Ecology and Environmental Science, Yunnan University, China
Prof. Yongchuan Yang	Professor, Chongqing University, China

Theme and Sessions

General theme: Major refugia of relict trees

Session 1: Phylogeny and biogeopraphy of relict plants

Session 2: Biodiversity of relict plants in time and space scale

Session 3: Conservation and management of relict plants

Session 4: Paleobotany related to relict species

Session 5: Ecology of relict trees

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General Information

Introduction

The International Symposium on Major refugia of relict trees is a high-level scientific collaboration event co-sponsored by Shanghai Chenshan Botanical Garden and University of Fribourg, Switzerland, which aims to promote scientific exchange and cooperation between China and Switzerland. The present symposium in Shanghai is to provide a platform for sharing the knowledge, technologies and practices on the research and conservation. The Symposium will proceed through reports and discussion about five sessions. Experts and representatives from relevant fields in the world will attend this symposium.

Accommodation

We have reserved rooms for participators at Shanghai Xueyuan Hotel. Please pay the cost using cash or VISA card. The hotel will provide receipt to you upon request.

The hotel is approximately 70km (1.5H) from Pudong International Airport.

Location of Meeting Rooms

All meetings will be held at the Shanghai Chenshan Plant Science Research Center. Please refer to the transportation arrangement for the specific location.

Badges

Please wear your name badge at all times.

Conference Meals and Social Event

The workshop covers lunches and dinners from July 7th to 9th. The standard room rates cover breakfasts.

Date	Time	Item	Location
July 7	18:00-20:00	Dinner	Xueyuan Hotel
July 8	06:30-08:00	Breakfast	
	12:40-13:20	Lunch	Dazhong Hotel
	18:30-20:00	Dinner	
July 9	06:30-08:00	Breakfast	Xueyuan Hotel
	12:40-13:30	Lunch	Dazhong Hotel

Transportation

We will provide shuttle bus service during the conference events.

Content	Date	Time	Starting point	Terminal point
For Conference	July 8, 9	08:30	Xueyuan Hotel	Chenshan Plant Science Research Center (CSBG)
		08:00		
For Lunch	July 8	12:25	CSBG	Dazhong Hotel
		13:20	Dazhong Hotel	CSBG
	July 9	12:30	CSBG	Dazhong Hotel
For Excursion Tour of CSBG	July 8	17:05	CSBG	Dazhong Hotel
For Hotel	July 8	20:00	Dazhong Hotel	Xueyuan Hotel
	July 9	13:30	Dazhong Hotel	Xueyuan Hotel
For invited speakers'FW	July 9	13:30	Dazhong Hotel	Pudong International Airport

Guidelines for Oral Presentations

Please send your electronic presentation files to cherish-faith@163.com before July 6th. Name your file in the flowing format: Last name-order#-Date.extension. For example: Aowphol-1-July 8.pptx or Aowphol-1-July 9.pdf.

We will accept material in PDF or Microsoft PowerPoint only.

Oral Presentations will be strictly 30 minutes in total. (Keynote speakers will be strictly 40 minutes in total.) Please complete your talk in 28 minutes to allow for 2minutes of questions and changing over to the next speaker.

Contacts

If you are in need of help during the conference events, please approach the staff as below:

Conference service

Anna Feng 180 1751 2536 july_anna@163.com

Yigang Song 153 1792 6939 cherish-faith@163.com

Accommodation service

Shanghai Xueyuan Hotel

Address: No.3499 Guangfulin Road, Songjiang District, Shanghai

Scientific Program

Sunday, July 7

13:00-20:00	Registration

Monday, July 8

09:00-09:20	Welcome and Opening Remarks
09:20-09:30	Group Photo
09:30-11:10	**Session 1:** **Chair: Elizabeth J Hermsen** **09:30-10:10** Biogeographic origins of northern hemispheric relict distributions **Thomas Denk**, Swedish Museum of Natural History, Sweden **10:10-10:40** The key drivers shaping the spatial population genetics of evergreen forests trees in SW China--A case from regional evergreen oaks **Min Deng**, PI of CSBG, CAS, China **10:40-11:10** Demographics, local adaptation, and the genetic basis of quantitative traits in Norway spruce **Jun Chen**, Zhejiang University, China
11:10-11:20	Tea Break
11:20-11:50	**Session 2** **Chair: Thomas Denk** **11:20-11:50** Engelhardioid fruits from the Eocene of Patagonia and the paleobiogeography of Engelhardioideae **Elizabeth J Hermsen**, Paleontological Research Institution,USA

11:50-12:20	**11:50-12:20** Population genomic analyses provide insights into the evolutionary process and adaptive landscape of the East Asian Tertiary relict *Cercidiphyllum* (Cercidiphyllaceae) **Shanshan Zhu**, Zhejiang University, China
12:20-13:30	**Lunch**
13:30-15:10	**Session 3** **Chair: Giuseppe Garfi** **13:30-14:10** Plants and Forests that have Survived the Ice Ages in East Asia **Cindy Q. Tang**, School of Ecology and Environmental Science, Yunnan University, China **14:10-14:40** Will relict trees re-conquer Europe? Case study based on an example of *Pterocarya fraxinifolia* and *P. tonkinensis* (Juglandaceae) **Anna K. Jasinska**, Institute of Dendrology, Polish Academy of Sciences, Polish **14:40-15:10** Climate refugia on mountaintops of tropical rainforest **Honghu Meng**, Center for Integrative Conservation, Xishuangbanna Tropical Botanical Garden, CAS, China
15:10-15:20	**Tea Break**
15:20-16:00	**Session 4** **Chair: Cindy Q. Tang** **15:20-16:00** Ten-years' experience of conservation of Zelkova sicula, an endangered relict tree from Sicily (Italy): problems encountered and lessons learned **Giuseppe Garfì**, National Research Council - Institute of Biosciences and BioResources, Italy

16:00-17:00	**16:00-16:30** Life history strategies of riparian forest tree species and their restoration in Japan **Hitoshi Sakio**, Niigata University Forest, Sado Island Center for Ecological Sustainability, Niigata University, Japan **16:30-17:00** *Lilium ledeburii* from the Hyrcanian forest sheds new light on the biogeography of lilies **Hamed Yousefzadeh**, Environmental science department- Tarbiat Modares University, Iran
17:00-18:30	**Tour of CSBG**
18:30-20:00	**Dinner**
Tuesday, July 9	
08:30-10:40	**Session 5** **Chair: Yongchuan Yang** **08:30-09:10** Relict trees of the walnut family (Juglandaceae): global diversity, conservation priority areas and biogeographic synthesis **Gregor Kozlowski**, University of Fribourg,Switzerland **09:10-09:40** Biogeographic history of the genus Parrotia highlighted by a new plant-insect interaction **Benjamin Adroit**, State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology and Center for Excellence in Life and Paleoenvironment, CAS,China **09:40-10:10** Recent Fragmentation May Not Alter Genetic Patterns in Endangered, Long-Lived Species, *Taxus cuspidata* **Fang Du**, College of Forestry, Beijing Forestry University, China
10:10-10:20	**Tea Break**

	Session 5
	Chair: Gregor Kozlowski
10:20-12:00	**10:20-11:00** Fengshui forests promote population persistence for wild *Pseudolarix amabilis*, a relict species endemic to China **Yongchuan Yang**, Chongqing University, China **11:00-11:30** Diversity and Conservation Status of *Aquilaria* Species in Vietnam **Hoang Van Sam**, Vietnam National University of Forestry, Vietnam **11:30-12:00** Communities of invertebrates occurring on *Zelkova abelicea* **Dariusz J. Gwiazdowicz**, Poznan Life Sciences University
12:00-12:30	**Discussion & Closing Ceremony**
12:30-13:30	**Lunch**
13:30	**Heading to Pudong International Airport** **CZ6976 17:10 PVG – 19:20 Nanyang**
Wednesday to Thursday, July 10-11	**Field Work**
Friday, July 12	
10:30	**Heading to Nanyang Airport** **CZ6975 13:50 Nanyang – 16:00 PVG** **Hotel:** Airport Hotel Shanghai **Address:** No.6001 Yingbin Avenue, Pudong New Area

Speakers' Information and Abstracts

Thomas Denk, Swedish Museum of Natural History, Sweden
thomas.denk@nrm.se

Thomas Denk is a botanist and palaeontologist based in Stockholm. For his master thesis, he did extensive vegetation mapping in the Alps which sparked a strong interest in plant distributional patterns and how they are the result of history and environmental conditions. During his doctoral thesis, he investigated beech populations in western Eurasia focussing on morphological and molecular differentiation patterns including modern and fossil material. During this period he travelled in Eastern Europe, the Balkans, Turkey, the Caucasus and Iran. This, and subsequent travels to North America and China, strongly influenced his main research interests during the following years. Currently, he is interested in the Neogene evolution of modern temperate, Mediterranean, and continental biota and in the Paleogene evolution of arctic and subarctic biota. In addition, he investigates the evolutionary histories of selected northern hemispheric lineages using modern and fossil plants. Here, he wants to know when and why and to which extent plant groups expanded into novel environments and how such shifts affect morphology. He also tries understanding how fossils affect calibrating the tree of life and to which extent evolution is tree-like.

Abstract: Biogeographic origins of northern hemispheric relict distributions

Northern hemisphere woody angiosperms have distinct distributions, many of which are the result of area disruptions (vicariance) and range shifts (dispersal) during the Cenozoic (the past 60 million years). In this talk, I revisit classical biogeographic

hypotheses of Cenozoic plant dispersal via the *North Atlantic land bridge* (NALB), Beringia, and the closing *Turgai Strait (North Asia)*, and the *Arcto-Tertiary hypothesis* of Engler. The NALB has traditionally been discussed in the context of Paleogene (comprising the Paleocene, Eocene, and Oligocene) intercontinental migrations, but more recent palaeontological, geological, and molecular phylogenetic evidence indicates that it can also be invoked to explain Neogene dispersals. The Arcto-Tertiary hypothesis has been largely dismissed but recent and previous findings from Greenland and Spitsbergen (e.g. *Fagus, Ulmus*) demonstrate that some temperate plants might have originated at high latitudes and subsequently dispersed to mid latitudes. Many examples of Paleogene and Neogene (comprising the Miocene and Pliocene) crossings of Beringia are known both from palaeontological records and molecular phylogenetic studies. In addition to these migration routes, I will be discussing a number of novel routes including the Paleogene and Neogene *Central Asian-Siberian route*, the *Himalayan corridor*, and the *(sub)tropical Atlantic route* via rafting islands (e.g. *Vauquelinia, Smilax* Havanensis group). Specifically, I will be discussing Paleogene range expansion and founder niches and Neogene range constrictions, extinction, and niche evolution as fundamental processes of the assembly of modern patterns of (relictual) distributions. Finally, I will be talking about relict distributions in the late Cenozoic (Pliocene, Pleistocene) and causes for species extinction and survival. Throughout this talk special emphasize will be placed on the importance of a reciprocal testing of hypotheses derived from molecular phylogenies and the palaeontological record (e.g. *Liquidambar, Smilax* etc.).

Min Deng, Shanghai Chenshan Plant Science Research Center, CAS, China

dengmin@sibs.ac.cn

Dr. Min Deng is PI of Plant Systematics and Evolutionary Biology Group, Shanghai Chenshan Plant Sciences Research Center, Chinese Academy of Sciences. She received her B.S degree from Yunnan University in 2000, and she received M.S and Ph.D. from Kunming Institute of Botany, CAS in 2007. Currently, she is engaged in the investigation taxonomy, phylogeny, biogeography and conservation of Eurasian Fagaceae. She also serves as editor of Phytotaxa and Plant Diversity, Taxonomy Expert of International oak committee.

Abstract: The key drivers shaping the spatial population genetics of evergreen forests trees in SW China--A case from regional evergreen oaks

SW China, with high topographic complexity, endemism and relic species, is a global biodiversity hotspot. However, little was known on the mechanism to shape the temporal and diversity pattern of the regional biota. Oaks with important ecological service and dominance is a model lineage to gain the insights on how evolutionary ecology process contribute to the regional diversity pattern. We surveyed the spatial genetics structure (SGS) of *Quercus delavayi, Q. schottkayana, Q. kerrii, Q. cocciferoides*, which are representative trees in semidry evergreen broadleaved forests (EBFs), seasonal EBFs and dry river gorges respectively. By coupling the climatic niche analysis, our results reveal that the environmental heterogeneity along the latitude universally imprinted the nuclear SGS of the regional oaks, but the cpDNA SGS showed significant correlated to the seed traits of the species. The environmental heterogeneity due to the different Asia summer monsoon regime,

plus a long term isolation along the Red River fault zone boosted the allopatric divergence contributed to the East vs. the West population divergences found in these lowland and river gorge species. Three significant geographical barriers were identified. Moreover, the Northern populations of these evergreen oaks seemingly are most vulnerable under future climate change tendency, where both in situ and ex situ conservation should be enforced.

Jun Chen, Zhejiang University, China

cjevol@zju.edu.cn

Jun Chen got his bachelor's degree in 2006 in Nankai University, and Ph.D. degree in 2012 in Uppsala University Sweden. He worked on local adaptation and population genomics of Norway spruce in Lascoux's group in Evolutionary Biology Centre. In April 2019 he got back to China and now works as an investigator in the College of Life Sciences, Zhejiang University.

Abstract: Demographics, local adaptation, and the genetic basis of quantitative traits in Norway spruce

Norway spruce (*Picea abies*) is a dominant conifer species of major economic importance in Northern Europe. Extensive breeding programs were established to improve phenotypic traits of economic interest. In southern Sweden seeds used to create progeny tests were collected on about 3000 trees of outstanding phenotype ("plus" trees) across the region. In a companion paper (Chen et al., 2019) we showed that some were of local origin but many were recent introductions from the rest of the natural range. The mixed origin of the trees together with partial sequencing of the exome of >1,500 of these trees and phenotypic data retrieved from the Swedish breeding program offered a unique opportunity to dissect the genetic basis of local adaptation of three quantitative traits (height, diameter and budburst) and assess the potential of assisted gene flow. Through a combination of multivariate analyses and genome-wide association studies, we showed that there was a very strong effect of geographical origin on growth (height and diameter) and phenology (budburst)

with trees from southern origins outperforming local provenances. Association studies revealed that growth traits were highly polygenic and budburst somewhat less. Hence, our results suggest that assisted gene flow and genomic selection approaches could help to alleviate the effect of climate change on *P. abies* breeding programs in Sweden.

Elizabeth J Hermsen, Paleontological Research Institution, USA

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Liz Hermsen is currently a Research Scientist at the Paleontological Research Institution (PRI) in Ithaca, New York, U.S.A. She received her Ph.D. from Cornell University, after which she had postdoctoral positions at the University of Kansas and Cornell University. She was later a faculty member at Ohio University before joining the staff of PRI in 2018. Her dissertation research was focused on the North American fossil record of Itea and Ribes, whereas her postdoctoral research was centered on the systematics of vascular plants from the southern hemisphere (Triassic of Antarctica; Late Cretaceous and Eocene of Argentina). Currently, her primary research foci are on the fossil record of water ferns (Salviniales) and the systematics of the fruit and seed flora of the early Pliocene Gray Fossil Site, eastern U.S.A. Additionally, she is writing about the fossil record of land plants for the Digital Encyclopedia of Ancient Life, an online, open-access textbook of paleontology.

Abstract: Engelhardioid fruits from the Eocene of Patagonia and the paleobiogeography of Engelhardioideae

Although biogeographic connections between plant taxa found in the Paleogene fossil record of Patagonia and the fossil and modern floras of Australasia are common, connections with characteristically Laurasian taxa are rare. In 2016, the first macrofossil record of an occurrence of a member of Juglandaceae subfamily Engelhardioideae from South America, *Alatonucula ignis* Hermsen & Gandolfo, was described from the early Eocene Laguna del Hunco flora of Chubut Province in the

Patagonian region of Argentina. One fortuitously preserved specimen shows the internal division of the nutlet into four chambers, with its counterpart containing a locule cast in the shape of a lobed seed; this specimen provides the critical evidence linking *Alatonucula* to Juglandaceae. *Alatonucula* nutlets are attached to a wing that is either unlobed or three-lobed, which is consistent with some other Paleocene–Eocene Engelhardioideae-affiliated fossil fruit genera (i.e., *Casholdia, Paleooreomunnea, Paraengelhardtia*) that have unlobed or shallowly lobed wings. Engelhardioideae today include two genera (*Alfaroa, Oreomunnea*) distributed from Mexico to northern Colombia in the Americas, and two genera (*Alfaropsis, Engelhardia*) distributed in South, East, and Southeast Asia. Although *Alatonucula* is the only engelhardioid macrofossil record from South America, the subfamily has a well-documented macrofossil record in the Eocene to Miocene of North America to as far south as Panama; in the Eocene to Pliocene of Europe and western Asia; and in the Eocene to Pliocene of eastern Asia, ranging north to Kamchatka and south to Hainan. The fossil record suggests that Engelhardioideae achieved a widespread distribution early in their history and that they are somewhat more geographically restricted today.

Shanshan Zhu, Zhejiang University

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Shanshan Zhu is a Ph.D student major in Ecology, College of Life Sciences, Zhejiang University. She mainly uses population genomics and landscape genomics to conduct phylogeography and adaptive evolution of East Asian Tertiary relict plants, i.e. *Ceicidiphyllum* and *Euptelea*. She also focus on the population genetics and breeding system of *Lindera glauca*, Lauraceae.

Abstract: Population genomic analyses provide insights into the evolutionary process and adaptive landscape of the East Asian Tertiary relict *Cercidiphyllum* (Cercidiphyllaceae)

East Asia harbors the highest richness of Tertiary relicts, most of them with small population sizes, narrow ecological niches and a low rate of evolution (the so called "living fossils"). *Cercidiphyllum*, the only member of Cercidiphyllaceae, contains two extant species, *C. japonicum* and *C. magnificum*. The former is a dominant component of East Asian Tertiary relict forest widely extending north of the Yangtze and into the far north of Japan, while the latter is restricted to cool-temperate/subalpine forests of central Japan. With large geographic ranges spanning wide environmental gradients and a long evolutionary history, *Cercidiphyllum* provides an ideal system for studying the evolutionary process and adaptive evolution of East Asian Tertiary-relic forests species. Here, we generated a chromosome-level de novo assembly of *C. japonicum* genome and re-sequenced 100 individuals of *Cercidiphyllum*. Demographic history reconstruction showed that *C. japonicum* and *C. magnificum* diverged during the mid-Miocene (*c.* 10.33 Ma), as colder and more arid climates developed; whereas the former further diverged into Chinese and Japanese groups after the Japanese island completely separated from Eurasia *c.*5 Ma

(Pliocene). Population genomic analyses of *C. japonicum* revealed that a highly dynamic demographic history reduced genetic diversity greatly and that positive selection led to strong population differentiation. Signature of long-term balancing selection and local adaptation counteracted polymorphism loss caused by bottlenecks during the evolutionary history of *C. japonicum*. Introgression from *C. magnificum* could also be an important source of beneficial mutations that helped C. japonicum to quickly adapt to cool and wet environments in Japan. Hence, our results suggest that this “living fossil” species still lives vividly and has the ability to adapt to coming environmental changes.

Cindy Q. Tang, School of Ecology and Environmental Science, Yunnan University, China

cindytang@ynu.edu.cn

Cindy Q. Tang specializes in forest community ecology, restoration and conservation ecology of relict, endangered and rare plant species. She has a long-standing interest in forest dynamics, interaction between plant species, also species and their environment. Her research concentrates particularly on the mechanisms underlying the structure and dynamics of subtropical forests and relict plants’ survival in southwestern and south-central China. She has published more than 40 papers in highly regarded scientific English journals and a monograph (publisher: Springer). Please see for examples:

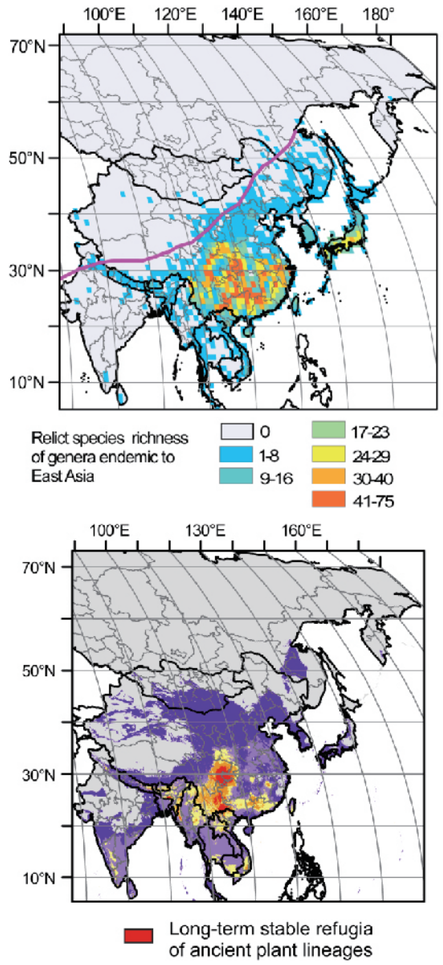
Tang CQ, Matsui T, Ohashi H, Dong Y-F, Momohara A, … López-Pujol J (2018) Identifying long-term stable refugia for relict plant species in East Asia. Nature Communications 9: 4488; doi: 10.1038/s41467-018-06837-3

Tang CQ (2015) The Subtropical Vegetation of Southwestern China: Plant Distribution, Diversity and Ecology. Plants and Vegetation vol. 11. Springer, Dordrecht. doi: 10.1007/978-94-017-9741-2

Abstract: Plants and Forests that have Survived the Ice Ages in East Asia

Today East Asia harbors remarkable plants that were more widespread in the Northern Hemisphere during the Paleogene-Neogene and earlier. Our studies have found that ecological niches and climatic refugia of extant relict plants and forests

prevail in the humid subtropical/warm-temperate forest region (22˚-37˚N) stretching from the boundary between southwestern China and northern Vietnam to central Japan (Fig. 1). We identify areas in southwestern China and northern Vietnam as long-term climatically stable refugia likely to preserve ancient lineages, highlighting areas that could be prioritized for conservation of such species (Fig. 2). Within the refugia that result from the complex habitat mosaics of mountainous topography, a great number of relict plants appearing as pioneer and seral species are restricted to local habitats with moderate disturbance regimes where competition usually is less intense and the regeneration potential of non-relict species is lower (Fig. 3).



Anna K. Jasinska, Institute of Dendrology, Polish Academy of Sciences, Polish
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Anna K. Jasińska – PhD, doctor of biological sciences, Coach of Science and a lecturer and scientific worker of the Institute of Dendrology of the Polish Academy of Sciences. She completed the three-year postdoc at the University of Tartu in Estonia as a member of unique in the world research - the FAHM project. Since four years she is a member of the Zelkova / Pterocarya research team, which connects together scientists from over 20 Institutions from 10 countries around the world. She is author / co-author of 36 publications in peer-reviewed journals. She participated in 11 international and two Polish conferences and she was a contractor in 10 research projects in Poland and abroad. She took part in over 10 scientific expeditions, including to Ukraine, Spain, Turkey, Italy, Georgia, Switzerland and Vietnam. She conducted a total of over 500 hours of training and workshops for children, youth, doctoral students and young scientists.

Abstract: Will relict trees re-conquer Europe? Case study based on an example of *Pterocarya fraxinifolia* and *P. tonkinensis* (Juglandaceae)

South-West Asia, South-East Europe and South-East Asia are one of the most important refuges for Tertiary relict trees. However, the historical process which led to formation of refugia, and future modifications of their niches remain poorly recognized. *Pterocarya fraxinifolia* and *P. tonkinensis*, a riparian Tertiary relict trees, are a good model to test the history, present state and possible changes of their

geographic range in the light of predicted climate changes. In this study, we applied ecological niche modelling to predicts the distribution of climatically suitable areas prevailing during the Last Glacial Maximum (LGM), and at present, and estimates the potential formation of new habitats in 2080 of the species. The suitable habitats contract during the LGM lead to the formation of current climate refugia, while the current distribution is limited to the post glacial refugia. According to our analysis, future climate changes may be a reason for the surprising expansion or extinction of the species. According to the historical distribution and features of the history of life, it should be taken into account that the fragmentation of coastal forests and extensive land use may cause difficulties in the migration of these species to future potential habitats.

Honghu Meng, Center for Integrative Conservation
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Honghu Meng, an assistant professor in Xishuangbann Tropical Botanical Garden, CAS; and a member of Youth Innovation Promotion Association, CAS. His current research interests include biogeography, plant evolution and biodiversity conservation. The current and future research plans mainly focus on the spatiotemporal evolutionary history of Juglandaceae (the walnut family) and Fagaceae (the oak family) to environmental variation and what are the implications for conservation under global change, particularly in tropical regions of SE Asia.

Abstract: Climate refugia on mountaintops of tropical rainforest

Climate refugia are locations where plants survive periods of regionally adverse climate, playing an important role in the maintenance of biodiversity and evolution of organisms. Numerous examples have been studied in the context of Quaternary climate oscillations. Now, there is an increasing need to apply insights from the past to characterize potential refugia and assess species vulnerability under future global warming and climate changes. Mountainous regions, in theory, may contain a high number of biodiversity due to the spatially heterogeneous environments available during the climate oscillations. Therefore, this article highlights the importance of mountaintops as climate refugia, drawing a lesson from high-mountain oaks in the Himalaya-Hengduan Mountains (HHM) and tropical rainforests to their south. The high-mountain oaks illuminate that mountaintops are and will be climate refugia during the changing climate. We suggest that it is necessary to pay more attention to define properly the aspects that predict climate refugia on the mountaintops under

global changing. In future research, elucidating the fine-scale processes and the particular geographic locations that buffer species against rapidly changing climate can guide current biodiversity conservation under global warming.

Giuseppe Garfi, National Research Council
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Dr. Giuseppe Garfì is a forest ecologist and Permanent Researcher at the National Research Council (CNR), Institute of Biosciences and BioResources in Palermo (Sicily, Italy). He is Member of the Mediterranean Islands Plant Specialist Group of SSC-IUCN. He is the discoverer of Zelkova sicula, a rare relict tree of the Cenozoic flora. His main fields of interest concern various aspects of conservation biology and conservation planning and management of relict trees and endangered plants in the Mediterranean.

Abstract: Ten-years' experience of conservation of *Zelkova sicula*, an endangered relict tree from Sicily (Italy): problems encountered and lessons learned

The conservation of climate relicts is an outstanding challenge especially when relating to rare endangered taxa or species restricted to regions at greatest risk from climate change. According to that, assisted colonization – i.e. the intentional moving of species to climatically suitable locations outside their current or historical range - may be an effective approach to mitigate the impact of climate change on biodiversity conservation.

Zelkova sicula is an emblematic climate relict tree from Sicily (Italy) known from only two small populations. It survived in isolated enclaves of poorly suitable micro-environments, surrounded by areas with hostile climate or unsuitable habitats acting as barriers against its dispersal. Its conservation raised a number of different issues, so the implementation of an integrated strategy required the improvement of basic knowledge (e.g. reproduction biology, genetics, ecology) as well as appropriate measures of environmental policy.

The two known populations revealed genetically different, but identical genetic profiles were found at intra-population level, most probably resulting from sexual sterility and clonal propagation. Accordingly, the production of new plants for *in-situ* and *ex-situ* conservation depended exclusively on vegetative multiplication, and great efforts were needed to overcome an unexpected recalcitrance to *in-vivo* and *in-vitro* propagation.

Based on several biogeographical and paleoecological criteria, and taking into account the good growth performances of some plants cultivated under cooler climate, more mesic conditions were inferred to better match the species' niche. Four new pilot sites were selected for translocation, three of which located 600-800 m higher than the two native populations. The first translocation activities were started in June 2016 and to date 45/46 plantlets have been planted in each site. In order to evaluate the success through time and the appropriateness of site selection a multi-year monitoring is ongoing. At present, the survival rate is almost 100%, and plants are healthy and showing an unexpected high growth.

Hitoshi Sakio, Niigata University Forest
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Hitoshi Sakio's professional expertise encompasses ecology of riparian forest, restoration and rehabilitation of riparian forest, life history of trees, for example, mast seeding, pollination, seed germination (*Fraxinus platypoda, Pterocarya rhoifolia, Cercidiphyllum japonicum, Actinidia polygama, Salix* spp. etc.), effects of global change on forest dynamics and phenology of plants, alpine timberline dynamics *(Larix kampferi)*, ecology and management of alien invasive species *(Robinia pseudoacacia)*, and artificial forest management *(Cryptomeria japonica).*

His group and he have joined in "Long-term ecological research (LTER)" and have research the dynamic of natural riparian forest (Chichibu Mountains), natural Japanese cider forest (Sado Island) and alpine timberline forest (Mt.Fuji).

Major Publications

Sakio,H & Tamura,T. (eds) 2008. Ecology of riparian forests in Japan: Disturbance, life history and regeneration. Springer, Tokyo

Sakio,H (2012) The advancing timberline on Mt Fuji : natural recovery or climate change?". J.Plant Res. 125:539-546 (Best Paper Award, 2013)

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The 16th Oze Prize, 2013

Abstract: Life history strategies of riparian forest tree species and their restoration in Japan

Riparian forests are important for river ecosystems and have many ecological functions. The riparian zone has high biodiversity and is often habitat for rare and relict plants. Natural disturbances are important for forest regeneration and the maintenance of species diversity in riparian vegetation. Canopy trees coexist due to the heterogeneity of environments caused by the various disturbances in the riparian zone. The different reproductive strategies of the constituent species are also likely to contribute to the coexistence of tree species. As a result, riparian tree species coexist in forest based on their life histories and ecophysiology, and the natural disturbance regime. In Japan, large forest areas were cleared during the 20th century. After World War II, cedar trees were planted at logging sites all over Japan, except for northern and southern areas. These plantations occupied hillsides and riparian zones. Consequently, natural riparian forests almost disappeared. Moreover, the expansion of the distribution of alien species (e.g., *Robinia pseudoacacia*) along rivers has become a major problem in river management. Based on the study results, I examined the restoration and rehabilitation of riparian forests in a mountain region and proposed management methods for riparian forest.

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Abstract: *Lilium ledeburii* from the Hyrcanian forest sheds new light on the biogeography of lilies

Lilium ledebourii (Baker) Boiss is among rarest lily and reported as a natural monument whose distribution is restricted to only a few small and fragmented areas of the Hyrcanian forest. This study aimed at evaluating the taxonomy of Iran's lily using four barcoding markers and at reconstructing divergence from other species of the genus *Lilium* to address how and when *L. ledburrii* come to Iran. The phylogenetic tree based on ITS strongly supported monophyly of the genus *Lilium* and division into seven clades. Neither phylogeny nor the five main ITS2 structures identified among studied taxa were consistent with their prior morphological classification. Biogeographic analysis using S-DIVA and BBM revealed that China played a vital role in the radiation of *Lilium*, supporting multidirectional expansion towards America, Eastern and Western Asia and Europe. Diverging from the ancestor of *Lilium* that originated during the Eocene some 50 Ma (95% HDP: 68.8 – 36.8), specific members

of *Lilium* colonized Iran (Western Asia) through five radiations from China and Europe. Accordingly, the north of Iran appear to have promoted both long-term persistence and migration of Lily species between Asia to the Europe.

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Prof. Gregor Kozlowski is a scientific director of the Botanic Garden and a group leader at the Department of Biology of the University of Fribourg (Switzerland). Furthermore, he is a conservator of the herbarium at the Natural History Museum in Fribourg (NHMF, Switzerland). His main research interests are biogeography and conservation biology of relict, endemic and threatened species. At the international level, the major focus of his research activities lies on woody species of the Ulmaceae (*Zelkova*), Juglandaceae (*Pterocarya*), and Salicaceae (*Populus*). On a national and local scale, his interest touches members of Sapindaceae (*Acer*) and Rosaceae (*Sorbus*). His research group coordinates the interdisciplinary and international projects Zelkova and Pterocarya, becoming in the last decade a leading force in the research and conservation of relict trees. Additional interest touches the evolutionary processes, biogeographical patterns and conservation issues of aquatic and alpine plants, both at regional and global scale. His group uses various biogeographical, molecular and dendrochronological methods and are conducting intensive fieldwork in the Alps and adjacent mountain chains, in the Mediterranean (e.g., Crete, Sicily), in Transcaucasia (e.g., Georgia, Azerbaijan) and in Eastern Asia (e.g., China, Japan, Vietnam).

Abstract: Relict trees of the walnut family (Juglandaceae): global diversity, conservation priority areas and biogeographic synthesis

From a palaeogeographic perspective, all the living members of Juglandaceae are relict trees. Additionally, the family includes numerous commercially significant timber and nut-producing species. Therefore, Juglandaceae is immensely valuable from a scientific and conservation standpoint. Despite the long history of Juglandaceae research, a biogeographic synthesis of the family has not recently been carried out. The aim of this presentation will be to fill this gap. Special focus, especially concerning the molecular phylogeny, will be given to the genus *Pterocarya*. Juglandaceae is clearly a Northern Hemisphere family, with the highest numbers of species and genera growing in the northern temperate zone between 20° and 40° N. Our global analysis confirms that tropical Juglandaceae mainly inhabit mountainous areas, which is particularly pronounced in the New World members of the family.

Four countries possess the highest species and generic diversity and thus have the greatest global responsibility for the conservation of the walnut family: China, Vietnam, the USA and Mexico. Furthermore, Costa Rica merits the status as a fifth conservation priority country, as it is a regional centre of species diversity for the only two Neotropical genera of Juglandaceae, *Alfaroa* and *Oreomunnea*, and thus, it is the most important refugium of the New World engelhardioids.

Although Eastern Asia is currently the main refugium and centre of generic and species diversity of the family, the earliest centres of Juglandaceae diversity were clearly North America and Europe. Juglandaceae is thus one of the best-documented cases of intercontinental migration of diversity centres (from North America and Europe towards Eastern Asia and to a lesser extent towards Central and South America) and could serve as a textbook example of a diversity centre that moved from its area of origin.

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Benjamin Adroit made his University cursus in Ecology and Environmental problematics. He became specialized in plants and forest changes during Master degree in Montpellier University (FRA, USA). Thereafter, he did a PhD in Paleobiology and Ecology in Bonn University (GER). His background allows him to develop project on both paleoecology and present environments, to understand our actual forests with the support of paleontological information, this is exactly my way of researches. His scientific project focuses on forest ecosystems and their structures. Temperate and Mediterranean (paleo)ecosystems are included in my works. He is significantly concerned with trophic interactions and their changes during the time due to abiotic (such as climate parameters) and biotic factors. Paleobiology data from the last millions and thousands of years are crucial in order to better understand the dynamics of ecosystems throughout the trophic interactions in these environments. Furthermore, he uses similar method of the fossil ones (and complementary ones) on present-day forests in order to improve our ecological interpretations.

Abstract: Biogeographic history of the genus Parrotia highlighted by a new plant-insect interaction

An instance of insect damage on a leaf reflects millions of years of evolution. Today, plants and insects contribute to more than 70% of the biodiversity on the Earth. Their interactions are crucial for the environmental structure of continental ecosystems. Nevertheless, until the late 20th Century there was no formal ichnotaxonomy system to designate traces of insect feeding on fossil leaves. Focusing studies on these plant-insect interactions in the fossil record is a very recent discipline; only ten years ago Labandeira et al. (2007) compiled all the known plant-insect interactions in the fossil record, but new ones can always be found. Precisely, during investigations in the Lagerstätte of Willershausen (3 Ma, Germany), a new insect feeding trace has been identified, named DT297. This damage looks like a long-bent concatenation of circular perforations less than 5mm in diameter. There is also another "version" of this damage, twice as large, probably due to a different larval stage of the insect. In addition to this new release, there is another specificity for DT297, because now, despite more than 10,000 fossil leaves which have been analyzed, the DT297 was exclusively found on one plant species: *Parrotia persica* C.A.Mey (Hamamelidaceae). This damage (i.e. DT297) has also been found on the present leaves of P. persica, which is today endemic to the Hyrcanian Forest (northern Iran). It has already been hypothesized that the present Hyrcanian forest was the best analogue of the European paleoforests from the late Cenozoic. The presence of DT297 on both fossil and current P. persica significantly supports this hypothesis. Lately, new investigations made on the Eastern China endemic plant species *Parrotia subaequalis* revealed the presence of this same damage type DT297 on both fossil leaves (Shanwang, mid-Miocene) and present-day leaves. Consequently, a large discussion about the biogeography of the genus Parrotia in Eurasia is now possible based on this discovery.

In conclusion, this breakthrough also raises several new questions and perspectives about the potential of plant-insect interactions as a good indicator in (paleo)ecology. These herbivory traces could provide insight into the biogeographical history of a plant species, its evolution, and the evolution of its environment. In future studies of fossil leaf collections, the identification of plant-insect interactions should become an integral part of the analyses.

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Fang Du obtained her Ph.D. from University of Bordeaux, France and Lanzhou University, P.R. China in 2010. After that she started her career as a principle investigator in Beijing Forestry University, mainly focused on genetic dynamics of forest trees. She had published 22 peer-reviewed scientific papers and they were cited 571 times according Google Scholar.

Abstract: Recent Fragmentation May Not Alter Genetic Patterns in Endangered, Long-Lived Species, *Taxus cuspidata*

Forestland fragmentation caused by overexploitation of forest resources can in principle reduce genetic diversity, limit gene flow and eventually lead to species developing strong genetic structure. However, the genetic consequences of recent anthropogenic fragmentation of tree species remain unclear. *Taxus cuspidata*, which has extremely small populations distributed mainly in Changbai Mt. in Northeast (NE) China, has recently endured severe habitat fragmentation providing an ideal model to test the endangered mechanism. Here firstly, paternal inherited chloroplast (cp) and mitochondrial (mt) DNA fragments were used to investigate the genetic diversity and structure, estimating the effective population size. Secondly, bi-paternal inherited single nucleotide polymorphisms (SNPs) from Restriction site-associated DNA sequencing (RADseq) were used to identify and quantify the importance of environmental variables in structuring the population genetic variation in both current and future environmental conditions. Both cpDNA and mtDNA data showed high degrees of genetic diversity, extensive gene flow over the entire geographical range and historical stability of both effective population size and distribution of the species. However, ecological niche modeling suggests a decrease in suitable areas for this species by the years 2050 and 2070. Gradient Forests (GF) showed that the geographical and the mean temperature of coldest quarter (bio11) is the most explained factors for the genetic variation. The maintenance of high genetic diversity and the existence of sufficient gene flow suggest that recent fragmentation has not affected the genetic composition of the long-lived tree *T. cuspidata*. However, severe impacts of anthropogenic activities are already threatening the species. Conservation and management strategies should be implemented in order to protect the remnant populations.

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Dr. Yongchuan Yang is now a professor of ecology in Faculty of Environment and Ecology, Chongqing University. He has conducted to continuous research of the survival mechanisms and conservation of Tertiary Relict trees (e.g., *Metasequoia glyptostroboides, Ginkgo biloba, Cathaya argyrophylla, Liriodendron chinense, Pseudolarix amabilis, Glyptostrobus pensilis,* and *Davidia involucrate*) in the past ten years. Dr.Yang also has a special interest in biodiversity patterns in urban ecosystems, especially biotic homogenization induced by urbanization. Till now, over 40 papers have been published in mainstream conservation journals, including Nature Communications. Biological Conservation, Forest Ecology and Management, American Journal of Botany, Oryx etc.

Abstract: Fengshui forests promote population persistence for wild *Pseudolarix amabilis*, a relict species endemic to China

Pseudolarix amabilis, the only surviving species of genus Pseudolarix, is now a rare "living fossil" species endemic to China. Although *P. amabilis* is widely cultivated, its "true distribution" still remains unknown, and its life-history strategies and regeneration requirements in the wild are unclear. Protected areas and correlated conservation programs specifically to protect *P. amabilis* are also in blank field. We conducted a comprehensive investigation of the wild *P. amabilis* forests along the Yangtze River in China. We found that existing wild *P. amabilis* populations are highly fragmented and are mostly distributed in the valleys and on the slopes. Wild *P. amabilis* forest patches occurred in three major types of forests: in the old-growth forests in nature reserves, in the Fengshui forests and in the secondary forests. The co-dominant species of the *P. amabilis* included a number of ancient species such as *Ginkgo biloba*, *Emmenopterys henryi* and *Nyssa sinensis*. For the wild *P. amabilis* in a national nature reserve free from human disturbance, the seedlings and saplings of this species were almost missing, leaving only adult trees. In Fengshui forests where selective cutting on a regular basis is carried out, both *P. amabilis* seedlings and saplings were abundant. In the secondary forests, although seedlings showed presence, the existence of many competitive trees inhibited the growth of *P. amabilis* as suggested by the tree ring data. Our results suggested that *P. amabilis* could be a light-demanding, low competitive conifer. Fengshui forests where management activities are conducted at a low disturbance intensity and on a regular basis may be the best practice for conserving wild *P. amabilis*. However, these Fengshui forests are still highly fragmented and spatially isolated. Considering the maintenance of gene sources and current wild *P. amabilis* population size, attentions and effective conservation programs are needed for this species.

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He is the founder and the first director of Biodiversity centre, Vietnam National University of Forestry. He is also the director of International cooperation Department of the University. He is a member of scientific committee of Flora Lao, Cambodia and Vietnam symposium.

Mr. Hoang Van Sam has carried out the field trip in many national parks, natural reserves in Vietnam. He has published more than 80 papers, many of them in SCI journals. He has supervised 9 PhD, 62 MSc and 60 Bsc students in Vietnam, Laos and China. He also give lectures in tropical plant for students in Germany, The Netherlands Japan and USA.

Abstract: Diversity and Conservation Status of *Aquilaria* Species in Vietnam

The study reports five *Aquilaria* species from Vietnam, such as *A. crassna, A. banaensis, A. rugosa, A. yunnanensis* and *A. bailonii*. All they listed in IUCN Red List (2019), but only *A. crassna* listed in the Red Data Book of Vietnam as Vulnerable (VU). The study assess all these species according to IUCN Criteria as Critically Endangered (CR) and suggests including of them to the Red Data Book of Vietnam. The volatile components extracted from studied *Aquilaria* species were indicated. Fifteen compounds were detected and quantified from essential oils and wood samples of the *Aquilaria* species. In comparison of identified conponents among *A. crassna* samples extracted from different origins, sample in Ha Tinh had the highest amount of compound content.

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Prof. Dr. Dariusz J. Gwiazdowicz is an acarologist who working in such field of mites life as taxonomy, ecology, zoogeography and parasitology. He published more than 200 papers including a few descriptions of new genus and several dozen descriptions of new species of mites (Acari). Research topics are implemented in several regions e.g. Arctic and Antarctic, Australia, South America (Peru) or Russia (Siberia).

Abstract: Communities of invertebrates occurring on *Zelkova abelicea*

Zelkova abelicea is an endemic tree species inhabiting five isolated places on the Greek island of Crete. Diverse habitat conditions, altitude above sea level (850-1800 m asl), which determines, among other things, the amount of precipitation and air temperature, activity of farm animals as well, may affect to the diversity of invertebrate assemblages found on trees of this species.

In 2018, a pilot project was started under which, for example, leaves and bark of trees were acquired, as well as mosses and lichens found on the bark. The collected material was then placed in the Tullgren funnels in order to scavenge the animals present in it. The collected material was stored in 95% alcohol.

Invertebrate species from several systematic groups, from which beetles (Coleoptera), mites (Acari) and springtails (Collembola) dominated, have been demonstrated. From the preliminary results, it can be concluded that the highest species diversity of invertebrates occurred in the mosses *Homophytesum sericeum* and *Leptodon smithi*, as well as on lichens *Pleurosticta acetabulum* and *Physcia tenella*.

The material was sorted to systematic group of invertebrates, and then was sent to the specialists, who will determine it to species level. The author focused on mites, which are often pioneer species because they are the first to inhabit new microhabitats. The initial diagnosis of mites shows that the dominant group are Prostigmata, slightly less is Mesostigmata, but sporadically there is also Oribatida.