25 JANUARY 2024 ISSUE 70 YEAR 2023

THE BEAN BAG

A NEWSLETTER TO PROMOTE COMMUNICATION AMONG RESEARCH SCIENTISTS CONCERNED WITH THE SYSTEMATICS OF LEGUMINOSAE/FABACEAE

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ON THE COVER: ANDROCALYMMA GLABRIFOLIUM (DIALIOIDEAE) PHOTO BY MARCUS FALCÃO

FROM THE EDITORS

WELCOME NOTE

Issue 70: From the Editors

The Bean Bag started in 1974 on the initiative of Charles (Bob) Gunn and Richard Cowan and the first printed issue was distributed almost 49 years ago in May 1975. The aim of the annual newsletter is to keep legume researchers informed about new publications, events and projects focused on the systematics of the family Leguminosae. Bean Bag Number 70 is another bumper issue reporting on diverse aspects of another vibrant and busy year of global legume systematics research.

This year's Bean Bag includes seven important announcements, reports from the legume phylogeny working groups, a report on the 8th International Legume Conference held in August in Brazil, three digests of 2023 legume papers written by postgraduate students, portraits of three leguminologists – all of them women who worked on interactions of legumes with other groups of organisms – in the Gallery of Leguminologists, spotlights on two botanical artists, new legume species highlights from 2023, and the annual compilation of legume literature in the 2023 bibliography. Also, check out the many photos of spectacular legumes in this issue.

Don't forget to keep an eye on the Legume Data Portal, which also posts news items of interest to the legume research community. You can read more about the Portal in this issue of the Bean Bag.

A big thank you to Helen Fortune-Hopkins and Euan James for assembling the portraits for the gallery of leguminologists and to Stephen Boatwright and João Iganci for taking care of the artist spotlight this year. We also thank Carole Sinou for assistance with posting the Bean Bag to the Legume Data Portal and Gwilym Lewis at Kew for help with checking this issue and facilitating the archiving of the Bean Bag in the Kew Research Repository. Thanks also to you, the legume community as a whole, and our many contributors for sharing their time and insights.

Colin Hughes (University of Zurich, Switzerland)
Warren Cardinal-McTeague (University of British Columbia, Canada)
Leonardo Borges (Universidade Federal de São Carlos, Brazil)

For recent BB issues see: the Legume Data Portal
Earlier issues of the BB (1975 to 2022) are available via the Kew Research Repository

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Androcalymma glabrifolium (Dialioideae) - Photo by Marcus Falcão

LEGUME PHYLOGENY WORKING GROUP REPORTS

The Legume Phylogeny Working Group (LPWG) is motivated to continue enhancing our understanding of the legumes. To take our knowledge forward, four informal working groups – Taxonomy, Phylogenetics, Occurrence Data, and Trait Data – were established in 2020 to promote collaboration and synthesis, each with their own focus and role to contribute towards the bigger picture. In addition, around the same time, the Legume Data Portal was established as a means of making data, knowledge, information and news about legumes widely available. Reports from the four working groups, plus the Legume Data Portal are presented here.

These informal working groups are evolving and merit on-going discussion across the legume community to ensure that they remain useful and relevant. For example, a subgroup is developing the legume Tree of Life (ToL) to underpin the Legume Data Portal.

TAXONOMY WORKING GROUP

Updates on the legume checklist and a new tool for names checking

Coordinators: **Marianne le Roux** (South African National Biodiversity Institute, SANBI, South Africa) **Anne Bruneau** (Université de Montréal, Canada) **Juliana Gastaldello Rando** (Universidade Federal do Oeste da Bahia, Brazil)

The legume Taxonomy Working Group was tasked in 2020 with establishing a community-endorsed legume species checklist to support and provide solid foundations for the work of the other working groups (Phylogenomics and Phylogenetics, Occurrence Data, and Trait Data), and indeed all legume research, and has been working steadily on generating the list. The Legume Taxonomy Working Group has now officially been recognised as a Taxonomic Expert Network in the World Flora Online initiative (see https://about.worldfloraonline.org/tens/fabaceae).

The major achievement during 2023 was making substantial progress on subfamily Caesalpinioideae. Importantly, new names published in Advances in Legume Systematics 14, Part 1, which focused on generic delimitation in Caesalpinioideae have been incorporated into the checklist, and has resulted in 32 genera being updated. In addition, thanks to collaboration with Bruce R. Maslin (Western Australian Herbarium and Singapore Herbarium), Donald Hoburn (Canberra, Australia), and Rafaël Govaerts and Nick Black

(Royal Botanic Gardens, Kew), we were able to integrate taxonomic information from the WorldWideWattle database (http://worldwidewattle.com). WorldWideWattle is a collaborative project, headed by Bruce Maslin, whose aim is to deliver authoritative information relating to species of *Acacia* s.l. and it contains the most up to date taxonomy for this group. This progress on subfamily Caesalpinioideae builds on the already completed lists for three of the six subfamilies (Cercidoideae, Dialioideae, and Duparquetioideae).

Two versions of the legume checklist were published in 2023. Version 2023v.3 included updates from taxon experts mainly in subfamily Caesalpinioideae, and version 2023v.4 incorporated corrections suggested by World Flora Online and the Global Biodiversity Information Facility. In total, 95 taxonomists representing 26 countries have contributed to the checklist to date, verifying names for 49% of legume genera. Version 2023v.4 is available on Checklist Bank (https://www.checklistbank.org/dataset/2304/about) and on the Legume Data Portal (https://www.legumedata.org/). Older versions of the checklist are available on Zenodo (e.g., https://zenodo.org/records/7252852).

Checking the remainder of the Detarioideae, Caesalpinioideae, and Papilionoideae is continuing, with 11, 119, and 337 genera, respectively, still left to check. In addition, five genera still unplaced in a subfamily need to be verified. The full list of genera still to be checked is available here:
https://docs.google.com/spreadsheets/d/1lkWVr8OUFbIVirX6hbr4ISszxTJpuhTw/edit#gid=463185985]{.underline}](#bookmark=id.gjdgxs (and can also be viewed on the Taxonomy Working Group page of the Legume Data Portal: https://www.legumedata.org/working-groups/taxonomy.

An important innovation was made during the year in how the Taxonomy Working Group works, with implementation of a tool that facilitates name verification. Up to now, the Taxonomy Working Group had to navigate a complex web of activities and communication between taxon experts, tribe or subfamily coordinators, and the World Checklist of Vascular Plants editor in order to capture name corrections in the checklist. However, the tide has turned with the advent of Rhakhis (https://list.worldfloraonline.org/rhakhis/ui/), a names editor developed by the World Flora Online team. Rhakhis empowers taxon experts to directly update and maintain the checklist online with ease and efficiency. This method of name editing has been tested and subsequently implemented by the Taxonomy Working Group. There are detailed instructions available online in the Rhakhis Users Handbook and training videos (https://plant-list-docs.rbge.info/rhakhis/). A sandbox (https://rhakhis.rbge.info/rhakhis/ui/) is available to practice and learn how to use this user-friendly tool. See below for some basic instructions.

Names can also be updated in the newly created Google sheet (https://docs.google.com/spreadsheets/d/1bnmb2CcQjky35rSDwqNn-6vgNo2mdWw3-LL4YehLbvY/edit#gid=277323699) and also using traditional (Word format) checklists. When using the Google sheet, it is possible to filter the long list of legume names, for just the genera of interest. Explanations of how to do this are provided below.

Following up, on the check-a-thon that was held at the 8th International Legume Conference in Pirénopolois in Brazil, we would like to challenge the legume community to another name checking event during the second week of April 2024. We will be contacting the legume systematics community soon with the objective of organizing an online name checking event, where from the comfort of your office, herbarium or library, you can participate in a friendly challenge to verify legume species names. Can we be ambitious and aim to finalize the list for the International Botanical Congress in Madrid in July 2024? Join us!

If you want to join the Taxonomy Working Group and contribute to name curation, please register online (https://docs.google.com/forms/d/1rWAcg8hJ6XIFqoJ6zT5TE4T0XjsYuUvfhUQcoL9rMUI/edit). We need your expertise! Notes on how to use the new tools for editing the checklist are provided here: https://hp-legume.gbif-staging.org/post/2024/taxonomychecklistprocedures/

All edited checklists must be submitted to the relevant subfamily or tribe coordinator. See the table below for the list of coordinators.

If you need further assistance, please contact Marianne le Roux (m.leroux@sanbi.org.za), Juliana Rando (jgrando@alumni.usp.br), or Anne Bruneau (anne.bruneau@umontreal.ca).

Subfamily/tribe/clade	Coordinator
Caesalpinioideae	Anne Bruneau and Marianne le Roux, Juliana Rando
Cercidoideae	Anne Bruneau
Detarioideae	Manuel de la Estrella
Dialioideae	Anne Bruneau
Duparquetioideae	Bente Klitgaard
Papilionoideae: Abreae	Jan Wieringa
Papilionoideae: Amburaneae	Ângela Sartori
Papilionoideae: Amorpheae	Sophie Winitsky
Papilionoideae: Andira clade	Domingos Cardoso & Toby Pennington
Papilionoideae: Angylocalyceae	Maria Povydysh
Papilionoideae: Baphieae	Mikhael Goncharov & Maria Povydysh
Papilionoideae: Brongniartieae	Luciano Queiroz & Oscar Dorado
Papilionoideae: Camoensieae	Rodrigo Schütz Rodrigues

Papilionoideae: Cicereae	Firouzeh Javadi
Papilionoideae: Cladrastideae	Martin Wojciechowski
Papilionoideae: Crotalarieae	Marianne le Roux
Papilionoideae: Dalbergieae	Bente Klitgaard
Papilionoideae: Desmodieae	Hiroyoshi Ohashi & Kazuaki Ohashi
Papilionoideae: Diocleae	Luciano Queiroz
Papilionoideae: Dipterygeae	Domingos Cardoso & Haroldo C. de Lima
Papilionoideae: Exostyleae	Vidal Mansano
Papilionoideae: Fabeae/Vicieae	Greg Kenicer
Papilionoideae: Galegeae	Stephen Boatwright
Papilionoideae: Genisteae	Annah Moteetee & Ozan Şentürk
Papilionoideae: Hedysareae	Mikhael Goncharov & Maria Povydysh
Papilionoideae: Hypocalypteae	Stephen Boatwright
Papilionoideae: Indigoferae	Rafaël Govaerts & Brian Schrire
Papilionoideae: Leptolobieae	Rodrigo Schütz Rodrigues
Papilionoideae: Loteae	Dario Alayon, Dmitri Sokoloff & Tatiana Kramina
Papilionoideae: Millettieae	Stephen Boatwright & Marcos José da Silva
Papilionoideae: Mirbelioids	Russell Barrett
Papilionoideae: Ormosieae	Domingos Cardoso & Toby Pennington
Papilionoideae: Phaseoleae	Alfonso Delgado Salinas & Annah Moteetee
Papilionoideae: Podalyrieae	Stephen Boatwright
Papilionoideae: Psoraleeae	Charlie Stirton
Papilionoideae: Robinieae	Matt Lavin
Papilionoideae: Sesbanieae	Martin Wojciechowski
Papilionoideae: Sophoreae	Toby Pennington & Stephen Boartwright

Papilionoideae: Swartzieae	Benjamin M. Torke & Vidal Mansano
Papilionoideae: Trifolieae	Ana Paula Fortuna
Papilionoideae: Vataireoid clade	Domingos Cardoso & Haroldo C. de Lima
Papilionoideae: Wisterieae	Jamie Compton
Unresolved/unranked: Dermatophyllum Scheele	Toby Pennington & Stephen Boartwright
Unresolved/unranked: Glycyrrhiza	Lei Duan
Unresolved/unranked: Neoharmsia	Gwil Lewis
Unresolved/unranked: Orphanodendron	Gwil Lewis
Unresolved/unranked: Pericopsis	Gwil Lewis
Unresolved/unranked: Sakoanala	Gwil Lewis

Vatairea guianensis (Papilionoideae) - Photo by D. Cardoso 3277

PHYLOGENOMICS WORKING GROUP

Coordinators: **Félix Forest** (Royal Botanic Gardens, Kew, UK) **Rafaela Trad** (Royal Botanic Gardens, Edinburgh, UK)

Here is a round-up of mini-reports on legume phylogenomics projects contributed by Bean Bag readers.

Phylogenomics of legumes with a focus on subfamily Papilionoideae

Rafaela Trad (rtrad@rbge.org.uk)

Over the last year, we have made much progress towards generating a complete genus-level phylogeny of the legumes with a particular focus on Papilionoids based on target enrichment sequencing using the universal probe set Angiosperms353. This work is part of the Plant and Fungal Trees of Life project at RBG Kew (https://www.kew.org/science/our-science/projects/plant-tree-of-life), which usually samples only one species/specimen per genus. Currently, we have over 95% of the currently recognised genera sequenced and analyses are ongoing. We aim to use the resulting phylogenetic tree to review the classification of subfamily Papilionoideae. We are particularly keen for the phylogeny to be a useful tool for the legume research community to address questions across the family and subfamily Papilionoideae.

We still need material for the genus *Neocolletia*. Material for all the other genera will be processed in the near future, or has already been sequenced. If you have access to tissue or DNA for this genus, please get in touch with Félix Forest (f.forest@kew.org) or Rafaela Trad (rtrad@rbge.org.uk).

Team: Rafaela Trad, Greg Kenicer and Flávia Pezzini (Royal Botanic Gardens Edinburgh, UK), Toby Pennington (Royal Botanic Gardens Edinburgh, UK and University of Exeter, UK), Félix Forest, Gwilym Lewis and Bente Klitgaard (Royal Botanic Gardens, Kew, UK).

Legume fossil database

Jia Linbo (jialinbo@mail.kib.ac.cn)

Over the past thirty years, the Paleobotanical Research Group at the Kunming Institute of Botany (Chinese Academy of Sciences) has collected approximately 800 well-preserved legume fossils from the Paleocene to Pliocene of East Asia. We are currently working towards the publications of these fossils and have to date published eight papers, which include the first fossil records of *Pterolobium* and *Mucuna*, as well as the earliest fossil records of *Bauhinia* and the oldest fossil records of *Cladrastis* in Asia. Additionally, we are preparing to report our findings from genera *Zenia*, *Mezoneuron*, *Peltophorum*, and *Christia*, with many of these fossils being the earliest discovered for these groups. Alongside these fascinating discoveries, we aim to investigate the evolution of Leguminosae using fossil evidence and to test hypotheses through molecular studies.

Rapid radiation in *Inga*

Rowan Schley (rowan.schley@gmail.com)

Inga setosa at Los Amigos Biological Station, Peru. Photo by Rowan Schley.

We are currently examining whether hybridisation catalysed the rapid radiation of *Inga*, a ubiquitous genus of rainforest trees from tropical America. Together, the *Inga* team have sequenced 1320 target capture loci for >1000 accessions, comprising >200 of ca. 300 *Inga* species. In addition to this, we have produced population-level, whole-genome resequencing data for >530 *Inga*s, comprising 40 species, as well as three chromosomallycontiguous, annotated *Inga* reference genomes with the Sanger Institute. We will use this genomic dataset to assess whether hybridisation transfers chemical defence gene 'cassettes' between *Inga* species, given that chemical defences are key in the high levels of *Inga* species coexistence. Finally, we recently submitted our first paper from the project examining the phylogenomics of hybridisation and introgression in *Inga*, which is currently in review.

Team: Rowan Schley (University of Exeter, UK), Toby Pennington (University of Exeter & RBG Edinburgh, UK), Alex Twyford, Kyle Dexter, Catherine Kidner & Kelly Bocanegra-González (University of Edinburgh & RBG Edinburgh, UK), Rosalia Piñeiro (University A Coruña, Spain), Flávia Pezzini (RBG Edinburgh, UK), María-José Endara (UDLA, Ecuador), Dale Forrister (STRI, Panama), James Nicholls (CSIRO, Australia), Jens Ringelberg (University of Edinburgh, UK) and Colin Hughes (University of Zurich, Switzerland).

Phylogenomics of the Sindora clade

Le Min Choo (lc988@exeter.ac.uk)

The Sindora clade consists of the five genera, *Sindora*, *Sindoropsis*, *Tessmannia*, *Copaifera* and *Detarium*. The aim of this study is firstly to investigate generic limits, especially as *Copaifera* is known to be non-monophyletic, and the disjunct distributions of *Sindora* (1 species in Africa, 19 in Asia) and *Copaifera* (37 in the Neotropics, 4 in Africa, 1 in Asia). Secondly, we aim to look for evidence of past introgression within the clade that might explain morphological similarities among the genera (e.g., spiky pods in *Sindora* and *Tessmannia*, brightly coloured arils in *Sindora* and *Copaifera*). This study is using the genes recovered using the Detarioideae-specific target-capture bait set. Recent samples (silica dried or herbarium) of neotropical *Copaifera*, *Tessmannia* spp. and *Sindoropsis letestui* will be very much appreciated!

Phylogenomics of *Lupinus* (Papilionoideae)

Bruno Nevado (bnevado@ciencias.ulisboa.pt)

Sequencing large numbers of whole genomes provides new opportunities to gain insights into the genomic and phenotypic bases of evolutionary diversification and to build next-generation phylogenies. We are doing this for the western New World Lupinus clade which comprises > 200 species and includes a series of recent, rapid, nested and parallel evolutionary radiations in western North America and the Andes. So far, a high-quality, chromosome-level reference genome for the Andean crop lupin, *Lupinus mutabilis* has been assembled and 282 whole genomes sequenced at lower coverage for species across this clade.

Team: Bruno Nevado (University of Lisbon, Portugal), Romulo Segovia (University of British Columbia, Canada) & Colin Hughes (University of Zurich, Switzerland)

Andean species of *Lupinus*, left to right: *L. luisanae*, 3800 m elevation, Cordillera Oriental, Colombian Andes, photo by Natalia Contreras and *L. ananeanus*, 4750 m elevation, Cordillera Real, Bolivian Andes, photo by Colin Hughes.

Pterocarpus and allied genera

Laura Albreht (laura.albreht@ulb.be) & **Bente Klitgaard** (b.klitgaard@kew.org)

Pterocarpus and allied genera are the focus of research led by Bente Klitgaard at the Royal Botanic Gardens, Kew. To-date phylogenetic and phylogenomic research supported by morphometric analyses by the Kew-led group has resulted in the first phylogeny of *Pterocarpus* (Saslis-Lagoudakis *et al.* 2011; doi.org/10.1371/journal.pone.0022275) and biogeographical analyses of the *Pterocarpus* clade (Schley *et al.* 2022;

doi.org/10.1111/jbi.14310). Furthermore, we have resolved the Neotropical *Pterocarpus rohrii* species complex, and in the process circumscribed 10 species, including one species new to science (Klitgaard *et al.* in preparation). Our current foci are on resolving the inter- and infra-generic relationships in the Pterocarpus clade and on producing a full taxonomic revision of Neotropical *Pterocarpus*.

Laura Albreht's doctoral project (Université Libre de Bruxelles, Belgium) tackles species delimitation of CITES-listed African *Pterocarpus* (Papilionoideae), using a phylogenomic approach in addition to morphological and ecological data. As a starting point, a large phylogeny including multiple samples of all accepted species has been reconstructed using the Angiosperms353 gene set, helping to identify taxa for further investigation of potential cryptic diversity. Additionally, we explored the potential of high-copy DNA for identifying African *Pterocarpus* species, by reconstructing and comparing chloroplast and ribosomal DNA phylogenies. The results will be useful for the development of tools facilitating the enforcement of CITES regulations. Laura's PhD is carried out in collaboration with CITES, Herbarium of Royal Botanic Gardens, Kew, Herbarium of Meise Botanic Garden and Royal Museum for Central Africa.

Left to right: Flowers of *Pterocarpus rotundifolius* and fruits of *P. angolensis.* Photos: Gwilym Lewis.

HYPERPLANT: Hyperdominance in plant communities

Manuel de la Estrella (mdelaestrella@uco.es)

This new project is funded for the next 4 years (2023-2027) by the Spanish science program and led by M. de la Estrella and L. Pokorny (with collaborators from other institutions/countries). The project will try to investigate the underlying causes of plant hyperdominance using Mediterranean Genisteae as a study group. The main expected HYPERPLANT deliverables are: (1) a comprehensive Genisteae phylogeny, with special focus on the species complex resulting in subtribe Genistinae; (2) establishment of the biogeographic origin of subtribe Genistinae, which will contribute to our understanding of the importance of the Mediterranean biome and the evolution of the xeric vegetation that largely characterizes it; and (3) characterization of the abundance and population genetic diversity patterns currently observed in hyperdominant vs. restricted taxa.

BERLiNiA project. Evolutionary ecology of tropical trees in the Berlinia clade

Dario Isidro Ojeda Alayon (dario.alayon@nibio.no)

This project targets the Berlinia clade (Detarioideae), an endemic African lineage of tropical trees, with around 16 genera and ca. 180 species. The group is distributed in two main habitat types: forest and savanna biomes. The project aims to investigate the evolutionary history of these two main bioclimatic niches, the drought tolerance/avoidance traits found in the group, and putative syngameons. Duration: 2023-2026.

Team: Dario Isidro Ojeda Alayon (Norwegian Institute of Bioeconomy Research, Norway), Olivier Hardy (Université Libre de Bruxelles, Belgium).

NEXTRAD project. Implementing cost-effective genomic tools for high resolution species delimitation in recent plant island radiations in Macaronesia

Dario Isidro Ojeda Alayon (dario.alayon@nibio.no)

This project will use the Angiosperms353 bait set to infer phylogenetic relationships within species-rich, recent island radiations. The main goal of the project is to establish the resolution limit of this bait set when dealing with closely related species of *Lotus* which radiated recently. Duration: 2024-2025.

Team: Dario Isidro Ojeda Alayon (Norwegian Institute of Bioeconomy Research, Norway), Javier Fuertes-Aguilar (Real Jardín Botánico, Madrid, Spain), Ruth Jaen-Molina, (Jardín Botánico Viera y Clavijo, Spain).

Different aspects of the Mediterranean legumes

Ozan Şentürk (osenturk@rbge.org.uk)

Based at Royal Botanıc Garden Edinburgh as a PostDoc, I am working on several aspects of Mediterranean Legumes. Firstly, The Illustrated Flora of Türkiye project–-co-editing and accounts for the Legume Volumes of this complete and updated revision of the Turkish Flora. Additionally, I am investigating the phylogeny of Mediterranean Genistoids and, as part of a TÜBİTAK grant, the complete phylogeny and biogeography of *Ebenus* L. (Hedysareae). This research will feed into wider aspirations to investigate the Biogeography of the

Mediterranean Basin and its surrounds using legumes as a key model group.

Ebenus laguroides and *Gonocytisus dirmilensis*, photos by Ozan Şentürk.

Phylogenomics and origins of nodulation

Ryan Folk (rfolk@biology.msstate.edu)

Many in the legume community will be aware of the recent "NitFix" sequencing effort, sequencing 100 phylogenomic loci to investigate the origins of nodulation. The capstone paper, Kates et al., was recently issued as a preprint and will hopefully follow in print early in the coming year. In this work, evolutionary rate analyses are used to demonstrate phylogenetic evidence for both multiple origins of root nodule symbiosis (RNS) and the elevated lability of symbiotic states in the nitrogen-fixing clade (NFC) ancestor (the "predisposition hypothesis"), overcoming earlier study limitations. An added complexity of the new study was the identification of more complex evolutionary rate variation in RNS than observed previously, doubtlessly due to the greatly improved taxon sampling and resolution of relationships. Finally, key sister nodulating/non-nodulating clades are resolved for the first time, providing an important focus for more detailed genomic and experimental study targeting the reconstruction of what early symbiosis may have looked like. Numerous collaborations have arisen within the NitFix project proceeding from more detailed uses of the data, and members of the legume community will note that this large sequence data release is finalized on the Sequence Read Archive (SRA) as an important resource for future studies.

Kates H.R., O'Meara B.C., LaFrance R., Stull G.W., James E.K., Conde D., Liu S., Tian Q., Yi T., Kirst M., Ané J.-M., Soltis D.E., Guralnick R.P., Soltis P.S., Folk R.A. 2022. Two shifts in evolutionary lability underlie independent gains and losses of root-nodule symbiosis in a single clade of plants. bioRxiv.:2022.07.31.502231.

A phylogenomic survey of *Astragalus*

Ryan Folk (rfolk@biology.msstate.edu)

One of the exciting collaborations resulting from the NitFix initiative focuses on *Astragalus*, the familiar poster-child for mega-genera and an important floristic element in many cold, arid areas of the northern hemisphere. Consistent with the inherent challenges of large, poorly understood clades, *Astragalus* has seen limited prior study from a phylogenomic point of view, primarily using plastid genomes and geographically focused sampling, but a globally scoped sequencing initiative has yielded a strong framework for further study. A pair of preprints advances our understanding of *Astragalus* by exploring (1) diversification, biogeography, and niche evolution and (2) using quantitative methods to investigate phytogeographic patterns in this important north temperate radiation. In both papers the story revolves around Central Asian origins and the importance of edaphic specialization in diversity hotspots (no surprise for nodulating plants!). The study greatly improves upon prior work in terms of taxon and gene sampling, but still has limited taxon coverage of some groups of Eurasian *Astragalus*. Neo-Astragalus also requires further study with stronger sampling but more limited phylogenetic resolution, where evidence of complex paralogy and discord, largely missing in the eastern hemisphere species, indicate the presence of complex evolutionary processes.

Folk R.A., Charboneau J., Belitz M., Singh T., Kates H.R., Soltis D.E., Soltis P.S., Guralnick R.P., Siniscalchi C.M. 2023a. Anatomy of a mega-radiation: Biogeography and niche evolution in *Astragalus*. bioRxiv.:2023.06.27.546767.

Folk R.A., Maassoumi A.A., Siniscalchi C.M., Kates H.R., Soltis D.E., Soltis P.S., Belitz M.B., Guralnick R.P. 2023b. Phylogenetic diversity and regionalization in the temperate arid zone. bioRxiv.:2023.11.01.565216.

Phylogenomics of *Mimosa*

Leonardo Borges (aquitemcaqui@gmail.com)

Aiming to understand the patterns and processes of morphological disparification in *Mimosa*, we will improve the current phylogenetic hypothesis for the genus with hybrid capture data. In order to increase taxon and loci sampling, we will use sequences already generated for the NitFix project and sequence new samples using both NitFix and Mimobaits probes. Sequencing is planned to start by May 2024 and we are aiming to cover at least half of the 600+ species in *Mimosa*.

Team: Leonardo Borges (Universidade Federal de São Carlos, Brazil), Rafael Barduzzi (Universidade Federal de São Paulo, Brazil), Carolina Siniscalchi (University of Mississippi, USA), Jens Ringelberg (University of Edinburgh, UK), Marcelo Simon (Embrapa Cenargen, Brazil), Ryan Folk (University of Mississippi, USA)

OCCURRENCE DATA WORKING GROUP

Coordinators: **Edeline Gagnon** (University of Guelph, Canada) **Joe Miller** (Global Biodiversity Information Facility (GBIF), Denmark) **Jens Ringelberg** (University of Edinburgh, UK)

The Occurrence Data Working Group aims to promote the use of legume occurrence data in scientific studies. Our main output is a webpage (https://www.legumedata.org/working-groups/occurrences/) on the Legume Data Portal, where we provide information and resources about the assembly and cleaning of occurrence data, and an up-to-date list of published studies with publicly-available quality-controlled legume occurrence datasets. We will publish a new version of this webpage version soon and would welcome feedback and input, especially if you know of any available legume occurrence datasets that we forgot to add to the list.

Like last year, here we give an update on recently-published and on-going studies that use legume occurrence datasets.

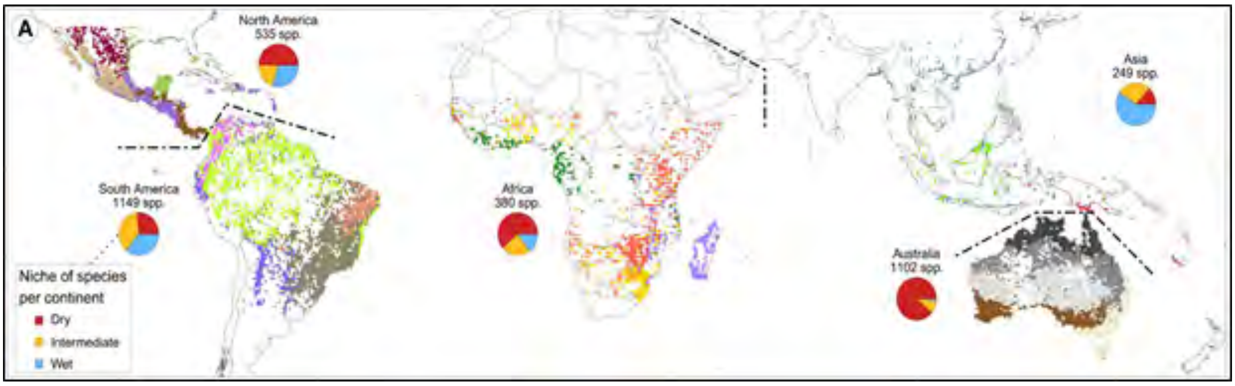
Francisco Velásquez-Puentes (German Centre for Integrative Biodiverstiy Research (iDiv), Germany), **Renske Onstein** (Naturalis Biodiversity Center, the Netherlands) and colleagues published an exciting study on trait evolution in *Swartzia* (Papilionoideae). Using occurrence data from circa 3,700 curated herbarium specimens for 156 *Swartzia* taxa, phylogenies, and various trait measurements, Francisco *et al*. looked for correlations between bioclimatic niche and trait measurements. They found strong links between climate and leaflet and petal sizes, but no association between niche and fruit size.

An international group led by **Oyetola Oyebanji** (University of Louisiana, U.S.A.)and **Ting-Shuang Yi** (Kunming Institute of Botany, China) studied drivers of diversity in the global Millettioid/Phaseoloid clade (Papilionoideae), which has over 3,000 species in 161 genera. Using a dataset of over 116,000 occurrence points, they found a strong overall latitudinal richness gradient, but also distinctive patterns across the multiple tribes that make up the Millettioid/Phaseoloid clade.

Advances in Legume Systematics 14 part 2, edited by **Anne Bruneau** (Université de Montréal, Canada), **Luciano de Queiroz** (Universidade Estadual de Feira de Santana, Brazil), and **Jens Ringelberg** (University of Edinburgh, UK), and with contributions from a large number of collaborators, is currently in press in the journal PhytoKeys. This special issue will feature a new tribal and clade-based classification and full generic synopsis of the entire subfamily, as well as distribution maps of all 163 Caesalpinioideae genera and species and genus richness maps of the subfamily, based on a dataset of over 548,000 occurrence points. Occurrence data of non-mimosoid Caesalpinioideae were contributed by **Juliana Rando** (Universidade Federal do Oeste da Bahia, Brazil), **Guilherme Sousa** (Universidade

Estadual de Campinas, Brazil), **Haroldo de Lima** (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Brazil), **Isau Huamantupa-Chuquimaco** (Universidad Nacional Amazónica de Madre de Dios, Peru), and **Domingos Cardoso** (Universidade Federal do Bahia & Jardim Botânico do Rio de Janeiro, Brazil).

Finally, **Jens Ringelberg**, **Erik Koenen** (University of Brussels, Belgium), and **Colin Hughes** (University of Zurich, Switzerland) and colleagues published a study on the drivers of turnover across space and time in the pantropical Mimosoid clade (Caesalpinioideae). This clade contains circa 3,500 species in 100 genera and occurs across the tropics, and Jens *et al*. assembled an occurrence dataset of over 424,000 occurrence points, covering all genera and 93% of Mimosoid species. Various analyses, such as ancestral niche reconstruction and phylogenetic regionalisation (see figure), show that water availability across the tropics is the main driver of taxonomic and phylogenetic turnover.



Phylogenetic regionalisation of Mimosoid legumes (separate per continent) by Ringelberg *et al*. (2023).

This year's 8th International Legume Conference in Pirenópolis, Brazil, also allowed us to catch a glimpse of several exciting upcoming studies that employ legume occurrence data. **Moabe Fernandes** and **Toby Pennington** (University of Exeter, UK) have compiled an impressive occurrence dataset for all New World legumes, which they are using to assess phylogenetic niche conservatism and biome switching across the Americas. **Charlotte Hagelstam-Renshaw** (Université de Montréal, Canada), **Anne Bruneau** and **Warren Cardinal-McTeague** (University of British Columbia, Canada) are studying biogeographic patterns and biome evolution across the pantropical Cercidoideae subfamily. There are also multiple upcoming studies focusing on the Mimosoid clade (Caesalpinioideae): **Rachel Ferreira** (iDiv, Germany) and **Renske Onstein** study the evolution and spatial distribution of herbivore defense traits in this pantropical clade, while **Ryan Folk** and **Carolina Siniscalchi** (University of Mississippi, USA) analyse niche shifts and the biogeography of nitrogen fixation in multiple ongoing studies.

In conclusion, 2023 has been a vibrant and productive year for studies generating and employing legume occurrence datasets, with much more to follow in the near future.

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Ringelberg JJ, Koenen EJM, Sauter B, Aebli A, Rando JG, Iganci JR, de Queiroz LP, Murphy DJ, Gaudeul M, Bruneau A, Luckow M, Lewis GP, Miller JT, Simon MF, Jordão LSB, Morales M, Bailey CD, Nageswara-Rao M, Nicholls JA, Loiseau O, Pennington RT, Dexter KG, Zimmermann NE, Hughes CE (2023) Precipitation is the main axis of tropical plant phylogenetic turnover across space and time. Science advances 9: eade4954. https://doi.org/10.1126/sciadv.ade4954

Velásquez-Puentes FJ, Torke BM, Barratt CD, Dexter KG, Pennington T, Pezzini FF, Zizka A, Onstein RE (2023) Pre-adaptation and adaptation shape trait-environment matching in the Neotropics. Global Ecology and Biogeography 32: 1760–1772. https://doi.org/10.1111/geb.13730

TRAITS WORKING GROUP

Coordinators:
Leonardo Borges (Universidade Federal de São Carlos, Brazil)
Renske Onstein (Naturalis Biodiversity Centre, Netherlands & German Centre for Integrative Biodiversity Research, iDiv, Germany)

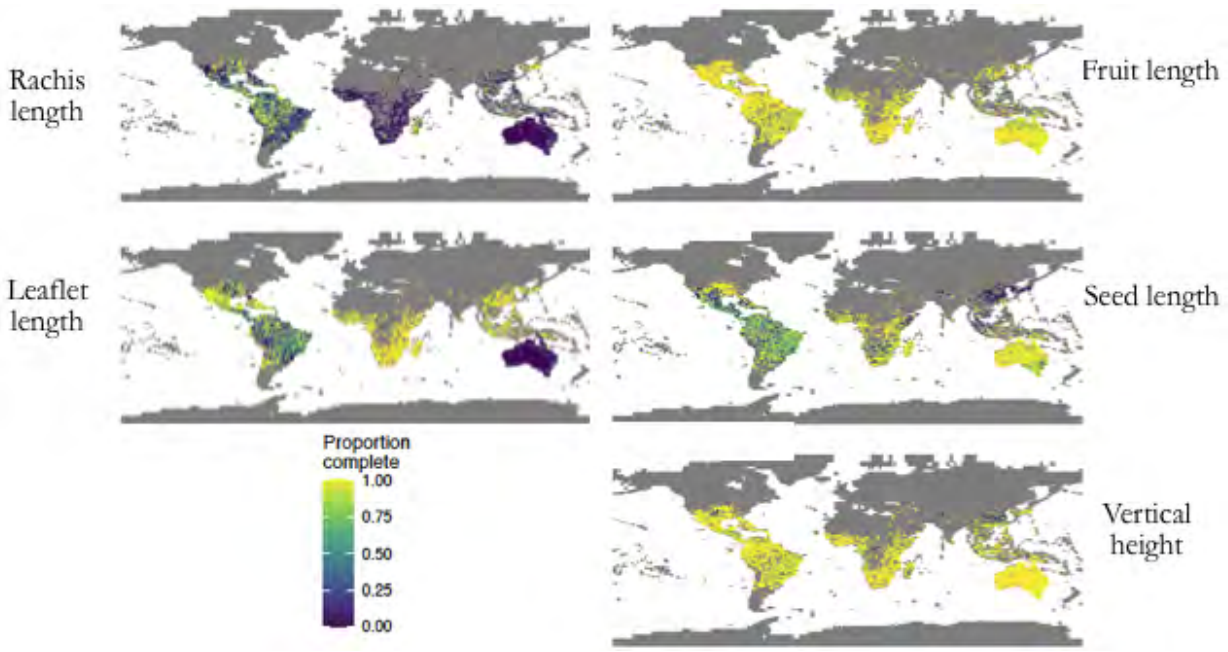
2023 was a good year for legume trait research. Two initiatives led by members of the Traits Working Group are now published and included datasets that can be used by the legume community. One is the paper by Trethowan et al. (https://doi.org/10.1111/jbi.14751) investigating the relationships between flower traits, climatic gradients and island biogeography in the Malaysian archipelago. Another is a contribution by Vélasquez-Pontes et al. (https://onlinelibrary.wiley.com/doi/full/10.1111/geb.13730) in which the authors tested trait-environment matching across the evolution of the genus *Swartzia* Schreb. (Papilionoidae).

Two projects on Mimosoid traits highlighted in the previous volume of the Bean Bag have advanced in the last year. Rachel Ferreira, Jens Ringelberg, Renske Onstein and their collaborators presented the first version of a mimosoid trait database at the Legume conference in Brazil. The dataset contains species-level trait data on leaves, fruits, defense, and whole-plant traits (~40 traits) for ~2100 species based on information from monographs and herbaria. They are currently exploring the phylogenetic and geographical coverage of the traits, and plan to publish the database as part of a data paper towards the end of 2024. In the future, this database will be extended to include missing traits (particularly reproductive ones) with data already compiled by Ryan Folk, Leo Borges, Rob Guralnick and colleagues using text mining tools.

Looking ahead to this year, we are planning an informal meeting of the Traits Working group at the XX International Botanical Congress in Madrid. If you are interested in talking traits over a lunch meeting, please fill up the form at https://forms.gle/PhGpijr6KZdeb49d7.

We also noticed that a large number of participants of the 8th International Legume Conference are working on legume morphology, particularly on micromorphology. However, most of these researchers are not members of the Traits Working Group. In this context, we would like to reinforce one of the main goals of the Traits Working Group: to inform each other and promote collaboration between researchers working with legume morphology, including functional trait data.

Thus, if you work, or plan to work with legume morphology and functional traits both at macro and micro scales, please fill up and take a look at the spreadsheet at https://shorturl.at/aqzR1

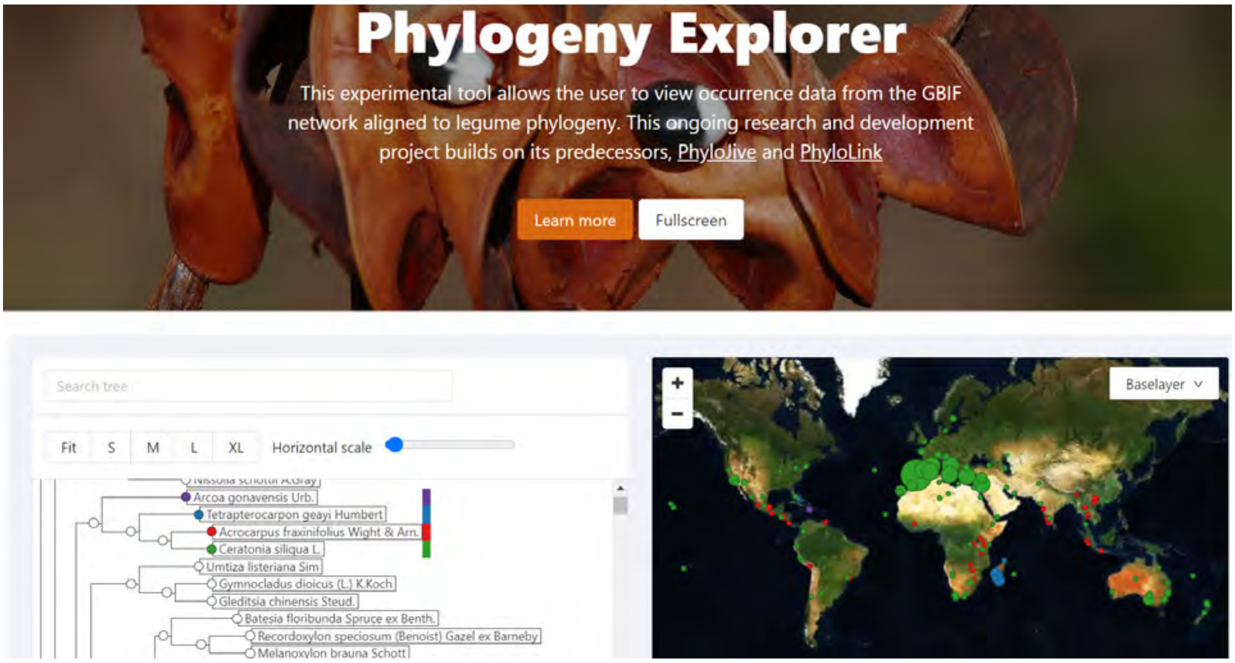


Geographical coverage of the mimosoid trait database by Rachel Ferreira and collaborators.

LEGUME DATA PORTAL 2023 UPDATES

Anne Bruneau (Université de Montréal, Canada) **Carole Sinou** (Université de Montréal, Canada) **Joe Miller** (Global Biodiversity Information Facility (GBIF), Denmark)

The Legume Data Portal (https://www.legumedata.org) continues to actively publish news from the legume systematics community and to host updated versions of the legume species checklist ([https://www.legumedata.org/taxonomy/species-list/]{.underline}) (see Taxonomy Working Group report).



This year the Legume Data Portal was excited to serve as the testing ground for launching GBIF's new Phylogeny Viewer. This new Phylogenetic Explorer (https://www.legumedata.org/phylogeny/explore) is a visualization tool that offers a novel view of species occurrence data from the GBIF network, organizing it in accordance with current phylogenetic evidence on the evolutionary relationships of legume species. The current default view presents GBIF-mediated occurrence data aligned with the recently published phylogeny of one of the six legume subfamilies, the Caesalpinioideae by Ringelberg et al. (2023; https://www.science.org/doi/10.1126/sciadv.ade4954). Users can browse and select occurrence records for a sample of 1,860 species of Caesalpinioideae at the tips of the tree as well as some higher-order taxa / clades at the nodes in the phylogeny. All taxa are matched to the GBIF backbone taxonomy (see https://data-blog.gbif.org/post/gbif-backbone-taxonomy), such that the map displayed for any individual species in the phylogeny corresponds to the species map available on GBIF.org. The viewer's novelty lies in its ability to map occurrences for an entire clade, or group of taxa linked by one common ancestor, with a single click. Users can also select and compare multiple clades, including closely related sister clades, navigate the phylogenetic tree, change map views and colours, and download the occurrences they select. Future versions will include phylogenies of other legume clades as they become available on Open Tree of Life with the ultimate aim of including a phylogeny of all legumes.

The Legume Data Portal, supported by Canadensys (https://www.canadensys.net) and GBIF, runs as an instance of GBIF's hosted portal service (https://www.gbif.org/hosted-portals). We are happy to announce that Flávia Pezzini (Royal Botanic Gardens, Edinburgh) has joined the Legume Data Portal committee to help maintain and develop our portal. We are keenly interested in seeing the translation of the portal into Spanish and Portuguese. If you wish to help on that project, or if you would like to contribute to content, please contact us! There is tremendous scope to expand the Portal with other sorts of legume data beyond the current legume species checklist and species occurrence data.

Send us your news items and announcements (outstanding publications, new projects, positions available in your legume research group, meetings, activities, etc.) to post on the Legume Data Portal. News items get published regularly on the Portal alongside the annual Bean Bag Newsletter. The entire community appreciates your contributions!

Uleanthus erythrinoides (Papilionoideae) - Photo by D. Cardoso 4070

ANNOUNCEMENTS

FUNDING OPPORTUNITY: THE RUPERT BARNEBY AWARD OF THE NEW YORK BOTANICAL GARDEN

Ben Torke (The New York Botanical Garden, USA)

The Rupert Barneby Award, named in honor of the late NYBG scientist and renowned legume expert, consists of US$2000 granted annually to assist researchers to visit The New York Botanical Garden to study the rich herbarium collection of Leguminosae.

Rupert Barneby on the San Rafael Swell, Wayne Co., Utah, 1978. Photo: Noel H. Holmgren.

Graduate students and early career professionals with research in systematics and/or legume diversity are given special consideration. Projects that will result in the improved curation of the collection are desirable. Anyone interested in applying for the award should submit the following: 1) curriculum vitae; 2) a proposal describing the project for which the award is sought; 3) contact information for two individuals who can vouch for the qualifications of the applicant. The proposal should address specifically the activities to be performed at NYBG and should consist of four parts: 1) title page with proposal title, applicant's name, address, and e-mail address; 2) body of the proposal of no more than two pages, including justification, objectives, and research plan; 3) literature cited; 4) travel budget. Please email your application to Dr. Benjamin M. Torke **(btorke@nybg.org)** no later than **April 1, 2024** for consideration for the upcoming Award.

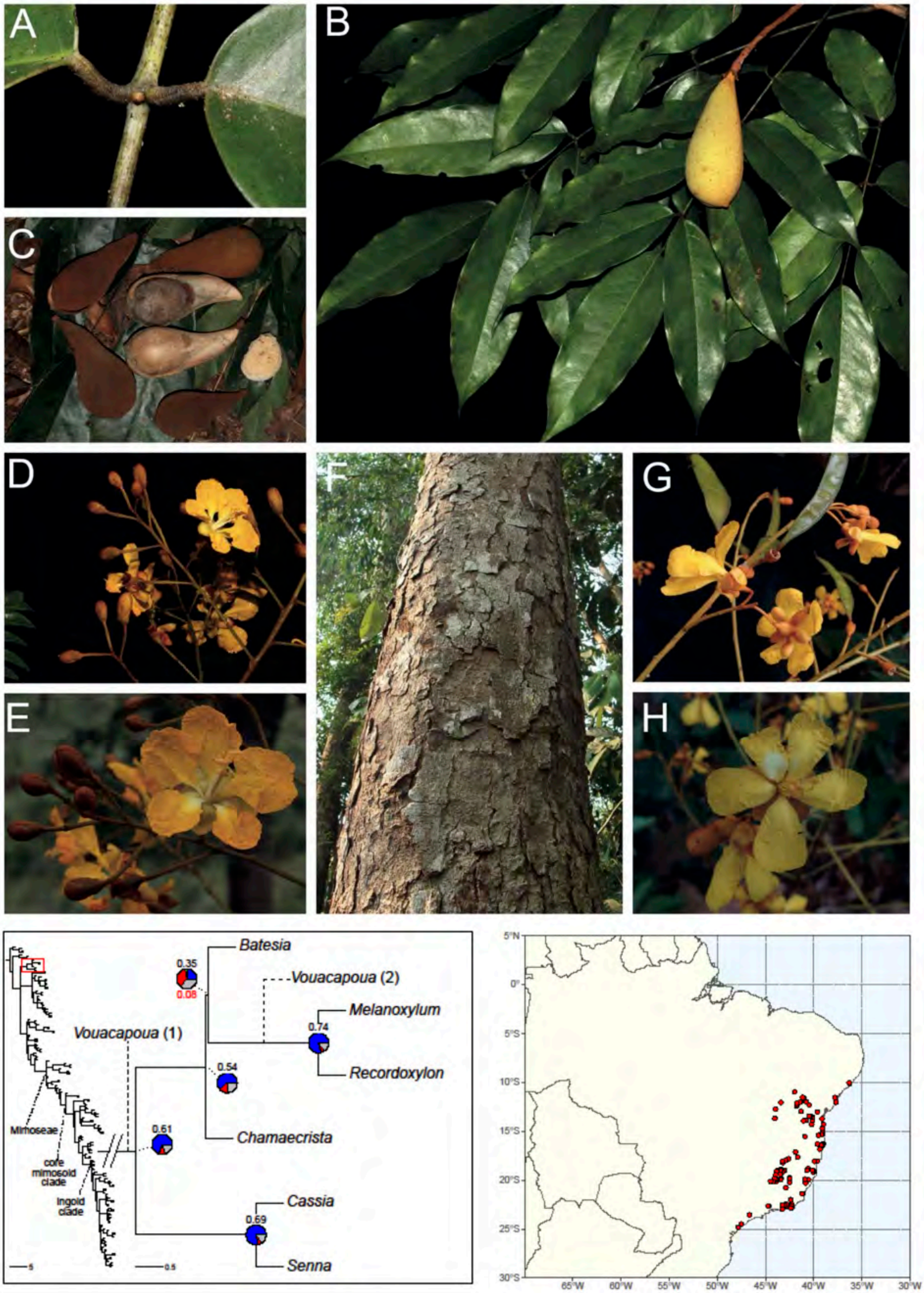
Announcement of the recipient will be made by May 1, 2024. Travel to NYBG should be planned for some period after July 1, 2024 and before June 30, 2025. Recipients are asked to give a presentation about their research.

ADVANCES IN LEGUME SYSTEMATICS 14

Classification of Caesalpinioideae. Part 2 – Higher-Level Classification

Anne Bruneau (Université de Montréal, Canada) **Luciano Paganucci de Queiroz** (Universidade Estadual de Feira de Santana, Brazil) **Jens J. Ringelberg** (University of Edinburgh, U.K.)

Caesalpinioideae is the second largest subfamily of Leguminosae with ca. 4680 species and 163 genera. It is an ecologically and economically important group formed of mostly woody perennials that range from large canopy emergent trees to functionally herbaceous geoxyles, lianas and shrubs, and which has a global distribution, occurring on every continent except Antarctica. Following the recent re-circumscription of 15 Caesalpinioideae genera presented in *Advances in Legume Systematics 14, Part 1*, published in the journal PhytoKeys in 2022 (https://phytokeys.pensoft.net/issue/3247) and edited by Colin E. Hughes, Luciano P. de Queiroz and Gwilym P. Lewis, *Part 2* presents a new higher-level classification and synopsis of genera for the subfamily. Based on a phylogenomic analysis of 997 nuclear gene sequences for 420 species and all but five of the genera currently recognised in the subfamily (Ringelberg et al. 2022), 45 legume experts from 14 countries have come together to propose this new classification of Caesalpinioideae. The paper is in press for publication in PhytoKeys in early 2024.



Examplar plate from the generic synopsis of Caesalpinioideae presented in ALS 14, Part 2. A–F: *Batesia*, *Melanoxylum*, *Recordoxylon* and *Vouacapoua* floral, fruit and leaf diversity (tribe Cassieae) (Photo credits: D Cardoso, G Pereira-Silva). Below left: Schematic phylogeny showing generic relationships in tribe Cassieae and the placement of the tribe in the genus-level phylogeny of Caesalpinioideae. Below right: Distribution of the genus

Melanoxylum based on quality-controlled digitised herbarium records.

The new classification comprises eleven tribes, all of which are either new, reinstated or re-circumscribed at this rank: Caesalpinieae Rchb. (27 genera / ca. 223 species), Campsiandreae LPWG (2 / 5–22), Cassieae Bronn (7 / 695), Ceratonieae Rchb. (4 / 6), Dimorphandreae Benth. (4 / 35), Erythrophleeae LPWG (2 / 13), Gleditsieae Nakai (3 / 20), Mimoseae Bronn (100 / ca. 3510), Pterogyneae LPWG (1 / 1), Schizolobieae Nakai (8 / 42–43), Sclerolobieae Benth. & Hook. f. (5 / ca. 113). Although many of these lineages have been recognised and named in the past, either as tribes or informal generic groups, their circumscriptions have varied widely and changed over the past decades, such that all the tribes described here differ in generic membership from those previously recognised. Importantly, the approximately 3500 species and 100 genera of the former subfamily Mimosoideae are now placed in the reinstated, but newly circumscribed, tribe Mimoseae. Because of the large size and ecological importance of the tribe, the authors also propose a clade-based classification system for Mimoseae that includes 17 named lower-level clades. Fourteen of the 100 Mimoseae genera remain unplaced in these lower-level clades: eight are resolved in two grades and six are phylogenetically isolated monogeneric lineages.

In addition to the new classification, *ALS 14, Part 2* provides a key to genera, morphological descriptions, and notes for all 163 genera, all tribes, and all named clades. The diversity of growth forms, foliage, flowers and fruits is illustrated for all genera, and for each genus a distribution map, based on quality-controlled herbarium specimen localities is provided. A glossary of specialised terms used in legume morphology is also provided. This new phylogenetically based classification of Caesalpinioideae provides a solid system for communication and a framework for downstream analyses of biogeography, trait evolution and diversification, as well as a platform for taxonomic revision of still understudied genera.

NEW BOOK: LEGUMINOSAE – PAPILIONOIDEAE DO RIO GRANDE DO SUL, BRASIL

João Iganci (Universidade Federal de Pelotas, Brazil)

Authors: Silvia Teresinha Sfoggia Miotto, Roseli Lopes da Costa Bortoluzzi, João Ricardo Vieira Iganci & Fernanda Schmidt Silveira, Porto Alegre, 2022. 366 p.: 148 il. ISBN: 978-65-5973-142-8

LEGUMINOSAE-PAPILIONOIDEAE DO RIO GRANDE DO SUL, BRASIL

Silvia Teresinha Sfoggia Miotto
Roseli Lopes da Costa Bortoluzzi
João Ricardo Vieira Iganci
Fernanda Schmidt Silveira

This newly published book presents the first complete treatment of legume subfamily Papilionoideae for the State of Rio Grande do Sul, in southern Brazil. The book presents a synthesis of knowledge acquired over more than four decades of study including extensive and continuous bibliographic research, data compilation and analysis of collections deposited in regional, national and international herbaria, mainly in neighboring countries like Argentina and Uruguay, in addition to vast and intensive field sampling, with excursions covering all the physiographic regions of the State and its diverse vegetation types.

From left to right: Silvia Miotto, Roseli Bortoluzzi, João Iganci and Fernanda Schmidt Silveira

A few species of Papilionoideae of Rio Grande do Sul. Left to right: *Arachis burkartii* (photo João Iganci), *Muellera torrensis* (photo Silvia Miotto), *Sellocharis paradoxa* (photo R. Ludtke).

For Rio Grande do Sul, 54 genera, 195 species and 17 native varieties were confirmed, totaling 212 taxa. A description of the Leguminosae family, a key to the subfamilies and description of subfamily Papilionoideae are presented alongside descriptions of genera, species and varieties. For each genus its distribution is indicated and, in the case of genera with more than one species or infra-specific category, keys are presented for identification of these taxa. For all species and varieties, in addition to one voucher, data and maps of occurrence in the physiographic regions of the State, photo plates, information on flowering and fruiting phenology and preferred habitat are presented. 148 plates with photographs of taxa with confirmed occurrence are shown. In addition to taxonomic and geographic data, the book provides information on the economic importance and conservation status of species, as well as chapters on phytogeography, information on tribes and nomenclatural updates to subfamily Papilionoideae. Lists of bibliographic references and scientific and popular names are presented at the end, as well as a glossary of botanical terms.

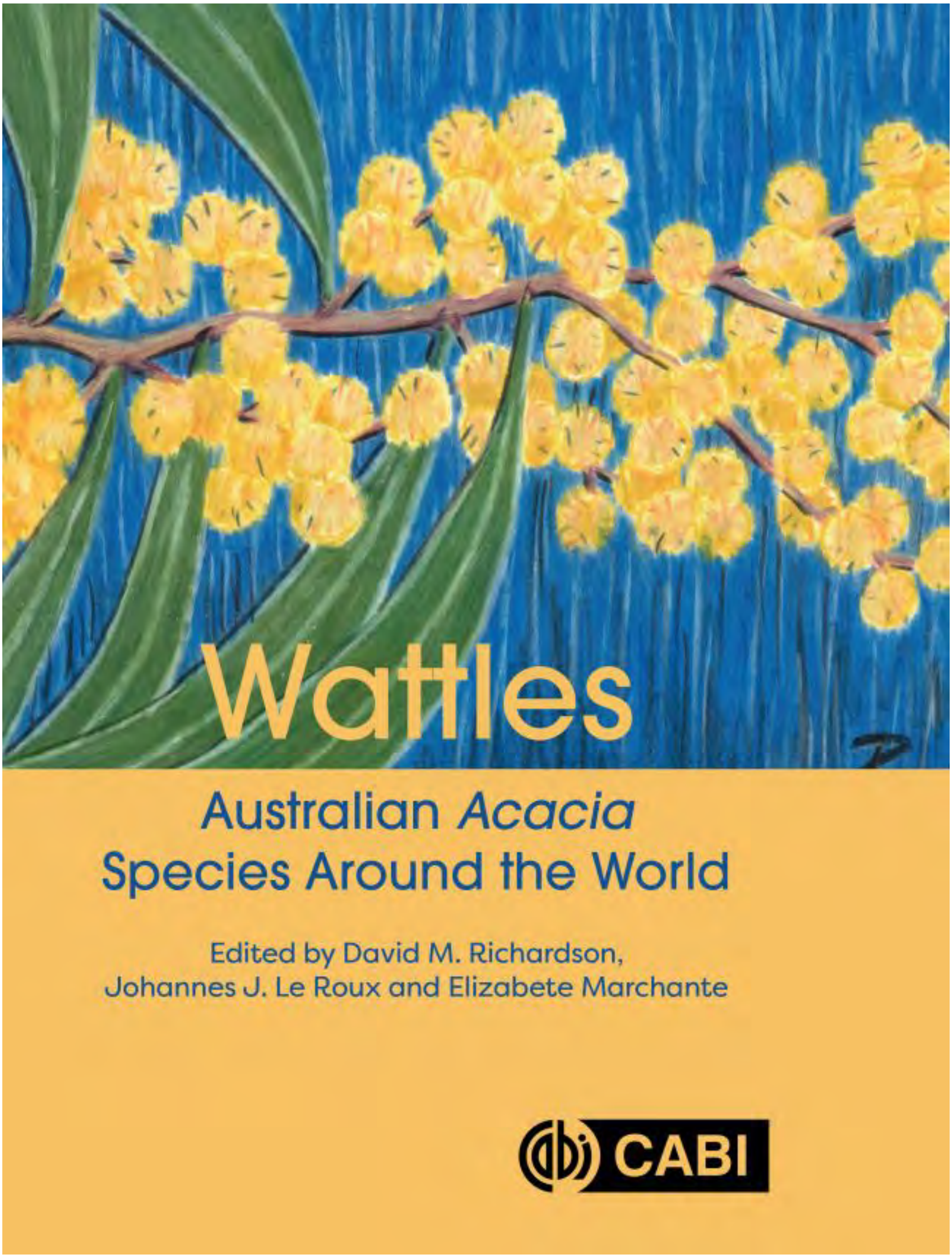
NEW BOOK: WATTLES ON THE MOVE

Colin Hughes (University of Zurich, Switzerland)

Travelling through parts of South Africa or Iberia, such as southern Portugal, it would be easy to imagine that one is actually in the heart of the Australian bush, such is the abundance, prominence and diversity of species of Australian acacias that are now found in these areas. *Acacia* species – known generically in Australia as *wattles* – now dominate significant areas in parts of the world where they are introduced. In southern Portugal, alongside the wattles, are large-scale plantations of eucalypts, further accentuating just how 'Australian' some of these distant habitats have become. It is this process of the globalisation via introductions and invasions of wattles that is the focus of a new book: *Wattles. Australian Acacia Species Around the World*, published by CABI in 2023, and edited by David Richardson, Johannes Le Roux and Elizabete Marchante, who appropriately work respectively in South Africa and Portugal.

While it is well-known that the large, mainly Australian, legume genus *Acacia* is now one of the planet's most widely spread plant genera, the sheer scale and extent of its anthropogenic translocation are quite staggering. As documented in this new book, 41% of the 1082 species of *Acacia* are known to occur as non-native species; introduced wattles have been recorded from 172 countries; 75 species have established self-sustaining populations following introductions; 28 species are classified as invasive and causing substantial ecological and socio-economic impacts. These impacts include even the establishment of novel ecosystems, so-called *wattle jungles* or thickets, following invasion or abandonment of *Acacia* plantations. Because of this, wattles have emerged as a flagship group for understanding invasion biology.

This book explores in great depth and breadth the insights that can be gained from understanding these plants. With 120 authors from 17 countries, spanning a wide range of disciplines, this book represents a gold mine of knowledge about the ecology, evolutionary biology, biogeography and macroecology, utility and invasiveness of the genus *Acacia*, the second largest genus of legumes, and its spectacular conquest of the world.



The book starts with a series of chapters that present a synthesis of the taxonomy, environmental amplitudes and functional trait and genetic attributes of the vast natural species pool encompassed by the genus *Acacia*, linking that knowledge to the invasion status and invasiveness potential of species. This is followed by a set of chapters documenting the history of introduction, spread and invasion of acacias, dubbed the Anthropocene conquest of the globe by the wattles. This synthesis is based around detailed regional studies in Europe, California, Africa, Brazil/Chile, and New Zealand, including data on the utility and perceptions of wattles by people around the world. Next, follow chapters on the biology of interactions between *Acacia* and other groups of organisms – symbionts, seed dispersers, pollinators, and pests and diseases – biology that underpins our understanding of why wattles are such successful invaders. It is this biological knowledge that provides the basis of potential biological control and management options in areas where wattles have invaded. There are then chapters devoted to assessments of the impacts – social, economic and ecological – of *Acacia* introductions and invasions. The final section of the book is devoted to discussing ways to control, monitor, manage and model wattle invasions. The concluding chapter, entitled the '*Wattles' Invasion Syndrome*, attempts to encapsulate the key elements of why acacias are such prominent travellers and invaders. This is neatly summed up in the book as **W**oody **A**ustralian **T**rees that **T**ransform landscapes: **L**eguminous, **E**nemy-free, with persistent **S**eedbanks, i.e., **WATTLES**!

Swartzia acutifolia (Papilionoideae) - Photo by D. Cardoso 3622

MUCUNA MONOGRAPH

Gwilym Lewis (Royal Botanic Gardens, Kew)

Gwilym Lewis, Tânia Moura and Helen Hopkins, with contributions from several other international colleagues, are putting together data for a monograph of the pantropical papilionoid genus *Mucuna*, which currently comprises 111 species.

We seek high quality photographs, line drawings and colour paintings of *Mucuna* inflorescences, flowers, fruits, and seeds. And photos of habit and habitat. If you have images that you would be willing to share, we would love to hear from you.

Flowers of species of *Mucuna*. Clockwise from top left: *Mucuna championii* (photo: Stephan Gale), *M. gigantea* (photo: Tim Utteridge), *M. novoguineensis* (photo: Tim Utteridge), *M. macrocarpa* (photo: Peter Wilkie).

We are also compiling information on uses, common names, and published *Mucuna* references, so if you know of any unpublished, or otherwise difficult to access, data on the genus please get in touch with Gwilym Lewis (G.Lewis@kew.org).

LEGUMES AT THE INTERNATIONAL BOTANICAL CONGRESS (IBC) JULY 2024, MADRID, SPAIN.

Compiled by Rafaela Trad, Greg Kenicer, Ozan Sentürk, Manuel de la Estrella & Dario Ojeda

Two symposia focused on legumes are planned for the IBC.

See: XX INTERNATIONAL BOTANICAL CONGRESS MADRID 2024 (ibcmadrid2024.com)

LEGUME SYSTEMATICS: FROM COLLABORATIVE NETWORKS TO GENOME SEQUENCING

Organisers: Manuel de la Estrella & Dario Ojeda

Abstract: Leguminosae (Fabaceae) is the third largest angiosperm family in terms of species richness with c. 800 genera and over 23,000 species. In ecological and economic terms, the family is also one of the most important plant groups of the World: it not only includes economically important food crops but also key components of a wide variety of ecosystems. Legume systematics benefits from the intensive work by the international Legume Phylogeny Working Group, an informal group of international scientists working towards a new insight of the classification and evolution of these plants. Increasing efforts on phylogenomics studies revealed multiple whole genome duplications within legumes, that along with the new NGS data available are contributing to our better understanding of the group's diversification and evolution. Additionally, the new era of collaborative tools allowed the publication, and since then a continuous update, of the Leguminosae checklist provided for the worldwide community through a specific online legume data portal. This symposium will host leading experienced researchers as well as young systematists from across the World to introduce the most recent achievement in taxonomy, phylogenomics and evolution of legumes.

Presentations will include:

Marianne Le Roux, Domingos Cardoso & Anne Bruneau
Contact: M.LeRoux@sanbi.org.za, cardosobot@gmail.com, anne.bruneau@umontreal.ca
Talk: **The future of legume systematics and the use of collaborative tools**

Rowan Schley & Le Min Choo
Contact: rowan.schley@gmail.com, choolemin@gmail.com
Talk: **Evolution of legumes: from introgression to whole genome duplication**

Ting-shuang Yi & Rong Zhang
Contact: tingshuangyi@mail.kib.ac.cn
Talk: **Resolve tribal relationships of Fabaceae using nuclear, plastid and mitochondrial genomic data**

RECENT ADVANCES IN THE MEGADIVERSE LEGUME SUBFAMILY PAPILIONOIDEAE

Organisers: Rafaela Trad, Greg Kenicer & Ozan Sentürk

Abstract: The megadiverse legume subfamily Papilionoideae contains over 14,000 species across every major terrestrial ecosystem, with myriad lifeforms and life-histories. Its representatives are well-known for their economic and social importance (e.g., beans, peas, lentils, rosewoods and many others), and their ecological significance in nutrient cycling, habitat infrastructure and coevolution with nitrogen fixing bacteria. Although almost any evolutionary question can be asked about the papilionoids, building a comprehensive phylogeny is the first step in trying to understand the successful evolutionary history of this group. Recent molecular advances have opened new avenues and allowed systematists to include hundreds or thousands of nuclear genes, accounting for different processes and distinct gene histories. For example, it was suggested by Koenen et al. (2021) that the relationships in Papilionoideae could be better represented by a network, raising questions such as what are the causes of this reticulation?–- incomplete lineage sorting, hybridization, polyploidization or gene tree estimation error. Therefore, this symposium will focus on large-scale studies across the subfamily and key clades within it highlighting the new findings and questions that remain to be answered. This will serve as a valuable update for a wide audience as it aims to present the first comprehensive phylogeny for this subfamily generated with nuclear genes, along with talks presenting the recent advances in understanding the large Dalbergioid and Mirbelioid clades, the tribe Phaseoleae, and

phylogenetic reconstruction methods. The proposed symposium will also highlight the collaborative approach of the Legume Phylogeny Working Group, (LPWG), and demonstrate how collaborative networks are speeding up advances in one of the most successful angiosperm groups. The interdisciplinary approach to be presented in this symposium could serve as a framework for studying other large groups of plants, making the symposium attractive to a broad audience at the IBC 2024.

Presentations will include:

Rafaela J. Trad, Flávia F. Pezzini, R. Toby Pennington, Gwilym Lewis, Bente Klitgaard, Russell Barrett, Anne Bruneau, Warren Cardinal-McTeague, Domingos Cardoso, James Clugston, Manuel de la Estrella, Ashley N. Egan, Colin Hughes, Erik Koenen, Todd McLay, Daniel Murphy, Matt Renner, Jens Ringelberg, Rowan Schley, Mohammad Vatanparast, Martin Wojciechowski, Darren Crayn, Olivier Maurin, Raquel Negrão, Catherine McGinnie, Paul Bailey, William J. Baker, Félix Forest, and Gregory J. Kenicer.
Talk: **A new phylogeny of the megadiverse legume subfamily Papilionoideae**

Ana Paula Fortuna-Perez and Bente B. Klitgaard.
Talk: **Advances in legume systematics: insights from the Dalbergiod clade (from rosewoods to fodder plants and peanuts)**

Ozan Şentürk, Zeki Aytaç, and Gregory J. Kenicer
Talk: **Revisiting *Ebenus* L. (Leguminosae): A Molecular Perspective**

Flávia Fonseca Pezzini, Moabe Ferreira Fernandes, Rafaela Jorge Trad, Gregory J. Kenicer, Erik J. M. Koenen, Jens J. Ringelberg, Kyle G. Dexter, Colin E. Hughes, and R. Toby Pennington.
Talk: **Combining legacy Sanger with new phylogenomic DNA sequence data to produce a densely sampled papilionoid phylogeny for comparative biology**

Abdulwakeel A. Ajao, Tlou S. Manyelo, and Annah N. Moteetee.
Talk: **Developments in the phylogenetic and taxonomic studies of southern African genera of the tribe Phaseoleae**

James A. R. Clugston, Russell L. Barrett, Matthew A. M. Renner, Peter H. Weston, Lyn G. Cook, Peter C. Jobson, Brendan J. Lepschi and Michael D. Crisp.
Talk: **Phylogenetic resolution of Mirbelieae (Fabaceae) using the Angiosperms353 target-capture probe set**

Registration for the IBC is open (https://ibcmadrid2024.com/index.php?seccion=registrationArea&subSeccion=registrationInfo, and registration form here: https://ibcmadrid2024.com/index.php?seccion=registrationArea&subSeccion=onlineRegistration)

Posters can still be submitted and the deadline is February 1st 2024. Please see the guidelines and submission pages

SAVE THE DATE FOR THE UPCOMING ICLGG CONFERENCE

Professor Michael Udvardi ICLGG 2024 Chair

We are delighted to inform you about the upcoming 11th International Conference on Legume Genetics and Genomics (ICLGG) in 2024. This conference will bring together up to 400 leading and emerging national and international researchers, educators and agri-food representatives in the field of legume genetics and genomics.

Event details

ICLGG 2024 will be held in Brisbane, Australia, from Monday 30 September to Thursday 3 October 2024. Save the date now in your calendar!

Why should you attend?

- Establish new and foster existing relationships with local and international colleagues working on legume genetics and genomics, crop improvement and enabling technologies.
- Share and learn about recent international advances in legume science at a face-to-face event.
- Discover creative solutions to global problems emerging from legume research.
- Enjoy the many attractions of subtropical Brisbane, located in the sunshine state of Queensland.

For more details and to stay up to date, please register your interest here.

Abstract submissions for oral and poster presentations from individuals who would like to present their research, projects, or experiences, will open **Wednesday 31 January 2024**.

Early bird registration will open on **Thursday 15 February 2024**.

We hope you can join us for the 11th International Conference on Legume Genetics and Genomics in Brisbane.

For more information, please contact the ICLGG 2024 Conference Organizers at +617 3848 2100 or iclgg2024@expertevents.com.au

Mimosa weberbaueri (Caesalpinioideae) - Photo by C.E. Hughes 3075

ARTICLES

ARTIST SPOTLIGHT: BOBBI ANGELL

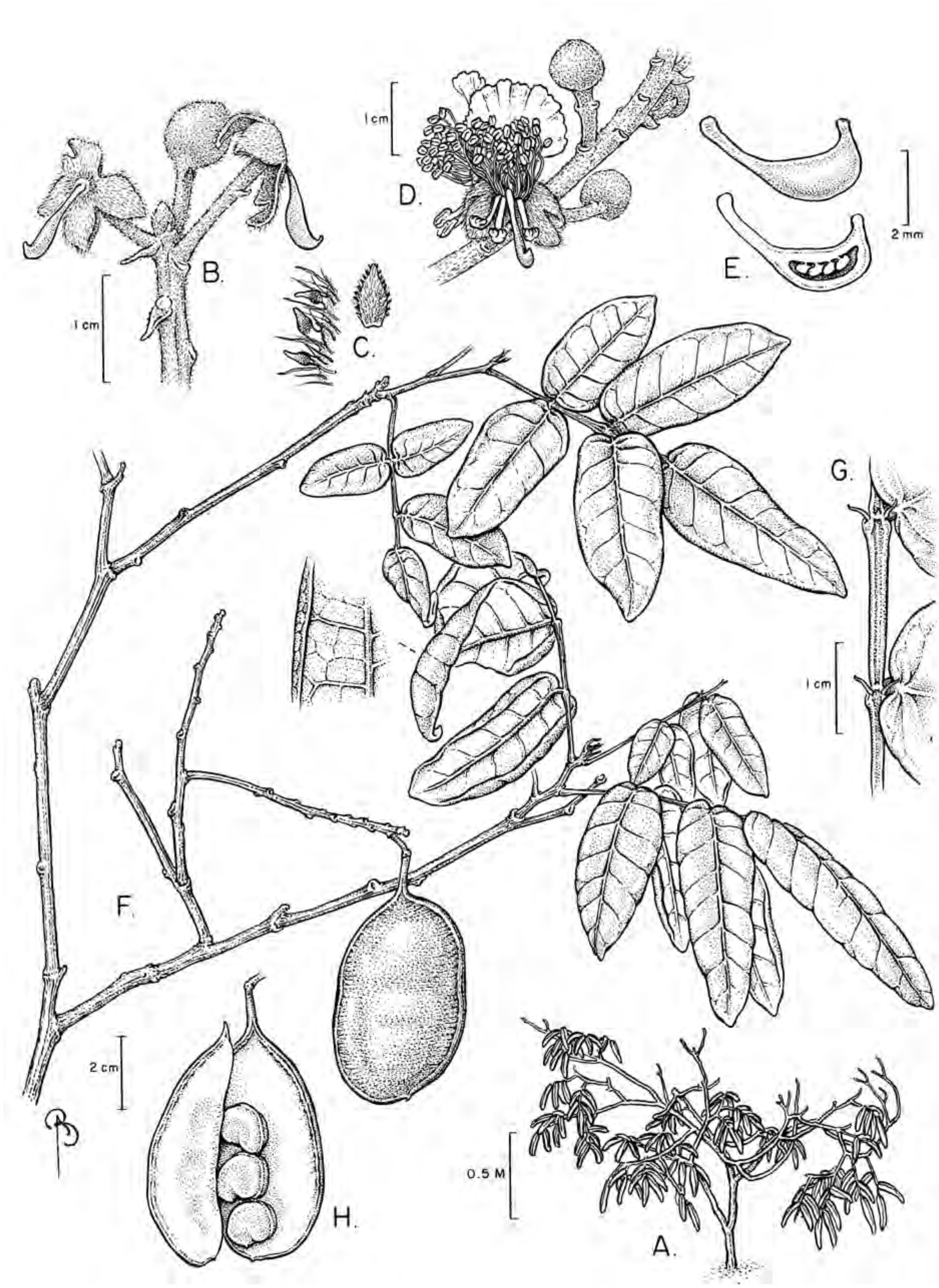
J. Stephen Boatwright (University of the Western Cape, South Africa)

Bobbi Angell grew up in New York, and discovered a love for botanical illustration in college. She graduated in Botany at the University of Vermont in 1977, thereafter starting a career illustrating plants for scientists at the New York Botanical Gardens (NYBG) and other institutions around the world. She lives in southern Vermont, and pursues a love for gardening along with illustrating native and tropical plants.

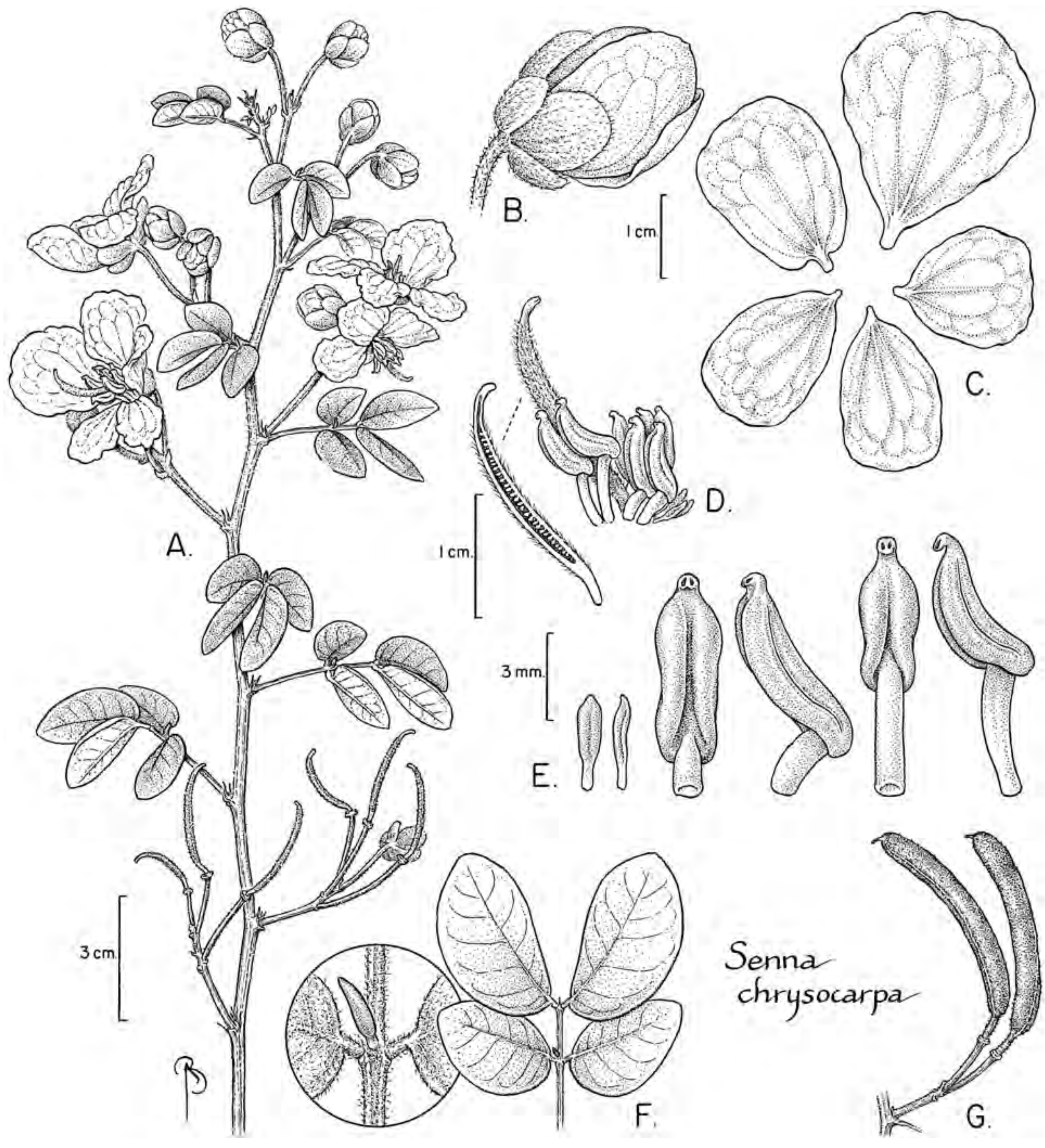
During her career, Bobbi has focussed on illustrating plants for scholarly texts, aimed at clarifying the identification and description of plants. Her illustrations are based on herbarium material, pickled flowers, photographs or drawn in the field. Her illustrations are exceptionally detailed, and often include magnified details of the plants. She has amassed an immense portfolio, having completed thousands of illustrations for various publications and geographical regions. Many of her illustrations are published in monographs and articles of new species, and have more recently focused on Anacardiaceae, Melastomataceae, Myrtaceae and Myristicaceae. She has worked on several floras, including *Flowering Plants of the Neotropics, Guide to the Vascular Plants of Central French Guiana* (2 volumes), *Orchid Flora of the Greater Antilles, Vines and Climbing Plants of Puerto Rico* and *Intermountain Flora* (9 volumes). Some of her most well-known work on legumes were the illustrations she made for Rupert Barneby, including the Fabales volume of the *Intermountain Flora* and many new species in *Silk Tree, Guanacaste, Monkey's Earring* (2 volumes 1996, 1997) and *Sensitivae Censitae Mimosa* (1991).

Her interests also span other projects, including adding artwork to garden memoirs and working on her copper etchings. Two co-authored books have been published recently – *A Botanist's Vocabulary* and *Darwin and the Art of Botany.*

Further information can be found on her website (https://www.bobbiangell.com/)



Swartzia arenophila R. B. Pinto, Torke & Mansano and *S. thomasii* R. B. Pinto, Torke & Mansano, published in Brittonia 64: 119–138, 2012.



Senna chrysocarpa (Desv.) H.S.Irwin and Barneby from *Guide to the Vascular Plants of Central French Guiana.*

ARTIST SPOTLIGHT: JOÃO AUGUSTO CASTOR SILVA

João Iganci (Universidade Federal de Pelotas, Brazil)

João Augusto Castor Silva is from Minas Gerais, Brazil. He was born in 1996 and started in the world of arts from the age of 13-14, when he made his first tattoo. He graduated from the Faculty of Plastic Arts at Escola Guignard (UEMG) in 2014 and, in 2018, completed and defended his qualification in woodcut engraving. Currently studying a Bachelor's degree in Biological Sciences at Universidade Federal de Pelotas, he develops research in arts and science for the "Pampa Singular" project and the Scientific Illustration Center (NIC) for science outreach, under the supervision of Prof. João Iganci, who is also a leguminologist.

The name *Erythrina* L. comes from the Greek word "erythros" meaning "red," and referring to the color of its showy petals. *Erythrina crista-galli* L. is a tree species that can reach up to 20 meters high and 80 centimeters in diameter. It is found in wetlands in the central and southern parts of South America, with records in Argentina, Bolivia, Brazil, Paraguay, and Uruguay. It has a twisted trunk covered in a thick, corky bark. Its branching is dichotomous, and it has curved and flattened spines on the branches and leaves, which are trifoliolate. The pseudoracemose inflorescences are erect or curved, with numerous flowers. The flowers have five petals of different sizes, which gives the flowers bilateral symmetry. The ressupinated standard (basal petal in this case) is wide and oval and provides support for two elongated and fused keels that function to bring the stamens closer together, as well as two reduced, free wings. The fruits are dehiscent legumes with a green color when immature and dark brown when mature. The seeds are also dark brown and oblong. It has a monoecious sexual system, and only 6% of its flowers develop seeds. Its main pollinators are hummingbirds and bees, and its nectar is abundant, slightly viscous, and odorless.

GALLERY OF LEGUMINOLOGISTS

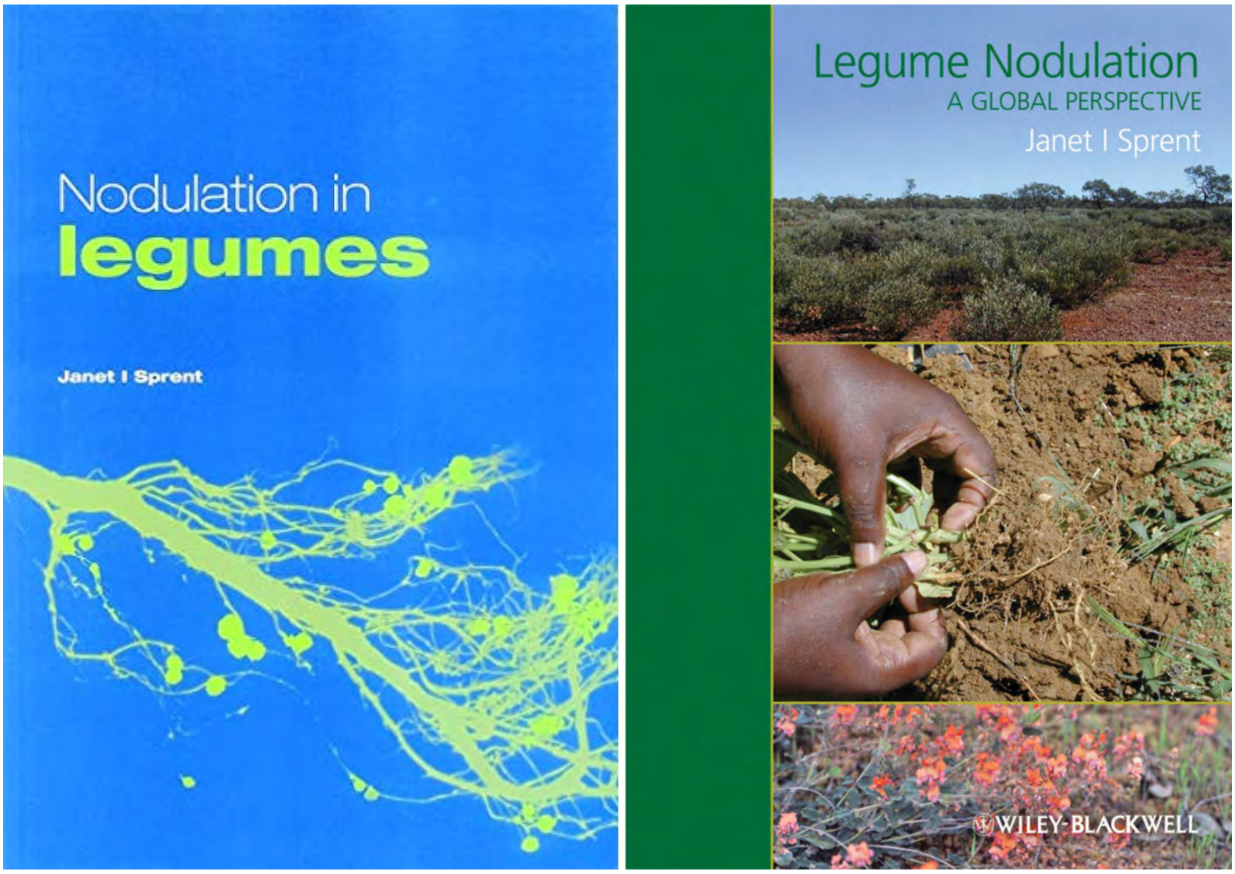
Janet Sprent (1934–)

Compiled by Euan James, Julie Ardley, Colin Hughes and Peter Young

Janet I. Sprent received a BSc, Associateship of the Royal College of Science (ARCS) from Imperial College London in 1954, a PhD from the University of Tasmania in 1960, a DSc from London University in 1988 and an honorary Doctorate in Agriculture from the University of Uppsala (Sweden) in 2006. Most of Janet's academic career was spent as a professor at the University of Dundee in Scotland where she is now Emeritus Professor of Plant Biology.

Janet Sprent in Tasmania, 2019. Photo: Julie Ardley.

Through her extensive research career spanning more than 50 years, Janet became a leading world authority on legume nodulation and nitrogen-fixation. She travelled widely, conducting field research in many countries, including Kenya, South Africa, Australia and Brazil. A major focus of Janet's research has been to relate legume taxonomy and evolution to microsymbiont taxonomy, and throughout her career she collaborated extensively with the legume systematics community, contributing evidence from nodulation to the understanding of legume evolution, and always eager to see the latest legume phylogenies and what they say about nodulation. Janet's work also addressed practical problems through more applied research, such as the development of novel drought-resistant legumes for the wheat belt of Australia; this has led to the naming of one of the rhizobial inoculants that is used, in her honour, as *Paraburkholderia sprentiae*. Janet is a long-standing member of British Ecological Society (BES), a Fellow of the Royal Society of Edinburgh (FRSE), and was latterly a Trustee of the Royal Botanic Gardens in Edinburgh. She has published more than 500 peerreviewed papers since the mid-1950s, many of them pioneering studies on legumes and other symbiotic plants. Janet has also published four books that became standard textbooks on the N-cycle, legume nodulation and N-fixation spanning all levels from high school upwards.



Sprent (2001) and Sprent (2009) are standard texts for nodulation in the Leguminosae.

Indeed, Janet is a remarkable communicator able to cross cultural and educational boundaries and she has been particularly committed and effective in mentoring, supervising and helping scientists in the developing world, especially women, thereby contributing a legacy of expertise on nodulation around the globe. Her endeavours in education were recognized by her award of the Order of the British Empire (OBE) in 1996. Janet has always been enthusiastic about joining legume experts from different fields, particularly encouraging collaborations between legume systematics and nodulation research, and playing a leading role in the international legume community. Indeed, her spirit of scientific integration and international collaboration epitomises the essence of the International Legume Conferences, the most recent of which in Pirenópolis, Brazil, in 2023 honoured her contribution by dedicating a session on symbioses to her.

Left to right: Janet Sprent at the Embrapa-CENARGEN herbarium, Brasilia, in September 2005 examining voucher specimens of *Mimosa* spp. Janet Sprent and Euan James in the Chapada dos Veiadeiros National Park, Goias, Brazil in September 2005. Photos: Peter Young.

Josephine (Jo) Kenrick (1929–)

Compiled by Peter Bernhardt and Helen C.F. Hopkins

Jo Kenrick worked in the School of Botany at the University of Melbourne in Parkville, Australia. Many of her early publications, often in collaboration with R. Bruce Knox, were on the pollen and stigmas of *Acacia*, including a major overview of pollen-pistil interactions in mimosoid legumes in *Advances in Legume Biology* in 1989, and she also published on the pollination of *Acacia* species in Victoria. She received an MSc in 1982, followed by a PhD in 1994. Although she is probably best known for her studies on *Acacia*, as part of a pollen and allergen research group, her interests later extended to other plant families. The following reminiscences have kindly been contributed by Prof. Peter Bernhardt of St. Louis University, U.S.A.

"When I think of Jo Kenrick I think of precision. Who else had the patience and determination to develop the skill of removing a polyad from an *Acacia* anther and depositing it flat on the narrow receptive surface of the stigma? To compare pollination in nature, Jo fixed entire inflorescences of *Acacia* species and observed each one under a microscope to see which stigmas bore polyads. She even found a few natural examples of two polyads in one stigma cup because they were deposited vertically. I was blown away by her first fluorescence micrographs showing pollen tubes germinating from each grain in the polyad then growing down the style and unravelling so each tube found one ovule. As the female phase in all the florets in an Australian *Acacia* inflorescence is synchronous, Jo often hand-pollinated more than one stigma in the same head or spike producing multiple pods which you rarely see under natural conditions.

Left to Right: Jo Kenrick at the Flora of Australia *Acacia* Workshop, Melbourne, 1983, and at Paradise Falls, Victoria, Australia, 1985, photos Bruce Maslin.

"Dr Kenrick and I finished post-graduate degrees within a few years of each other but she was among the first to be hired by the late Professor R. Bruce Knox (1938–1997) to work in the new Plant Cell Biology Research Centre at Melbourne University. Both of us were assigned initially to the *Acacia* reproduction division and Jo was the kindest of all coworkers. She added me to a study on a seaside population of *Acacia retinodes* growing by a golf course at Cape Schanck. She did the hand pollinations while I caught the pollinators. She discovered that these large shrubs cloned themselves with woody runners under the sand. Now she could do both crosses between clones to compare self-incompatibility results versus outcrossed individuals. We had to leave early in the morning as the receptive stage in *Acacia* stigmas is early and very brief. I'd take a tram to her house before we headed off and she would have a hot breakfast waiting for me and she\'s the ONLY person who ever made me kedgeree. We also discovered a bakery along our route to Cape Schnack that made the best brandy snaps. We became regular customers for the duration of the fieldwork.

"Many Australian acacias bloom during the winter and I remember Jo taking us to the edge of the Little Desert just before dawn. The stems of spiny, prostrate species wore long, needle-crystals of hoar frost. As the sun rose, we watched those crystals sublimate and vanish."

"Jo organized several expeditions within the state of Victoria while she headed the *Acacia* Reproductive Biology programme within the Plant Cell Biology Research Centre. This was of interest to other schools within Melbourne University and certain government agencies. There was an agricultural element to see if native acacias could serve as green manures and whether their root nodules added appreciable amounts of nitrogen to soils. A horticultural division expressed an interest in some of the spiniest species that might serve as "anti personnel" plants around buildings. There was even talk about the nutritional aspects of *Acacia* seeds based on a history of indigenous women pounding them into cakes."

"Fieldwork on *Acacia terminalis s.l.* in Gippsland, Victoria, posed new challenges to Jo. Depending on the population, this species can produce a large, red extrafloral nectary at the base of its petiole. As inflorescences appear at the base of the leaf, this suggested bird-pollination. Jo and her assistants learned to mist-net, band and release birds after taking instruction from local experts. To see if the bird was carrying *Acacia* polyads when caught, she rubbed the beak and head feathers with a cube of glycerine jelly stained with basic fuchsin. The cube was placed on a glass slide under a cover slip. She found the best way to liquify the cube, exposing the exine to the stain, was to warm the slide with the cigarette lighter in the dashboard of the university vehicle she had signed out for the trip. *Acacia terminalis* blooms during cold, wet April in Gippsland. While the mist net was checked, frequently some of the birds (tiny thornbills and silvereyes) were obviously shocked by entrapment and handling as well as by the cold, moist season. I would return from insect-collecting to find Jo and her assistants warming the birds under their coats and giving them drinks of glucose and water. Mosquitoes were thick in this woodland and we were surprised to see the same birds, once warmed and recharged, would often eat the dead mosquitos we swatted and offered before releasing them."

Suzanne Koptur (1955–)

Compiled by Helen C.F. Hopkins

Suzanne Koptur is an ecologist and botanist with a wide interest in plant-animal interactions. Although she has not worked exclusively on legumes, she has had a long and enduring association with the family and has published on genera in all three of the traditionally recognized legume subfamilies. Her research covers mutualisms with ants and the role of extrafloral nectaries in plant defence, floral biology, breeding systems and pollination ecology, and the biology of caterpillars as herbivores.

For her PhD at UC Berkeley, Suzanne studied the floral biology, breeding system and phenology of many species of *Inga*, and their pollination by a variety of organisms including sphingid moths, hummingbirds and butterflies in the forests of Monte Verde in Costa Rica. Her hand-pollination experiments revealed that, for two species, cross-pollinations between individuals of the same species were not compatible unless the parent trees were separated by 1 km or more. This work was under the umbrella of a larger study of the phenology of cloud forest trees and shrubs and was supervised by Herbert Baker and Gordon Frankie. For good measure, she also studied the interactions among *Inga's* herbivores and the insects attracted to their foliar nectaries.

Left to right: Suzanne in the Everglades National Park, Florida, photo Hipolito Paulino Neto, and with a non-legume, *Guettarda scabra*, 2014, photo John J. Koptur-Palenchar.

As a NATO-funded postdoc with John Lawton at York University in the U.K., she used artificial defoliation experiments in an allotment garden to explore the effects of herbivores on *Vicia sativa*. Untangling the interactions among ants and parasitoids that visited the stipular extrafloral nectaries, she found that the ants prevented the parasitism of herbivorous moth larvae that feed inside the developing fruits. The study continued in subsequent summers with support from the British Ecological Society, comparing the plant/herbivore/parasitoid interactions of two species with extrafloral nectaries (*V. sativa* and *V. sepium*) and two without (*V. cracca* and *V. hirsuta*).

In 1985 she joined the faculty of Biological Sciences at Florida International University (FIU), where she taught courses in botany and ecology. The genera she and her many postgrad students have studied included *Centrosema, Chamaecrista* and *Senna*, with much of the fieldwork done in southern Florida. She also conducted research as a Fulbright scholar in Mexico, on ferns with foliar nectaries, in collaboration with Victor Rico-Gray and colleagues at the Instituto de Ecologia in Xalapa in 1994 and again in 2009, when she and her family spent six months living in the *Pueblo Magico* of Coatepec.

Retiring in August 2021, Suzanne is increasingly involved with local plant and insect societies, also finding time for gardening and other creative ventures. But she continues to work on the pollination of plants in the pine rocklands and on the effects of urban areas on plants and animals in habitat fragments, and she is writing up projects whose publication has been delayed by the demands on a professor's time. She reports that two of her final PhD students have recently completed, with one more to go! – Andrea Salas, who is investigating the potential for a native plant, *Senna mexicana* var. *chapmanii*, to serve as an insectary in the cultivation of fruits and vegetables in south Florida agriculture.

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THE 8th INTERNATIONAL LEGUME CONFERENCE (8ILC), PIRENÓPOLIS, BRAZIL, AUGUST 2023

Marcelo Simon (Embrapa Cenargen, Brazil) **Tania Moura** (Instituto Federal Goiano, Brazil)
On behalf of the 8ILC Organizing Committee

The ILC is a series of international conferences focused on the legume family. It encompasses a wide range of topics, including but not limited to systematics, evolution, biogeography, morphology, ecology, biological nitrogen fixation, and genomics. Since the first conference back in 1978, the ILC has consolidated itself as an international event with significant participation of researchers from different countries and continents, including a considerable proportion of students. The ILC has promoted substantial advances in scientific knowledge about legumes. One of the aims of this event is to promote collaboration between researchers worldwide, which for example resulted in the creation of the Legume Phylogeny Working Group (LPWG). This year, for the first time, the ILC was held in Brazil, a country renowned for its extraordinary biological diversity including a dizzying tally of legume genera and species, as well as cultural diversity, and as home to a vibrant community of legume researchers.

Group photo of the 8ILC in Pirenópolis, August 2023, photo by Adilson Werneck.

The 8th International Legume Conference (8ILC) took place from 6th to 11th of August 2023 in Pirenópolis, one of the most charming towns in the heart of the savanna landscapes of the Cerrado biodiversity hotspot. The global legume community was well-represented in Pirenópolis, with 147 participants hailing from 18 countries, spanning diverse institutions and nationalities. Particularly noteworthy was the substantial presence of students among the attendees, underscoring the promising role the new generation is playing in advancing legume science. It is also worth mentioning that approximately 40% of all participants and keynote speakers were women, highlighting our efforts towards attaining gender equality in science.

The 8ILC was centered around the theme of "Integrating knowledge on the legume family". At the opening ceremony, Dr. Marcelo Simon (Chairperson of the 8ILC) addressed the conference by welcoming all delegates. Then, Professor Fabio Scarano (Univ. Federal do Rio de Janeiro) delivered an inspiring opening keynote talk "Legumes and futures: dialogues between different ways of knowing", which was followed by a cheerful reception.

Left to right: Opening speech at the 8ILC, photo by Gustavo Shimizu. Welcome cocktail at the 8ILC, photo by Adilson Werneck.

The 8ILC scientific program featured a total of 126 presentations, including invited keynote talks, contributed oral presentations, and posters, distributed among eight main symposia: (i) Assembling global checklists and floras of legumes; (ii) Advances in legume morphology and anatomy; (iii) Updates in legume systematics; (iv) Legumes and society: genetic resources, uses and conservation; (v) Legume research in the era of genomics; (vi) Animals and legumes: from mutualistic to antagonistic interactions; (vii) Legumes as a model for biogeography, macroecology, and evolution; and (viii) Novelties in legume-rhizobia symbiosis: a tribute to Janet Sprent. Most of the symposia were opened by a keynote speaker from outside the legume community, bringing new perspectives and ideas from current research on other plant families or in a global context. Then, a second keynote talk by a legume expert covered the general subject of the symposium with a focus on the legume family, which was followed by a series of contributed oral presentations.

Poster session at the 8ILC, photo by Gustavo Shimizu.

The 8ILC Organizing Committee took the opportunity of hosting the conference in Brazil to pay tribute and make awards to seven Brazilian legume researchers: Ana Maria Goulart de Azevedo Tozzi (Universidade Estadual de Campinas), Angela Maria Studart da Fonseca Vaz (Jardim Botânico do Rio de Janeiro), Haroldo Cavalcante de Lima (Jardim Botânico do Rio de Janeiro), José Francisco Montenegro Valls (Empresa Brasileira de Pesquisa Agropecuária), Luciano Paganucci de Queiroz (Universidade Estadual de Feira de Santana), Marli Pires Morim (Jardim Botânico do Rio de Janeiro), Silvia Teresinha Sfoggia Miotto (Universidade Federal do Rio Grande do Sul), who have contributed significantly to advancing knowledge about the legume family throughout their careers, by publishing widely on the systematics and phylogenetics of the family and by teaching and mentoring the next generation of legume scientists. Three plant collectors, Glocimar Pereira da Silva (Empresa Brasileira de Pesquisa Agropecuária), Maria Lenise Silva Guedes (Universidade Federal da Bahia), and Vinicius Castro Souza (Universidade de São Paulo/ESALQ), each having collected more than 3,000 legume numbers, were also celebrated during the special ceremony, which was presented by Dr. Gwilym Lewis. The awardees were each presented with a certificate and a trophy in recognition of their widely appreciated and impressive contributions to legume science. The 8ILC also dedicated one symposium to the career of Janet Sprent, a global authority on nodulation in legumes.

Celebrating the work of Brazilian leguminologists – a Ceremony recognising ten outstanding people at the 8ILC, photo by Adilson Werneck.

Conference attendees had the opportunity to unwind and savor the beauty of a natural reserve during a field excursion, where they strolled through the unique Cerrado vegetation, observed a number of interesting and/or endemic legume species of the Brazilian flora, and indulged in refreshing swims beneath cascading waterfalls despite the cold water! Later that evening, the conference party provided a delightful experience, complete with live music and dancing, adding a memorable touch to the day's events.

Before the closing ceremony, the conference opened a discussion of proposals to host the next 9ILC in Kunming, China, or in Edinburgh, Scotland, as kindly offered and nicely presented by Professor Tingshuang Yi and Professor Toby Pennington, respectively. Although a final decision about this was not taken during the conference in Pirenópolis, we are all excited about our forthcoming meeting in the next few years to delve deeper into the frontiers of legume science.

A selection of works presented at the 8ILC will be part of the series Advances in Legume Systematics (volume 15), which will be published as a special issue of the *Brazilian Journal of Botany* in 2024 (https://www.springer.com/journal/40415/updates/24622142). Papers not presented at the 8ILC, but within the various research topics involving legume science, are also being considered for publication in the same special issue.

Field excursion to the Salto Corumbá waterfall during the conference break, photo by Adilson Werneck.

In summary, the 8ILC proved to be a resounding success, bringing together people from all over the world, allowing them to meet in person, present groundbreaking scientific research, and establish new connections and collaborations. The conference book of the 8ILC, as well as the event's photo book, are available on the conference website (www.8ilc.com). The Organizing Committee of the 8ILC would like to thank all attendees and sponsors for making such a stimulating and enjoyable conference. We look forward to meeting all of you again at the next ILC!

Cerrado landscape from the field excursion - Photo by C.E. Hughes

STUDENT DIGEST

Oceans and rain dictate Mimosoid species distributions across the tropics

L. Ellie Becklund, PhD candidate
Department of Environmental and Plant Biology, Ohio University, Athens, Ohio, USA

Why do species occur here, but not there? Biologists have long investigated (Buffon, 1761) the factors influencing species distributions, community assemblages, and biomes to understand biogeographic trends, for example, why species assemblages in the tropics differ from those in temperate climates. Three main influences on present-day species distributions have been proposed, including stochastic processes, geographic barriers promoting speciation and limiting dispersal (e.g., oceans), and ecological niche barriers (e.g., precipitation, frost) that limit a species' success outside of its niche space (Cavender-Bares et al., 2009). If geographic distance shapes species distributions, instances of long-distance dispersal should be rare and niche shifts common, whereas if phylogenetic niche conservatism is the main driver of species distributions, long-distance dispersal should be more frequent than shifts into new niche space. We can test which among geography and niche conservatism has a larger effect over species distributions by investigating variations in phylogenetic turnover, i.e., the evolutionary dissimilarity between species assemblages across regions (Hardy et al., 2012). The advent of large phylogenetic, geographic, and environmental data sets allows us to do this across continents. In Fabaceae, Mimosoid legumes are species-rich in the tropics, occurring pantropically across the globe, but are scarce in temperate climates. While several genera are pantropically distributed (e.g., *Parkia*, *Vachellia*), some Mimosoid lineages are confined by continental connectivity (e.g., *Inga*, *Desmanthus*). The question is whether these present-day distributions are the result of dispersal limitations, or ecological adaptive barriers, or both, and whether geography or adaptation has a larger effect?

In a recent paper in Science Advances, Ringelberg et al. (2023) tackle this longstanding question by investigating the impacts of dispersal limitation and climatic niches on phylogenetic turnover of Mimosoid species. The Mimosoid clade is an ideal group to investigate broadscale patterns of phylogenetic turnover because of its high number of species (~3,500 in total) and lineages which vary from pantropical to continental distributions, and can be investigated in a phylogenomic context (Ringelberg et al., 2022) to understand speciation and dispersal trends over the last 45 Ma. A composite "metachronogram" was constructed by grafting subtrees onto a generic time-calibrated phylogenomic backbone as the basis for climatic niche comparisons of 3,156 species based on 424,333 occurrence records. To evaluate the effect of climate and dispersal limitation on phylogenetic turnover, mean annual precipitation, mean annual temperature, and seasonality of precipitation were compared, after correcting for geographic distance, across the entire pantropical data set and individual data sets partitioned by continent (Africa, North America, South America, Australia, and Asia). The authors found that dispersal limitation caused by oceanic barriers better explained phylogenetic turnover at the pantropical scale in Mimosoids. Interestingly, more instances of transoceanic dispersal events happened before 20 Ma and have since slowed, suggesting the pantropical distribution of the clade was achieved early. Conversely, within continents, precipitation and then temperature were better indicators of phylogenetic turnover. Within continents, Mimosoid species diversified within their ancestral precipitation regimes ~95% of the time, with just 5% of speciation events involving shifts into wetter or drier environments. Climatic niche also explained more of the turnover in past distributions than present, and periods of diversification and niche shifts throughout the clade's evolutionary history coincided with global cooling and opening of drier habitats. As expected, a high degree of tropical niche conservatism shaped Mimosoid species' distributions with just 7.2% of Mimosoids making it into temperate zones and tolerating frost.

Left to right: Different rainfall regimes of *Neltuma velutina* and *Vachellia constricta* (dry) in the United States, *Parkia pendula* (intermediate) in Bolivia, and *Archidendron lucidum* (wet) in Taiwan. Photographers: L.E. Becklund; V.A. Vos (iNaturalist); mira_hlt (iNaturalist).

Based on global data sets and near-complete sampling of a large pantropical lineage, Ringelberg et al. (2023) highlighted the importance of long-distance dispersal at the pantropical scale and of precipitation at the continental scale in dictating Mimosoid diversification over the past 35 Ma. Their findings align with other studies that also found mean annual precipitation, seasonality, and temperature as the most important variables that shape the climatic niche among plants and animals (Liu et al., 2020; Oyebanji et al., 2020). This importance of climate points to the strong selection pressures precipitation and temperature exert and to a strong propensity for phylogenetic niche conservatism. Yet, geographic and climatic distances alone do not altogether explain phylogenetic turnover in the Mimosoid clade, and other niche components such as competition, mutualisms, geology, and elevation, although not quantified by Ringelberg et al., undoubtedly also influenced the distribution of species and lineages. Alongside plant functional traits, morphology, and ploidy, these factors likely account for the remaining unexplained variance in phylogenetic turnover.

One of the most striking findings of the Ringelberg et al. (2023) study is that the estimated number of trans-continental dispersal events is greater than the number of tropical to temperate transitions, despite the geographic adjacency of the tropics and the temperate zone, i.e., where there is an obvious dispersal barrier. For Mimosoids frost greatly limits distributions, posing an adaptive barrier that is as strong or stronger than the barrier to moving great distances across oceans. The study by Ringelberg et al. provides a template to investigate phylogenetic turnover in other groups and communities, as well as the underlying causes of the exceptions to these predominant trends. The limited evolvability to climate has remained consistent over evolutionary time, and leaves much to consider in our changing world.

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STUDENT DIGEST

Comparative anatomy sheds light on the evolution of sympetaly of mimosoid legumes

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The breathtaking diversity of flowers stems not only from evolutionary change driven by extrinsic factors, such as biotic interactions, but also intrinsic factors, such as genetics and development. Developmental changes resulting from genetic mutations over time and/or from changes in the physical environment of apical meristems may lead to modification or elaboration of floral structures (Ronse De Craene 2018). For example, tubular corollas formed by fusion of petals (i.e., sympetaly) may be associated with protection of reproductive organs (Endress 2011). Moreover, tubular corollas can augment pollination efficiency, by restricting access to floral resources for pollinators with specific morphologies (Endress 2011), impacting on reproductive success and thereby influencing evolutionary diversification.

One of the largest groups of Angiosperms, the asterids, is well-known for its sympetalous corollas, a trait that evolved multiple times within that clade (Zhong & Preston 2015). The complex evolution of sympetaly in asterids is consistent with the multiple developmental trajectories of petal fusion. Fused corollas may form at early developmental stages in which petals emerge already fused in a ring primordium (congenital fusion), or later by fusion or joining of the margins of individually formed petals (post-genital fusion) (Philips et al., 2020). Sympetaly is not unique to asterids, but also occurs in other angiosperm lineages, and is particularly prevalent in mimosoid legumes (LPWG 2017), a clade deeply nested in the rosids. As corollas with free petals are prevalent in rosids, understanding how sympetaly develops in mimosoids may hint at mechanisms underlying variation in the morphology, function, and evolution of tubular flowers.

Left to right: Inflorescence of *Inga vera* Willd.; Inflorescences with some flowers removed from *Stryphnodendron rotundifolium* Mart. and *Mimosa nuda* Benth. Photos by Monique Maianne.

In a recent paper published in *Perspectives in Plant Ecology, Evolution and Systematics*, Pedersoli et al. (2023) investigated the development of sympetaly in 16 of 100 mimosoid genera. They found that sympetaly is post-genital and arises by tissue fusion (connation), interlacing of epidermal papillae (coherence), or a mixture of both (connation-coherence). Additionally, some of the investigated genera have special mucilage cells (Matthews & Endress 2006) on the abaxial surface and distal part of the petals. While such mucilage cells could be enhancing the protective role of the corolla during floral development, Pedersoli et al. suggested that mucilage secretions could provide additional support and flexibility to the corolla tube and, therefore, may be associated with sympetaly in mimosoids.

What insights can the phylogenetic distribution and type of sympetaly provide regarding the evolution of mimosoids and diversification of their flowers? Pedersoli et al. proposed that cohered petals are phylogenetically over-dispersed , while connation is apparently restricted to the derived Ingoid clade. Although more taxa need to be studied to verify these claims, this pattern suggests that gamopetalous corollas formed by interlacing of epidermal papillae on petal margins and evolved before connation in mimosoids.

Pedersoli et al. also demonstrated that, despite variation in the type and extent of petal fusion the resulting corolla macro-morphologies are similar. Indeed, floral morphology is relatively uniform across mimosoids, which have small radially symmetrical flowers with valvate petal aestivation and synchronous floral development. Although there are exceptions, phenotypic variation occurs mainly in the size of the organs, number of parts per whorl and the degree of fusion of floral organs (Ronse De Craene 2010; Koenen et al., 2020). As shown by Pedersoli et al., comparative studies of development have the potential to provide new insights into the diversity of mechanisms underlying the evolution of the distinctive mimosoid flower.

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STUDENT DIGEST

Different modes of trait evolution weave a rich tapestry of functional diversity in the Neotropics

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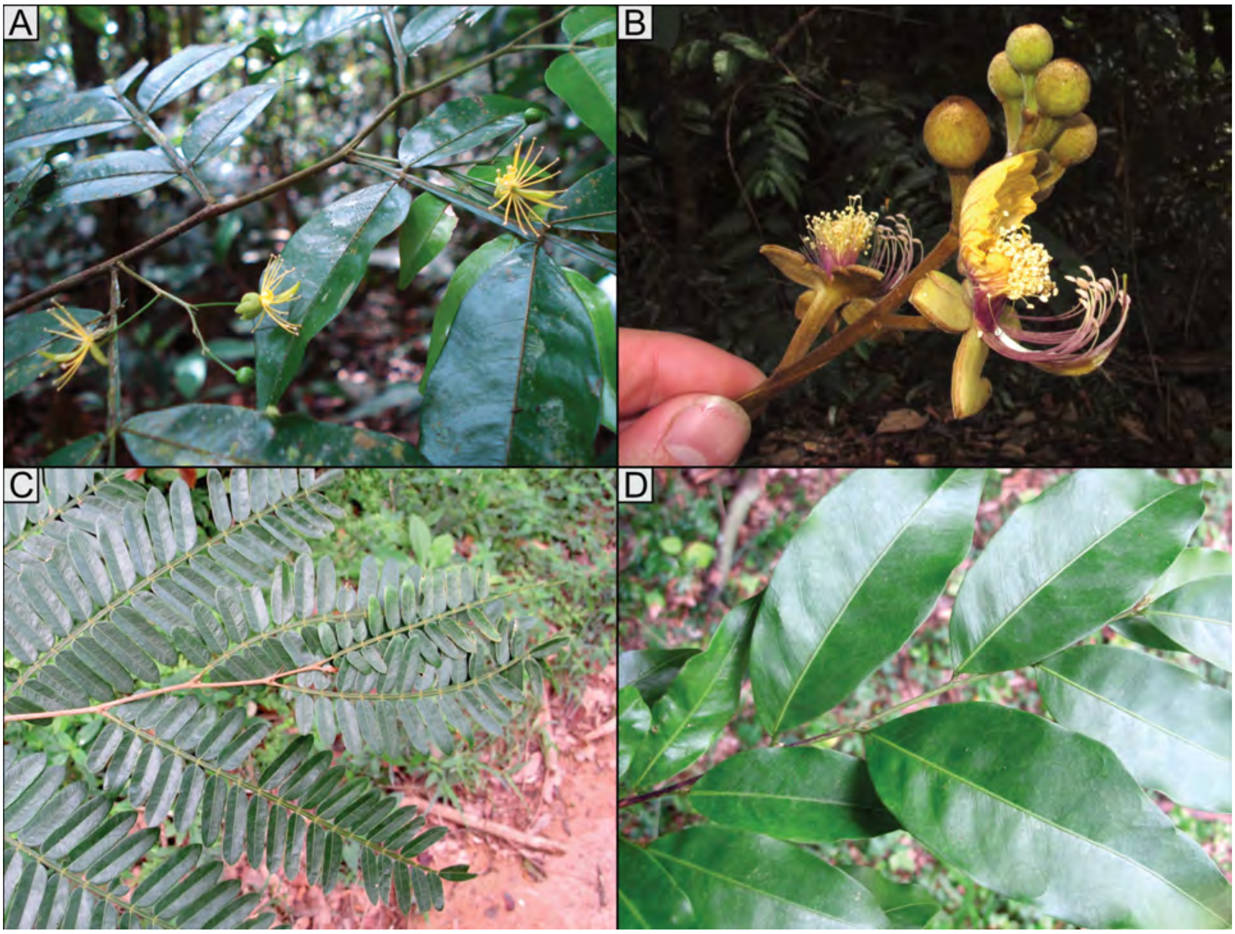
The astonishing functional diversity of neotropical ecosystems has been largely attributed to the dynamics of major geological and climatic events. The uplift of the Andes, Pleistocene climatic oscillations,decline in atmospheric CO_2, and Miocene marine flooding, all resulted in new ecosystems and biomes and also drove trait evolution. For example, the increasing dominance of flammable grasses, attributed ultimately to drops in atmospheric CO_2 levels (Jaramillo, 2023): triggered the assembly of the young South American savannas, resulting in *in situ* adaptations to fire in numerous independent plant lineages (Simon *et al.*, 2009). On the other hand, pre-existing traits may also have enabled lineages to colonise new environments, provided those traits conferred fitness advantages in those environments (i.e., pre-adaptation, or 'exaptation' *sensu* Gould & Vrba, 1982). Aerial roots in mangrove species, for example, probably arose as the result of selection for oxygen transport and nutrient uptake in non-mangrove saline habitats, and were only later co-opted as support structures in mangroves (Sahu *et al.*, 2016). Therefore, both adaptation and pre-adaptation can lead to optimal ecological performance through trait-environment matching.

In a paper published in *Global Ecology and Biogeography*, Velásquez-Puentes *et al.* (2023) addressed whether trait and environmental niche evolution are correlated and what is the primary mode of trait evolution relative to environment. To answer these questions, they studied the genus *Swartzia* Schreb. (Leguminosae, Papilionoideae): an emblematic neotropical legume radiation. *Swartzia* provides a suitable model to investigate trait-environment patterns and their underlying causes due to its high species and morphological diversity and relatively wide geographic distribution predominantly in rain forests, but also in other biomes, such as savannas and dry forests (Torke and Schaal, 2008). Velásquez-Puentes *et al.* hypothesised that (**H1**) trait-environment matching is evident in *Swartzia*; (**H2**) trait and environmental niche evolution are correlated; and (**H3**) pre-adaptation is the predominant mode underlying trait-environment matching. The authors reconstructed a phylogeny sampling 89 *Swartzia* taxa (ca. 40% of the total) and assembled trait and environmental data encompassing leaflet, fruit, and petal trait dimensions and water deficit, soil texture, soil fertility, and temperature environmental factors. Using phylogenetic comparative methods, Velásquez-Puentes *et al.* found a positive correlation between leaflet area and annual precipitation/temperature, and a negative correlation between petal width and annual temperature, supporting **H1**. They also found strong support for correlated evolution between leaflet size, presence or absence of petals, and climate niche evolution, suggesting that transitions between trait states are contingent on transitions between environmental states (**H2**). Finally, leaflet size shifts preceded environmental shifts (pre-adaptation) while shifts between presence and absence of petals follow environmental shifts (adaptation): suggesting that both adaptation and pre-adaptation shaped morphological diversity in *Swartzia* (**H3**). Neither fruit dimensions nor soil data showed a significant match with any other factor. Nonetheless, their results show that trait-environment matching shapes trait diversity in *Swartzia* and that trait evolution followed complex macroevolutionary trajectories in which *Swartzia* lineages evolved either by tracking abiotic conditions to which they were adapted or by adapting following transitions to new environments.



Swartzia species featuring some of the key traits addressed by Velásquez-Puentes *et al.* (A) *Swartzia arborescens*, apetalous flowers; (B) *Swartzia grandifolia*, petalous flowers; (C) *Swartzia prolata*, small leaflets; (D) *Swartzia simplex*, large leaflets. Photos: Benjamin Torke.

But what are the ecological associations that shaped these trait-environment correlations and what evolutionary mechanisms drove these distinct modes of trait evolution in *Swartzia*? Because the evolution of large and small leaflets facilitated transitions to wetter/warmer and drier/colder environments, the authors suggested that water and temperature stress impose limitations on leaflet size. Their results support a pre-adaptive mode of leaflet size evolution, suggesting that the current functional significance of different leaflet sizes may be distinct from the function they were originally selected for. Velásquez-Puentes *et al.* suggested that small leaflets, which can be an adaptation to drought (Bacelar *et al.*, 2004): probably evolved first within rainforests, thereby facilitating subsequent colonisation of drier areas. Although the initial pressure for smaller leaflets in wet habitats is unknown, the authors suggested that local climatic gradients, genetic constraints, and/or herbivory may have influenced variation in leaflet size in rainforests. In contrast with leaf evolution, Velásquez-Puentes *et al*. found evidence for an adaptive mode of evolutionary loss of petals contingent on temperature, as S*wartzia* lineages lost petals only after colonisation of warmer habitats. This suggests that petal loss may be under positive selection due to heat stress and herbivory, as large petals may not be as efficient as small petals for heat regulation via transpiration (Descamps *et al.*, 2020) and higher temperatures may increase herbivory (Hamman *et al.*, 2021). Additionally, petal loss is common when pollinator-mediated selective pressures are absent due to evolution of other means to attract pollinators (Zhang *et al.*, 2013). Indeed, pollination attraction in *Swartzia* is strongly mediated by visual cues (dimorphic stamens) and chemical signals (Basso-Alves *et al.*, 2022).

Velásquez-Puentes *et al.* provide robust evidence that both adaptation and pre-adaptation shaped trait diversity and lineage composition of *Swartzia* across the Neotropics. Historical biogeographic origins of *Swartzia* in Amazonian rainforests and later dispersals and adaptations to adjacent habitats, is common in many plant and animal groups (Antonelli *et al.*, 2018). Velásquez-Puentes *et al.* pave the way for future research to investigate whether different modes of trait evolution occur in a concerted way to shape the astonishingly high functional diversity of the Neotropics as a whole.

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LEGUME DISCOVERIES AND NEW SPECIES HIGHLIGHTS 2023

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Surveying the suite of new legume species discoveries and descriptions published in 2023, it is apparent that legume revisionary taxonomy is very much alive and well. Not only did we see another substantial clutch of interesting new legume species described during the year, but the data and evidence underpinning these newly delimitated taxa, and the abundance and quality of illustrations and photos accompanying them, are extremely impressive. It is now almost universal for new species to be accompanied by comprehensive sets of high-quality photographs, and here in the New Legume Species Highlights section we present a subset of these photos, illustrating once again the exceptional and spectacular diversity of legumes from all corners of the globe.

Two new Ironwoods from northern Australia

Traditionally a single species of *Erythrophleum* has been recognised in Australia, but a recent study by Barrett and Barrett (2023) added two new segregate species. None of the three species now recognised is rare and all three are conspicuous trees, begging the question as to why these two new species have only come to light now. The reason is the considerable variation in leaf morphology among seedlings, resprout shoots and adult trees which has generated confusion. More careful tallying of this variation showed that there are three distinct and readily diagnosable species and this is corroborated by molecular, geographical and ecological evidence. All three species are adapted to withstand fire through their thick bark and by resprouting and grow in savanna woodlands in northern Australia. The Barrett and Barrett paper presents a detailed revision of the genus in Australia with maps, numerous photos, and extensive data on uses and phytochemistry.

Clockwise from top left: Flowers of *Erythrophleum arenarium*, pods of *E. pubescens* (photos by Geoff Byrne), leaves of *E. pubescens* and habit of *E. chlorostachys* (photos by Russell Barrett).

Barrett, R.L. & Barrett, M.D. 2023. Taxonomic revision of Australian *Erythrophleum* (Fabaceae: Caesalpinioideae) including description of two new species. *Australian Systematic Botany* 36(5): 401-426.

Baphia arenicola: a new geoxyle from Kalahari sand savannas in central Angola

The c. 50 species of the genus *Baphia* across tropical Africa are almost all shrubs or small trees of woodlands, forests and savannas. However, *B. arenicola*, recently described by Goyder et al. (2023) from the Kalahari sand savannas of central Angola, is quite different. This unusual species is a geoxylic suffrutex forming large mats arising from extensive woody below-ground stems which comprise considerable underground woody biomass. Species of geoxyle habit, characterised by Frank White as forming the *underground forests of Africa*, are generally considered adaptations to fire and / or frost. The grasslands where *B. arenicola* occurs are rich in geoxyles and are found on fossil river terraces of white, highly leached sands, largely devoid of nutrients. Like other species of *Baphia*, this new species also has unifoliolate leaves.

Baphia arenicola flowering at ground level on short prostrate shoots and forming extensive colonies arising from large underground woody stems, a classical geoxyle suffrutex habit, growing on heavily leached, nutrient-poor white sands in central Angola. Photos: David Goyder.

Goyder, D.J., Davies, N., Finckh, M., Gomes, A., Gonçalves, F.M.P., Meller, P. & Paton, A.J. 2023. New species of *Asclepias* (Apocynaceae), *Baphia* (Leguminosae), *Cochlospermum* (Bixaceae) and *Endostemon* (Lamiaceae) from the Kalahari sands of Angola and NW Zambia, with one new combination in *Vangueria* (Rubiaceae). *PhytoKeys* 232: 145-166.

Androcalymma rediscovered after 86 years

The rediscovery of the long-lost and very poorly understood genus *Androcalymma* (subfamily Dialioideae) reported in a paper by Falcão et al. published in 2023 is one of the highlights of the legume year. *Androcalymma glabrifolium* is the only species in its genus. First collected by Krukoff in Brazilian Amazon in 1936, the genus was described by Dwyer in 1958 based on its unusual hood-shaped anthers. Known only from the type and one other collection, from close to the indigenous village of Belém do Solimões, of the Ticuna people in the heart of the Amazon close to the border between Brazil, Colombia, and Peru, it was not seen again for 86 years. In 2022 the species (and genus) was rediscovered during an expedition by Falcão et al. to an area of indigenous lands on the Solimões River.

Clockwise from top left: Flowers, unripe fruit, trunk and leaf of *Androcalymma glabrifolium*, Photos by Marcus José de Azevedo Falcão.

Until this rediscovery, the genus had remained poorly-known and was even considered to possibly be extinct. This rediscovery allowed new collections and field observations to be made and photographs to be obtained. Now the fruits of this large 30-40m tall tree of primary terra firme forests have been described for the first time, together with the shape and colour of its flowers. These new field collections also provided DNA for sequencing, enabling *Androcalymma* to be included in the Dialioideae phylogeny for the first time, and revealing it to be sister to the genus *Dicorynia*, which is also from Amazonia. As currently known *Androcalymma* is extremely narrowly restricted geographically, from an area of just 8km2, and was assigned an IUCN Threat Category of Critically Endangered. The paper by Falcão et al. presents a beautifully detailed portrait of the ecology, distribution, morphology and phylogenetic relationships of this long-lost genus of legumes.

Falcão, M. J. A., Da Silva, G. S., & Cardoso, L. & Mansano, V. F. 2023. Unravelling the enigma of *Androcalymma* (Fabaceae: Dialioideae): the rediscovery of a critically endangered legume genus in the heart of the Amazon. Phytotaxa 601(2): 137-156.

18 new *Indigofera* species from southern Africa

The majority of new legume species being described in the modern era belong to species-rich genera and are narrowly restricted endemics, two trends that make sense as the inventory of species progresses. The genus *Indigofera*, with c.750 species globally, epitomises these trends with a steady on-going stream of new species being described, many of which are geographically restricted. Based on extensive field and herbarium work a suite of papers describing new South African Indigoferas have been published during 2023. Nine new species of *Indigofera* from the Greater Cape Floristic Region were described by Du Preez et al. (2023a,b); another nine new species from the Pondoland region of southern Africa were added by Grieve et al. (2023, 2024). All of these new species are extensively illustrated, including an abundance of photos; detailed distribution maps are presented. These increments bring the tally of species of *Indigofera* from the Greater Cape Floristic Region to around 100, 86 of which belong to a single 'Cape Clade'. They also attest to the unusual ecological amplitude of the genus spanning almost every seasonally dry habitat across southern Africa. These novelties reflect the diversity of life histories of the genus in that region: *I. barkeri* is a dwarf annual herb, 5-20 cm tall, with trifoliolate leaves, *I. pondoensis* is an erect muti-stemmed suffrutex, *I. tanquana* is a thick-stemmed shrub with spinescent branches, and *I. vanwykii* is an erect woody shrub to 2 m ht. Grieve et al. suggest that 80 to 90 species of *Indigofera* from South Africa still remain to be described.

A selection of new species of *Indigofera* from 2023. Clockwise from top left: *Indigofera hydra* (photo by A.T.D. Abbott); *I. gerrardiana*, *I. tysonii*, *I. herrstreyi* var. *herrstreyi* (photos by Graham Grieve).

Clockwise from top left: *Indigofera tanquana*, *I. gariepensis*, *I. dodii* and *I. barkeri* (photos by Brian du Preez).

Du Preez, B., Schrire, B.D., Dreyer, L.L., Stirton, C.H., Chimphango, S.B.M. & Muasya, A.M. 2023a. Revision of *Indigofera* section *Oligophyllae* (Fabaceae: Indigofereae) from South Africa. *South African Journal of Botany* 159: 544-562.

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Grieve, K.W., Grieve, G.R. & Schrire, B.D. 2023. New and poorly known taxa of *Indigofera* (Fabaceae, Papilionoideae, Indigoferae) from the Pondoland Centre of Endemism, South Africa: Part 1. *South African Journal of Botany* 160: 55-74.

Grieve, K.W., Grieve, G.R. & Schrire, B.D. 2024 (available online, 2023). New and poorly known taxa of *Indigofera* (Fabaceae, Papilionoideae, Indigofereae) from the Pondoland Centre of Endemism, South Africa: Part 2. *South African Journal of Botany* 164: 297-321.

Flying-buttressed *Monopteryx* trees in Amazonia

As part of a detailed and amply illustrated taxonomic account of the small Amazonian tree genus *Monopteryx* by Carvalho et al. (2023), the species *M. inpae* W.A.Rodrigues ex C.S.Carvalho, H.C.Lima & D.B.O.S.Cardoso is newly described to occupy the place of *M. inpae* W.A.Rodrigues, a name misapplied and not validly published. Even though this species does not represent a brand-new species discovery, it is highlighted here in the Bean Bag as a very interesting, unusual, and poorly known legume genus of giant rainforest trees. First, *Monopteryx* trees have unusual flattened, board-like, much-branched, flying buttresses which form arches from the elevated base of the trunk to the ground, which are unique among Amazonian buttressed leguminous trees. Second, *Monopteryx* species have unusual bilaterally symmetrical but not truly papilionate flowers.

Left: Flying buttressed tree of *Monopteryx uaucu* (photo by Domingos Cardoso); centre and right: Flowers of *Monopteryx inpae* (photos by Francisco Farroñay). Centre: a flower before pollination when the densely hairy keel petals conceal the wing petals and fully enclose the androecium and gynoecium; Right: a flower post-pollination where the keel is fully open exposing the reproductive structures.

Carvalho, C.S., de Lima, H.C., Zartman, C.E. & Cardoso, D.B. 2023. A taxonomic revision of *Monopteryx* (Leguminosae): A florally divergent and ancient papilionoid genus of large Amazonian trees. *Systematic Botany* 48(3): 447-468.

Nine new tree species of *Dalbergia* from Madagascar

Clockwise from top left: *Dalbergia nemoralis* in semi-arid S Madagascar with *Didierea procera*, and shrubby *Grewia* and *Mimosa* spp. (photo by R. Andriamiarisoa); *D. rakotovaoi* in W Madagascar (photo by S. Andrianarivelo); *D. rajeri*, N Madagascar showing the remarkably large and dense inflorescences of this species (photo by R. Randrianaivo); *D. pseudomaritima* in humid SE Madagascar (photo by S. Andrianarivelo).

The on-going large-scale description of new species of *Dalbergia* from Madagascar, which we reported on in last year's Bean Bag, represents a fascinating story in modern plant systematics. This Madagascan *Dalbergia* inventory initiative benefits from a very densely sampled phylogeny which is based on sequencing > 2000 nuclear genes for 683 accessions of *Dalbergia* from Madagascar, alongside morphological assessment of > 5,000 field collections, i.e., it is one of the most thorough attempts to combine large scale molecular data with morphology for species delimitation for any legume group undertaken to date. Forty-three species of *Dalbergia* were recognised in the *Legumes of Madagascar* book published in 2002. Twenty years later the tally of *Dalbergia* species for Madagascar is up to 64, including eight species newly described this year by Wilding et al. (2023) and one by Rakotonirina et al. (2023). All nine of these new species form trees large enough to have commercial potential for exploitation of their highly-prized and valuable hardwood, the rosewoods. Eight of these new species are judged to be threatened. Seven more new species of *Dalbergia* from Madagascar are in the pipeline. Completing the species inventory for *Dalbergia* is especially important given the massive increase in illegal and unsustainable exploitation of precious woods which prompted CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) to place Malagasy species of *Dalbergia* on its Appendix II in 2013, resulting in a total embargo on international trade. Any future exploitation of rosewoods needs to be based on an accurate inventory of species, where they grow, how threatened they are, and how they can be identified, and the Madagascar *Dalbergia* inventory is making impressive strides towards achieving that.

Rakotonirina, N., Phillipson, P.B., Crameri, S., Wilding, N., Lowry II, P.P., Rakouth, B. & Razakamalala, R. 2023. Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). IV. A new species from central and southern Madagascar and a narrowed circumscription for *D. emirnensis*. *Novon* 31(1): 73-87.

Wilding, N., Phillipson, P.B. & Crameri, S. 2023. Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). V. Eight new large tree species and notes on related Malagasy species. *Candollea* 78(2): 99-126.

Macrolobium paulobocae

Macrolobium is the second most species-rich genus in subfamily Detarioideae, with c. 75 species, most of which are distributed in the Amazon. The genus is ecologically important; some species growing as hyper-dominants and most species grow mainly on oligotrophic soils of white-sand vegetation, and seasonally inundated black-water floodplain forests known as *igapó*, including the species newly described by Farroñay et al. (2023), *M. paulobocae*. The species was named in honour of the Brazilian botanist Paulo Apóstolo Costa Lima Assunção (1956–2021), better known in the botanical world as "Paulo Boca", an expert of the Amazonia flora. *Macrolobium paulobocae* is known from just eight collections, from the Urubú, Marmelos, and Manicoré tributaries of the Amazon and was considered Endangered by the authors.

Leaves and fruit of *Macrolobium paulobocae* (photos by Francisco Farroñay).

Farroñay, F., de Sousa Macedo, M.T., Cardoso, D. & Vicentini, A. 2023. *Macrolobium paulobocae* (Leguminosae, Detarioideae), a new species from seasonally inundated black-water floodplain forests in the Brazilian Amazon. *Brittonia* 75: 180-190.

Three new and globally rare species of *Millettia*

It is to be expected that the majority of plant species remaining to be described are likely to be globally rare, simply because most of the common species have already been discovered. This means that many newly described species are categorised as threatened at the time of description. This is very much the case for three new species of the genus *Millettia* from south-east Asia described by Mattapha et al. (2023). Each of these three species is known from just a single locality, two in Thailand and one from Vietnam. One of these is categorised as Critically Endangered, a second is likely to be so, and the third lacks sufficient data to assign an IUCN threat category at this time. Even as these new species are added, the genus *Millettia* remains in need of major taxonomic revision and is almost certainly polyphyletic.

Flowers of new *Millettia* spp. Clockwise from top left: Inflorescence of *M. calcicola* (photo by C. Leeratiwong), flowers of *M. calcicola* (photo by C. Leeratiwong), flowers of *M. khaoyaiensis* (photo by Sawai Mattapha).

Mattapha, S., Forest, F., Schrire, B.D., Lewis, G.P., Hawkins, J. & Suddee, S. 2023. Three new species of *Millettia* (Leguminosae-Papilionoideae: Millettieae) from the Indo-Chinese region. *Kew Bulletin* 78: 175-187.

Acacia: the census continues

Left to right: *Acacia armigera* at the type locality in W Australia. Top: flowering branch (photo by K.R. Thiele); Bottom, from left to right: shrubby habit; acicular phyllodes; fruits (photos by G. Cockerton).

The genus *Acacia* is Australia's most species-rich genus and, after *Astragalus*, the second-most species-rich genus of legumes. Just as for other large legume genera such as *Indigofera* (see above), or *Mimosa*, new species of *Acacia* continue to be described at a steady rate, most of them very narrowly restricted endemics. In western Australia, an important centre of species diversity for the genus, 390 species of *Acacia* have been described in the last 50 years, many as a result of intensive taxonomic work in the region by Bruce Maslin, but there are still on-going increments. Indeed, Thiele et al. (2023) suggest that around 75 informally-named and incompletely-known species remain to be dealt with from this region. *Acacia armigera* is one such entity, first collected in 2015, and now formally named following collection of complete material. *Acacia armigera* is so named for its rigid finely acicular armed phyllodes which together with the dense, rigid, highly-branched crown, form formidably armed shrubs.

Thiele, K.R., Davis, R.W. & Cockerton, G.T., 2023. *Acacia armigera* (Fabaceae), a new, geographically restricted wattle from the Coolgardie bioregion of Western Australia. Nuytsia 34: 95-98.

Dipteryx rosea (Papilionoideae) - Photo by D. Cardoso 3430

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Warren Cardinal-McTeague (University of British Columbia, Canada)
with contributions from **Colin Hughes** (University of Zürich, Switzerland) and **Leonardo Borges** (Universidade Federal de São Carlos, Brazil)

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