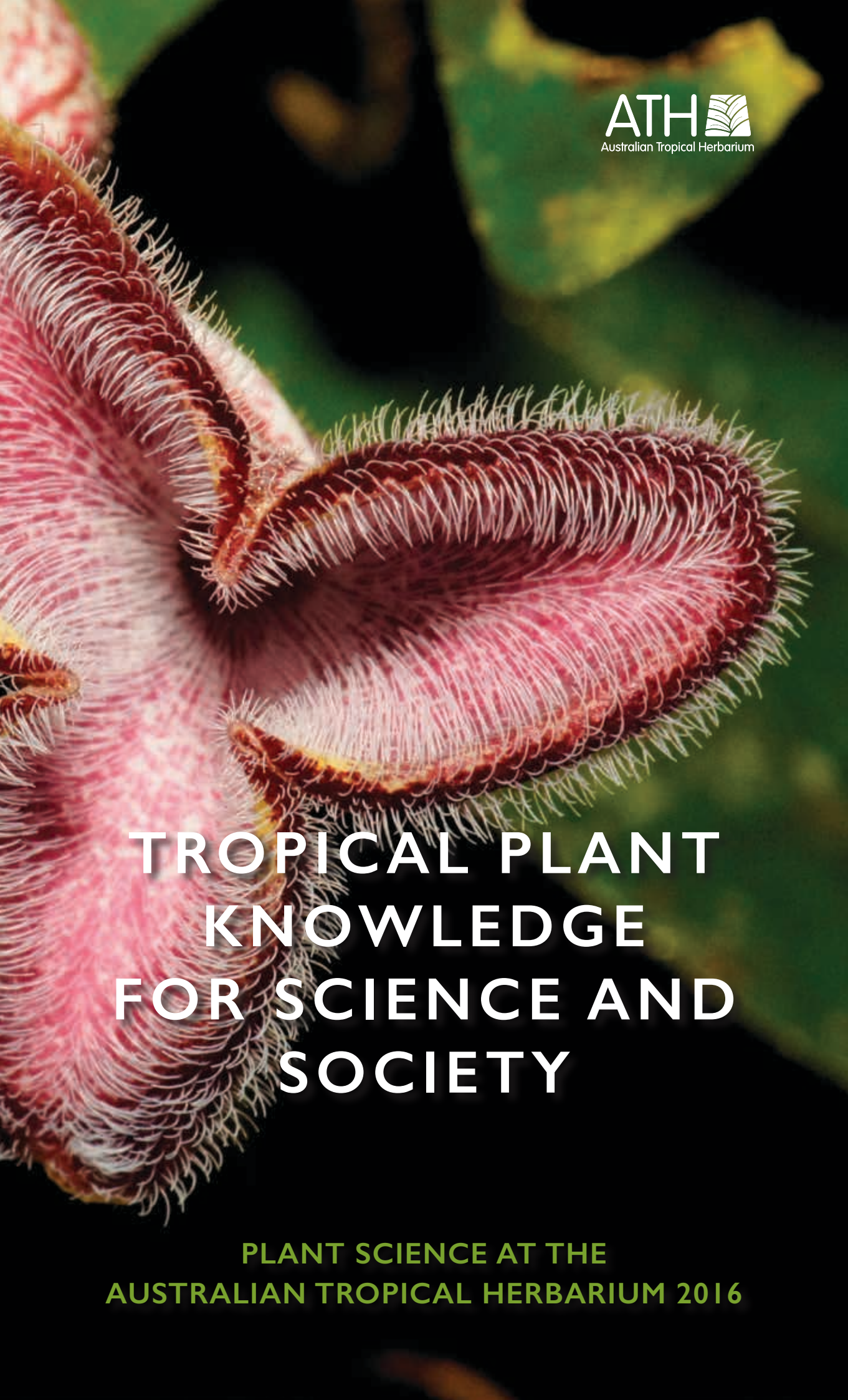

ATH
Australian Tropical Herbarium

TROPICAL PLANT KNOWLEDGE FOR SCIENCE AND SOCIETY

PLANT SCIENCE AT THE AUSTRALIAN TROPICAL HERBARIUM 2016

The Australian Tropical Herbarium (ATH) is a joint venture of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Director National Parks (DNP), Queensland Department of Science, Information Technology, and Innovation (DSITI), and James Cook University (JCU). The ATH is located on the Cairns campus of JCU, and administratively is part of JCU's Division of Tropical Environments and Societies.

The ATH's vision is to be a leader in tropical plant biodiversity research, that conducts diverse, relevant and innovative research; translates that research into useful products; offers training, inspiration and engagement with the community; and, by collaborating with others, achieves a greater understanding of sustainable tropical systems.

The ATH Board oversees the operations of the ATH and sets overall strategic management policy and objectives. The Board comprises two representatives of each of the joint venture participants, and an independent Chair.

We acknowledge Aboriginal and Torres Strait Islander People as the first inhabitants of the nation and acknowledge Traditional Owners of the lands where our staff, students, and associates live, learn and work.

Cover photo: *Paraistolochia deltantha.* Photo: John Dowe.
Inside cover photo: Mature rainforest, Bellenden Ker.

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ATH Board members and Director: Back row (l-r): Prof Darren Crayn (Director, ATH), Dr Gordon Guymer (Director, Queensland Herbarium, Queensland Department of Science, Information Technology and Innovation), Dr Greg Leach (Chair, ATH Board), Dr Christine Williams (Assistant Director General, Queensland Department of Science, Information Technology and Innovation). Front row (l-r): Dr Linda Broadhurst (Director, Australian National Herbarium, National Research Collections Australia, CSIRO), Prof Andrew Young (Director, National Research Collections Australia, CSIRO), Prof Iain Gordon (Deputy Vice Chancellor, Division of Tropical Environments and Societies, James Cook University), Prof Marcus Lane (Dean, College of Science and Engineering, James Cook University). Photo: Andrea Lim.

The Sir Robert Normal Building incorporating the Australian Tropical Herbarium. Photo: Brad Newton.

OUR HISTORY

Prior to the establishment of the ATH, plant biodiversity science research in Australia's tropical northeast was undertaken at three centres: the CSIRO Atherton Herbarium (QRS), the Mareeba Collection (MBA) of the Queensland Herbarium, and James Cook University (JCT). The retirement of the eminent botanist Dr Bernie Hyland in 2002, led to discussions between the CSIRO, James Cook University and the Queensland Government regarding a joint venture herbarium project. An agreement to establish the Australian Tropical Herbarium was signed on 30th of April 2006.

The Sir Robert Norman Building was completed on the Smithfield campus in November 2007, containing state-of-the-art facilities purpose-designed for the joint venture. The QRS and MBA collections were moved into the new premises soon thereafter. The Hon. Anna Bligh, Premier of Queensland opened the building on the 4th of March 2008 and the inaugural Director commenced duty on the 31st of March, the Operational Date of ATH.

During the seven-year term of the first ATH Agreement, the organisation grew from nine staff (full time equivalents) and three postgraduate students to 15 staff and 18 postgraduate students, and increased its outputs, outcomes and impact many-fold. On April 1 2015 the Joint Venture partners agreed a further 10-year term.

SCIENTIFIC COLLECTIONS – FOUNDATIONAL INFRASTRUCTURE

An herbarium specimen held in the ATH collections. Photo: Frank Zich.

Biodiversity science is enabled by research collections of expertly curated biological specimens. Such collections constitute an authoritative storehouse of information about biodiversity and underpin taxonomic, genetic, agricultural and ecological research - making these vital resources for conservation and the development of sustainable land and marine management systems.

The ATH boasts extensive research collections housed in facilities that are the state-of-the-art for preservation and research. The research herbarium comprises more than 180,000 pressed, dried plant specimens. The 'wet' collection of more than 17,300 samples preserves the soft parts of plants (e.g. fruits) in fluids for anatomical and other studies. A wood block collection enables research on the structural and functional properties of wood. Our DNA and tissue collection of over 19,000 samples representing over 3,000 species is the foundation of studies on genetics and evolutionary biology. Several thousands of specimens and samples are added each year to the ATH collections as a result of research activities.

HERITAGE COLLECTIONS

Among the ATH collections are items of immense scientific and cultural significance. These include three of the original botanical specimens collected in 1770 at the Endeavour River (now Cooktown) by Joseph Banks and Daniel Solander, botanists on Cook's first circumnavigation of the globe (1769-1772).

Other important items include over 18,200 collections (46,000 items) of B.P.M. (Bernie) Hyland, the eminent and pioneering botanist of Australia's northern rainforests, 9,300 collections (26,600 items) of Bruce Gray, and orchid specimens from the collection of Alec Dockrill.

Frank Zich (Curator ATH) and Michael Lovave (Curator Lae Botanic Gardens PNG) in the herbarium collection. Photo: Andrea Lim.

DISCOVERIES MAKING A DIFFERENCE

KEEPING INDIGENOUS PLANT KNOWLEDGE ALIVE

Plants have been at the centre of Indigenous cultures for millennia, and Traditional Owners are custodians of profound knowledge of the properties and uses of plants. The Tropical Indigenous Ethnobotany Centre (TIEC) partnership, based at the ATH, works through mutually beneficial partnerships with Traditional Owners to research traditional use of plants. Knowledge flow is two-way: Traditional Owners are empowered to keep their knowledge strong and to participate in and benefit from new discoveries (see p. 19).

UNDERSTANDING PATHOGENS

Managing diseases in natural and managed environments such as farms and nurseries requires knowledge of the pathogens that cause them. Research by ATH scientists is helping improve the understanding of the factors involved in fungal diseases of myrtaceous plants such as eucalypts and myrtles, and insects. Research is also underway into fungi that can help control nematode diseases of bananas.

Exemplar project - Mbabaram traditional plant use research. Project Leader – Gerry Turpin.

This collaborative project involving the Watsonville Aboriginal Corporation (Mbabaram) and the National Institute of Complementary Medicine (NICM, University of Western Sydney) is investigating the bioactive potential of medicinal plants of the Mbabaram people. TIEC, with assistance from Mbabaram Traditional Owners, collects and prepares plant materials used in traditional medicines for analysis by NICM under agreement. Subject to further funding, TIEC will work towards an agreement to commercialise any medicinal plants with potential.

Gerry Turpin, ATH Indigenous ethnobotanist examining culturally significant flora on Olkola country, Cape York Peninsula. Photo: Ben Menadue.

Exemplar project - Entomopathogenic fungi. Project Leader – Sandra Abell.

Fungi that infect insects are common in tropical regions. Despite their abundance, they have never been taxonomically studied in Australia. Recent samples taken from ants, flies, scale insects and spiders from Australian rainforests have revealed over 150 species probably new to science. This project will focus on the genera *Akanthomyces, Cordyceps, Gibellula, Hirsutella, Hypocrella, Ophiocordyceps,* and *Torrubiella.* A systematic revision and Lucid guide to at least 40 Australian species will be produced. This project will contribute to a better understanding of the health of insect communities and the identity of potential biological control agents of insect pests.

Rubus probus, a north Queensland plant of Indigenous cultural significance. Photo: John Dowe.

A species of *Ophiocordyceps* fungi new to science fruiting from the carcass of its ant prey. Photo: Sandra Abell.

DISCOVERING NEW SPECIES

Herbarium collections are the real frontiers of plant species discovery – most new species are discovered not by intrepid explorers in wild and remote places, but by scientists working painstakingly on existing, understudied collections. ATH scientists have named over 40 new species of plants and fungi since 2008 including wild relatives of lilly-pillies, melons, mangosteens, heathers, quandongs and truffles, and are currently working on many more. The potential utility of plants and fungi to humans (for fibre, fuel, food, medicine or amenity), their role in the environment, and their conservation can only be addressed once they have been discovered and accurately classified.

Exemplar project - Phylogenetics, systematics and evolutionary dynamics of Elaeocarpaceae. Project Leader – Darren Crayn.

Molecular phylogenetic and biogeographic work is clarifying the origins and patterns of diversification among lineages within the Elaeocarpaceae/Tremandraceae complex. Within the phylogenetic framework, we are analysing population-level genetic and morphological diversity in selected species in order to provide an insight into taxon boundaries, comparative evolutionary responses and speciation mechanisms in dry-adapted shrubs and rainforest tree species. New species are described as they are found.

Eda Addicott, head of the Regional Ecosystem mapping team, surveying vegetation on Cape York Peninsula. Photo: Mark Newton.

MAPPING AND MEASURING OUR BIODIVERSITY HERITAGE

Land use decision-making such as conservation reserve selection and management is based upon assessments of vegetation type and condition, threat, rarity and importance. We are contributing substantially to the evidence base for such decisions in northern Australia through mapping of Regional Ecosystems as well as identification of hotspots of biodiversity. For the latter, we are applying novel assessment methods that incorporate measures of evolutionary distinctiveness, which enables better management for a range of predicted, and unforseen, environmental futures.

Exemplar project - Regional Ecosystem Mapping. Project Leader – Eda Addicott.

The Queensland Herbarium's Regional Ecosystems (RE) Mapping Program is an extensive survey, mapping and monitoring program of the State. The RE maps, which show pre-clearing, remnant vegetation and regional ecosystems, are important tools for governments, landholders and scientists to plan and manage the natural environment, developments and vegetation restoration. As part of the RE mapping program, ATH staff are mapping (at 1:100,000 scale) the Cape York Peninsula (CYP) and Einasleigh Uplands (EIU) bioregions and updating the Wet Tropics (WET) bioregion mapping at 1:50,000 scale. Mapping and survey is done in blocks of 1:250,000 scale map sheets.

PROVIDING USEFUL TOOLS FOR THE COMMUNITY

A vast amount of information on the ecology, biology, uses and conservation status, of Australia's native plants has been compiled through over 240 years of scientific endeavour. This wealth of data will greatly improve our ability to sustainably manage our biodiversity. Publicly and freely available through the Atlas of Living Australia (ala.org.au), the data can only be utilised if the species name is accurately known. Knowledge for identifying plants can be very difficult to access by non-specialists: highly technical, expensive and held in distant libraries. The development and deployment of web-based interactive identification systems and apps targeted at the non-specialist enables almost anybody, anywhere to identify and learn about Australia's flora. This helps all community sectors to achieve their land and environmental assessment, management, educational, scientific and recreational goals. Principal beneficiaries include the resources, agricultural and horticultural industries, Indigenous land managers, private and public conservation estate managers, students, tourists, and scientific researchers.

Exemplar project – Australian Tropical Rainforest Plants Identification System. Project Leader – Frank Zich.

The Australian Tropical Rainforest Plants identification system (www.anbg.gov.au/cpbr/cd-keys/rfk/) is an easy to use, free, online system that enables almost anybody, anywhere to identify nearly 3000 species of tropical rainforest plants in Australia. The uptake by the user community has been overwhelming – over 15,000 visits per month. The ATH continues to develop this system including extending its taxonomic and geographical coverage, and is working to initiate an even more exciting project: the Australian Savanna Plant Identification System (see p. 19).

PREDICTING BIODIVERSITY IMPACTS OF ENVIRONMENTAL CHANGE

The one thing that is constant in the environment is change. Predicting the impacts that environmental change will have on biodiversity is critical to ensuring we manage for its survival and adaptation. We are driving several modelling projects that are determining the nature and extent of climate change threats to the plant species of tropical mountains in Australia and South America, many of which are found nowhere else on Earth.

Exemplar project – Orchid distributional modeling. Project Leaders – Lalita Simpson and Katharina Schulte.

Herbarium collections provide important information about plant distributions and therefore about the environmental requirements (niches) of species. By combining species distribution modeling and molecular phylogenetic evidence we are discovering how past climatic changes drove the evolution of the orchids of the Australian Wet Tropics. Using models of future climatic conditions, we are able to predict the impact of climate change on orchid species, in particular the rare and endemic orchid species of Australia's tropical mountain tops.

Front page of the online Australian Tropical Rainforest Plants identification system. Photo: Darren Crayn.

Flowers of *Elaeocarpus linsmithii*, an endemic tree of Queensland's Wet Tropics mountaintops. Photo: Darren Crayn.

Garcinia zichii, one of six native Australian species of the mangosteen genus. This species was named in honour the Collections Manager of the Australian Tropical Herbarium, Mr Frank Zich, by ATH Adjunct researcher Dr Wendy Cooper. Photo: John Dowe.

Exemplar project – The origins of mangosteen. Project Leader – Rismita Sari and Paul Gadek.

The mangosteen – *Garcinia mangostana* – is highly prized for its sweet, juicy flesh. Native to Indonesia, there are at least 250 species of Garcinia worldwide, although the number is highly disputed. Australia has at least nine native Garcinia species, several of these only described scientifically in the last few years. This project aims to shed light on the origins of the mangosteen by using genetics to discover which species it is most closely related to. The knowledge gained will assist with crop improvement programs which seek to increase production, fruit shelf life and disease resistance.

Exemplar project – Evolutionary diversity of ferns and lycophytes. Project Leader – Ashley Field.

In contrast with many flowering plants, lineages of ferns and lycophytes are often very widespread, linking floras all around the world. Australian ferns and lycophytes are very diverse. Some show Gondwanan and Oceanian affinities, whereas others have apparently arrived recently by long distance dispersal from the Western Palaeotropics and the Neotropics. Research at the ATH has linked into a worldwide network of fern and lycophyte scientists to study the global evolutionary history of ferns and lycophytes from their deep time origins to recent diversification processes that are critical to their survival.

UNDERSTANDING WILD RELATIVES OF DOMESTICATED PLANTS

Modern agriculture is re-discovering the potential of wild relatives of crop species as sources of traits for disease resistance, drought and salt tolerance, and nutritive value. Northern Australia has unique wild relatives of many important crops including rice, banana, cotton, melon, coffee, mangosteen, macadamia and sandalwood. ATH researchers are contributing to collaborative research programs on wild crop relatives that aim to improve food security in the tropics worldwide.

PIECING TOGETHER THE ORIGINS AND EVOLUTION OF THE FLORA

From where did our flora come? How has it evolved? How will it adapt to environmental change? ATH researchers are using genetic analysis to peer into the past and discover the origins of some of our most unique flora such as orchids, fungi, ferns, and quandongs. Piecing together the evolutionary pathways of lineages from their deep time origins to the modern-day species enables a better understanding of not only how organisms evolve, but how and why ecosystems change through time. This knowledge is essential to predict how species might adapt in a changing world.

ATH botanist Ashley Field collecting lycophytes on Cape York Peninsula for research. Photo: David Baume.

BUILDING USEFUL CLASSIFICATIONS

Biological classifications, or taxonomies, are systems for ordering knowledge of the relationships among organisms and governing the scientific naming of them. Classifications and names are the way we communicate about organisms both in science and in daily life, and like a well-organised library, an accurate classification improves the efficiency and quality of research and communication. ATH scientists are using their discoveries to refine plant classifications, ensuring that they reflect the most accurate and up-to-date knowledge.

Exemplar project – Taxonomy of orchids. Project Leader – Katharina Schulte.

Australia harbours a rich and highly endemic orchid flora. Based on DNA sequence data we are resolving evolutionary relationships for Australasian orchids. The molecular phylogenetic trees provide the scientific basis for re-examining controversial taxonomic concepts in order to improve our classification system. Orchid groups studied cover a broad range of Australian orchids, such as from the mega genus *Dendrobium*, or the highly diverse orchid tribe Diurideae which harbours the majority of Australian orchid species, with many threatened species. Phylogenetic evidence is used to improve orchid classifications at higher taxonomic level (e.g. at genus level) as well as to assess species delimitation questions.

Schizaea dichotoma, member of an ancient fern lineage. Photo: Ashley Field.

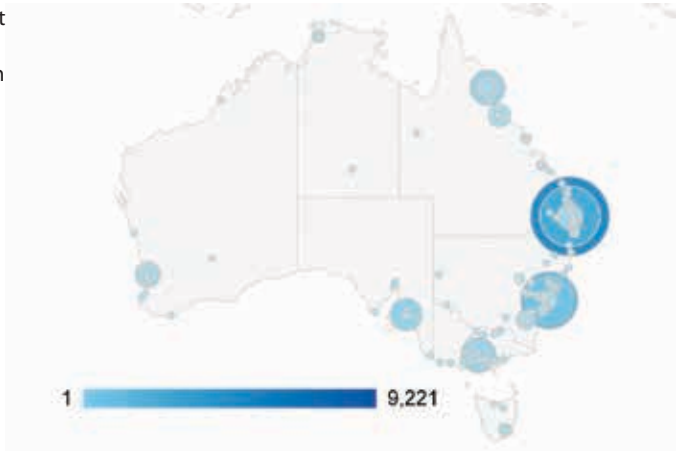
SCIENCE DELIVERY–LOCAL TO GLOBAL

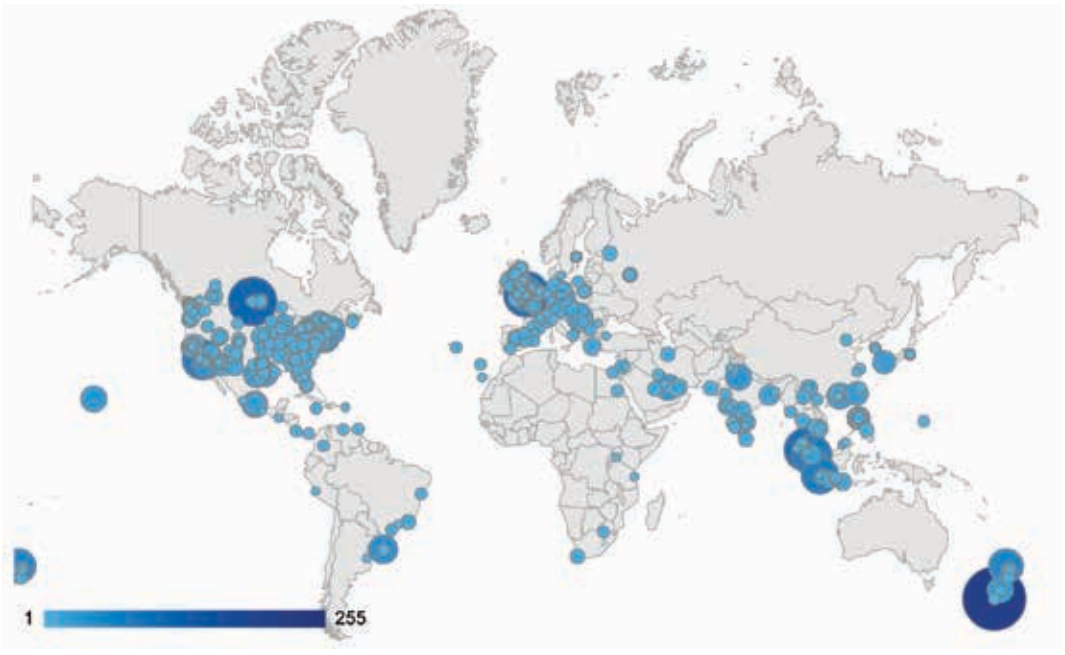
Science at the Australian Tropical Herbarium is improving knowledge of plants in northern Australia. Key programs include Regional Ecosystem mapping of the Cape York, Einasleigh Uplands and Wet Tropics Bioregions, research on traditional plant use by north Queensland Indigenous peoples, and the studies of the origins, evolution and conservation of Australia's tropical flora.

Beyond Australia, ATH staff and students work with researchers around the world on problems of local to global relevance. Our research is undertaken with colleagues on almost all continents including Argentina, Brazil, China, Estonia, Federated States of Micronesia, Germany, Indonesia, Japan, Malaysia, New Zealand, Papua New Guinea, Singapore, Solomon Islands, UK, USA and Vanuatu. Institutional relationships through organisations such as the Council of Heads of Australasian Herbaria provide further collaborative partnerships.

Global programs to which the ATH contributes include the International Barcode of Life project (iBOL) the largest biodiversity genomics initiative ever undertaken (ibol.org). iBOL aims to construct a DNA barcode reference library that will be the foundation for a DNA-based identification system for all multi-cellular life. The ATH also contributes to Global Plants, the world's largest community-contributed database used by students and researchers worldwide (plants.jstor.org). Through Global Plants, herbaria share high quality images of their plant Type specimens, experts determine and update plant names, and students discover and learn about plants in context, supporting research and teaching in botany, ecology and conservation.

ATH research has global impact: our scientific publications have been cited thousands of times by researchers all over the world, and the Australian Tropical Rainforest Plants online identification system website receives around 15,000 hits per month, many from outside of Australia.





Maps showing the national (top) and global usage of one ATH product, the Australian Tropical Rainforest Plants online identification system.

Prof. Darren Crayn conducting an herbarium tour for a local school group. Photo: Andrea Lim.

WE REGULARLY GIVE TALKS ON OUR RESEARCH TO COMMUNITY AND SCIENTIFIC AUDIENCES, AND HOST HERBARIUM AND LABORATORY TOURS.

Students from Cairns Hinterland Steiner School using the public reference collection. Photo: Andrea Lim.

SHARING OUR KNOWLEDGE

COMMUNITY ENGAGEMENT, SERVICE, AND REPRESENTATIVE ROLES

ATH staff share their botanical expertise in many ways. We regularly give community talks and lectures on our research and other topics of current interest in Australia and overseas. We teach University plant science as well as giving talks to primary and secondary school groups and TAFE classes, and host herbarium tours and talks for a broad range of stakeholder groups.

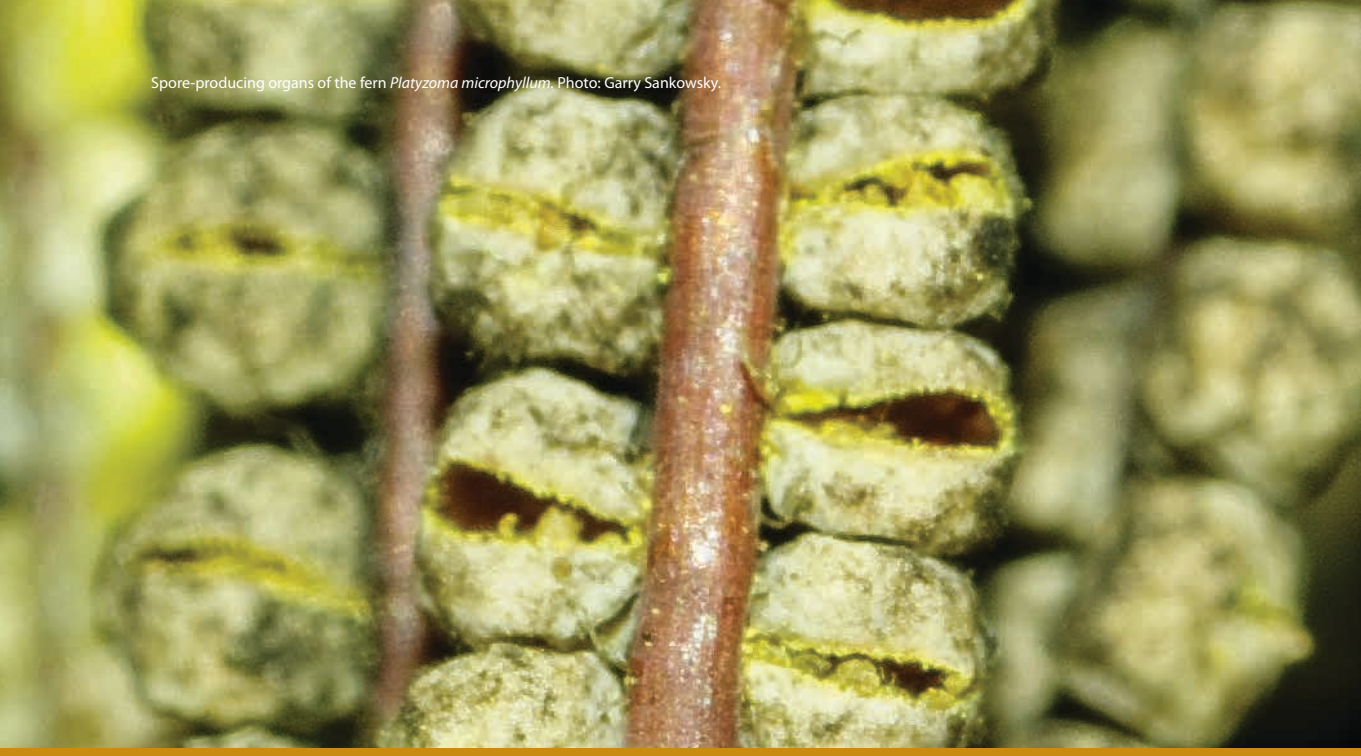
Through the Rainforest Plant Identification Courses, we deliver, in partnership with the Wet Tropics Management Authority, modular workshop-style

University plant science class learning in mountain rainforest.

tuition in the skills and resources needed to identify both native and weedy plant species in the rainforests of the Wet Tropics. The many past participants include environmental professionals, rangers, students and interested public.

ATH staff have delivered many other workshops to community and professional groups on diverse topics as plant pathogens, fire in the landscape, techniques for documenting cultural plant use, and plant classification.

We also provide a plant identification service which supports professionals in the commercial and not-for-profit sectors, as well as members of the public and students. We maintain a Public Reference Collection of authoritatively identified plant specimens that is free to use, and allows students, consultants and others to identify and learn about north Queensland plants.



Spore-producing organs of the fern *Platyzoma microphyllum*. Photo: Garry Sankowsky.

THIS SCIENCE WAS SUPPORTED IN PART BY COLLABORATIONS WITH 112 SCIENTISTS IN 19 COUNTRIES.

Melicope xanthoxyloides. Photo: John Dowe.

SUMMARY OF ACHIEVEMENTS 2016

SCIENCE DELIVERY – LOCAL TO GLOBAL

Our science was communicated broadly through:

- 33 peer-reviewed publications
- 5 reports and general articles
- 25 research seminars at international conferences and local meetings
- 17 public talks to mostly local groups.

This science was supported in part by:

- $311,653 external research grant income
- collaborations with 112 scientists in 19 countries.

SHARING OUR KNOWLEDGE

ATH staff shared our knowledge through:

- training and knowledge sharing workshops delivered to Indigenous groups in north Queensland and the Kwaio community, Malaita, Solomon Islands;
- plant identification training delivered through two workshops to the public and to government and industry stakeholders;
- responding to 236 scientific enquiries and 31 requests for plant identifications for external stakeholders;
- hosting 279 public visitors participating in school, public and professional group tours;
- hosting 30 scientists undertaking research at the ATH;
- 16 representative and leadership roles on international, national, and local bodies.
- communicating through 9 media items.

BUILDING, IMPROVING AND MOBILISING OUR COLLECTIONS

- 1,902 herbarium specimens accessioned into CNS, 4,241 collection records edited and 2,517 specimens re-determined.
- 1,800 samples accessioned into the DNA and Tissue Bank, which now contains over 19,000 samples.
- over 8.1 million specimen records downloaded in more than 22,000 download events by a range of external user groups through the Atlas of Living Australia portal (ala.org.au).
- 2076 images of 734 TYPE specimens available through JSTOR as part of the Global Plants project (plants.jstor.org).

The ATH thanks its many wonderful volunteers for their valuable contributions to our specimen processing, field and research programs.

PUBLICATIONS

REGIONAL ECOSYSTEM MAPS

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Wannan, BS (2016) Three new species in *Lindernia* All. s.l. (Linderniaceae) for Australia. *Austrobaileya* 9, 508–523.

Wilson, GW (2016) Reproduction in the Australian rainforest cycad *Bowenia serrulata* (Cycadales: Zamiaceae). *Encephalartos* 123, 9–13.

Wilson, GW, Rentz, DCF (2016) First observation in nature of effective predator defence behaviour in the spiny forest katydid *Phricta spinosa* Redtenbacher (Orthoptera: Pseudophyllinae: Phrictini). *Australian Entomologist* 43, 1–4.

Wilson, GW, Venter, S (2016) *Nepenthes parvula* (Nepenthaceae), a new species from Cape York, Queensland, Australia. *Phytotaxa* 277, 199–204.

GENERAL PUBLICATIONS AND REPORTS (UNREFEREED)

Gagul, J (2016) Molecular phylogenetics of *Elaeocarpus* (Elaeocarpaceae) with a focus on New Guinea species: Eichler Research Fund Report. *Australasian Systematic Botany Society Newsletter* 167, 4–8.

Kaslar, L (2016) Evolutionary relationships in the Leek orchid alliance (subtribe Prasophyllinae). CSIRO vacation scholarship 2015/2016, final report (unpublished).

Shellberg, J, Sinnamon, V, Paul, P, Drewien, G, Howley, C, Connor, S, Alpher, B, Turpin, G, Jaensch, R, Jardine, T, Schultz, P (2016) The Bio-Geo-Cultural Diversity of Mitchell River Delta Wetlands: Topsy Creek to South Mitchell River Coastal Study Area. Report to The Christensen Fund, the Kowanyama Aboriginal Shire Council, the Kowanyama Aboriginal Land and Natural Resources Management Office, and the Abm Elgoring Ambung Corporation. 475 pp.

Shellberg, J, Ross, M, Lowdown, J, Coleman, F, Malcom, B, Preece, N, van Oosterzee, P, Grimes, K, Turpin, G, Newton, M, Carroll, J, Coates, J, Ross, T, Hogbin, A, Kulka, G, Jack, L, Kulka, H, Ross, A, Ross, D, Kulka, K, Bramwell, W, Preece, L (2016) Kimba Plateau Physical and Biological Diversity, Olkola Country, Cape York Peninsula. Published by Olkola Aboriginal Corporation, through the Department of Environment and Heritage Protection, 117 pp.

Zich, F, Kerrigan, RA (2016) Australian Tropical Rainforest Plants Identification System. *Australian Plant Conservation Newsletter* 25(1), 10–12.

THESES

Atsawawaranunt, A. (2016) Evolutionary relationships in the *Dendrobium* alliance (Dendrobiinae, Orchidaceae): a phylogenomic study. MSc, Imperial College London, UK. Supervised by Dr K. Schulte (ATH) and Prof. T. Barraclough (ICL).

Mercier, V. (2016) In search of insect graveyards: the diversity and distribution of entomopathogenic fungi in a paleo-tropical ecosystem and implications for climate change. MSc, Imperial College London, UK. Supervised by Dr S. Abell (ATH/JCU) and Prof J. Lloyd (ICL).

RESEARCH PRESENTATIONS

Addicott, E (2016) Vegetation communities of Cape York Peninsula: Evaluating Queensland's Regional Ecosystem Framework. Pre-completion seminar for Master Thesis, James Cook University, Cairns [oral].

Atsawawaranunt, A (2016) Evolutionary relationships in the *Dendrobium* alliance (Dendrobiinae, Orchidaceae): a phylogenomic study. Masters exit seminar, Imperial College London, UK. [oral].

Atsawawaranunt, A (2016) Phylogenetic relationships in the *Dendrobium* alliance (Dendrobiinae): insights from plastome data. ATH Science Circle, James Cook University, Cairns [oral].

Bransgrove, K, Crayn, D, Abell, S (2016) Where do tropical endophytes call home: Does host, season or successional strategy matter? Australasian Mycology Society, Queenstown, New Zealand [poster].

Burley, H, Laffan, S, Crayn, D, Addicott, E, Thornhill, A (2016) Quantifying floristic beta-diversity of the Australian Wet Tropics using phylogenetic turnover. Australasian Systematic Botany Conference, Alice Springs [oral].

Field, AR (2016) Evolution of the Australian Wet Tropics Flora. Science seminar series. Universidade Federal Minas Gerais, Belo Horizonte, Brazil [oral].

Field, AR (2016) Next generation systematics of lycophytes and ferns. DSITI Science seminar series, Queensland Herbarium, Mt Coot-tha Botanic Gardens, Brisbane [oral].

Gagul, J, Rozefelds, A, Crayn, D (2016) Fruit mesocarp morphology of *Elaeocarpus* (Elaeocarpaceae): a phylogenetic survey. Australasian Systematic Botany Conference, Alice Springs [poster].

Gagul J, Rozefelds A, Nauheimer L, Crayn D (2016) Molecular phylogenetics of *Elaeocarpus* (Elaeocarpaceae) with a focus on New Guinea species. Flora Malesiana 10, Edinburgh UK [oral].

Greenfield M (2016) Interactions among fungi, ants and the ant-plant *Myrmecodia beccarii*. Ecological Society of Australia Annual Conference, Fremantle, WA [oral] * Wiley Fundamental Ecology Award Winner Presentation.

Kaslar, L (2016) Evolutionary relationships in the Leek orchid alliance (Prasophyllinae). ATH Science Circle, James Cook University, Cairns [oral].

Kaslar, L (2016) Evolutionary relationships in the Leek orchid alliance (Prasophyllinae). NRCA summer student symposium, CSIRO, Canberra [oral].

Puente-Lelievre, C, Brown, EA, Crayn, DM (2016) Evolution of variable sterility and pollen diversity in the Australian Ericaceae. Botanical Society of America, Savannah, USA [oral].

Sari, R, Abell, S, Gadek, P (2016) An assessment on *Septogarcinia sumbawaensis* Kosterm. (Clusiaceae) and the transfer to Garcinia. 10th Flora Malesiana Symposium. Royal Botanic Garden Edinburgh. UK (oral).

Schulte, K (2016) Conservation genomics for Australia's threatened orchid species. TESS Annual Science Meeting, Cairns [oral].

Schulte, K (2016) Evolution of Australia's rich endemic orchid flora: phylogenetic insights from hyperdiverse orchid lineages. Ecology, Evolution and Genetics Seminar Series, Australian National University, Canberra [oral], invited.

Simpson, L (2016) Phylogenomic insights into the spatio-temporal evolution of Australasian *Bulbophyllum* (Orchidaceae). PhD precompletion seminar, James Cook University [oral].

Thornhill, AH (2016) Spatial phylogenetics: determining patterns of diversity and endemism at different scales using examples from the Australian flora. VIII Southern Connections Congress, Punta Arenas, Chile [oral].

Turpin, G (2016) Plenary - Working with Indigenous Biocultural Knowledge in Natural Resource Management. Ecological Society of Australia Annual Conference, Fremantle, WA [oral, plenary]

Wagner, N (2016) Evolutionary relationships in Australia's terrestrial orchids of tribe Diurideae: a phylogenomic study. Seminar, University of Kassel, Germany [oral].

Wagner, N (2016) Orchid phylogenomics: insights into evolutionary relationships of Australia's terrestrial orchids. ATH Science Circle, James Cook University, Cairns [oral].

Wilson, GW (2016) Animal Rights: Considerations and concerns: A Southern Perspective. *Sustainable Planet* Summer School, Monash University Malaysia, Kuala Lumpur [oral].

Wilson, GW (2016) Opportunistic orchids and declining weeds: travels in botany in Malaysia. Friends of the Botanic Gardens, Cairns [oral].

Wilson, GW (2016) *Varanus salvator*: A large lizard adapting to urbanization. Cape York Herpetological Society, Cairns [oral].

Wilson, RF, Boucheria, L, Wilson, GW (2016) Large lizards adapting to urbanization. Association for Tropical Biology and Conservation, Montpellier, France. [oral].

COMMUNITY TALKS AND LECTURES

Addicott, E, Worboys, S, Newton, M (2016) CORVEG theory and practice (4 hours). Flora of Australia (BZ 3620), James Cook University, Cairns.

Crayn, DM (2016) Magnificent Mountains. Wet Tropics Wild Series, Cairns.

Crayn, DM (2016) Plant Diversity of Australia, Nayo High School (Japan) Student Delegation, James Cook University, Cairns (2 hours).

Crayn, DM (2016) Plant Diversity of Australia, Small World Journeys Singapore Student Delegation, James Cook University, Cairns.

Crayn, DM (2016) Species Concepts. Flora of Australia (BZ 3620), James Cook University, Cairns.

Crayn, DM (2016a) Uses of Phylogenies. Flora of Australia (BZ 3620), James Cook University, Cairns.

Crayn, DM, Worboys SJ (2016) Tropical Flora, Field lectures (28 hours), Flora of Australia (BZ 3620), James Cook University, Cairns (2 hours).

Field, AR (2016) Fern Diversity. Field lectures (4 hours), Flora of Australia (BZ 3620), James Cook University, Cairns.

Field, AR (2016) Gastropod mollusca. (MB2080). James Cook University, Cairns.

Field, AR (2016) Mounting and preserving entomological collections. (BZ3745). James Cook University, Cairns.

Schulte, K (2016) Phylogenetics – what questions can you ask? Flora of Australia (BZ 3620). James Cook University, Cairns.

Schulte, K (2016) Phylogenetics in action. Flora of Australia (BZ 3620). James Cook University, Cairns.

Schulte, K (2016) Introduction to phylogenetics. Flora of Australia (BZ 3620), James Cook University, Cairns.

Schulte, K (2016) Molecular phylogenetics. Flora of Australia (BZ 3620). James Cook University, Cairns.

Schulte, K, Nauheimer, L, Crayn D (2016) Phylogenetic analysis workshop (4 hours). Flora of Australia (BZ 3620), James Cook University, Cairns.

Worboys, S. (2016) Plant Morphology Refresher (2 hours). Flora of Australia (BZ 3620), James Cook University, Cairns.

Zich, F, Kerrigan, RA (2016) Interactive Key to the rainforest flora of Central Queensland – extension of the northern RFK." SGAP Mackay Branch.

PARTICIPANTS IN ACTIVITIES 2016

STAFF

Dr Sandra Abell (JCU[1])

Ms Eda Addicott (DSITI)

Dr Mohammed Alamgir (CSIRO[3])

Mr Peter Bannink (DSITI)

Ms Kaylene Bransgrove (JCU[2])

Dr Mason Campbell (CSIRO[3])

Prof Darren Crayn (CSIRO/JCU/DSITI)

Dr Ashley Field (DSITI)

Prof Paul Gadek (JCU[1])

Ms Lucy Graham (CSIRO[3])

Ms Megan Grixti (CSIRO[3])

Ms Melissa Harrison (JCU[2])

Ms Raelee Kerrigan (external grant)

Ms Andrea Lim (JCU)

Ms Jane Lloyd (CSIRO[3])

Dr Lars Nauheimer (external grant)

Mr Mark Newton (DSITI)

Ms Sandy Perkins (CSIRO[3])

Mr Terence Purkiss (CSIRO[3])

Ms Tonia Sankey (CSIRO[3])

Dr Katharina Schulte (CSIRO/JCU)

Ms Elizabeth Suarez Duque (CSIRO[3])

Mr Gerry Turpin (DSITI)

Mr Stuart Worboys (JCU[2]/external grant)

Mr Frank Zich (CSIRO)

1 together contribute 1 full time equivalent research position

2 together contribute 1 full time equivalent Laboratory Manager position

3 casual technical staff

RESEARCH STUDENTS

Mr Kamolphat Atsawawaranunt (ICL)

Ms Eda Addicott (JCU)

Mr Habat Asad (JCU)

Ms Kaylene Bransgrove (JCU)

Ms Janet Gagul (JCU)

Ms Melinda Greenfield (JCU)

Ms Margaret Heslewood (University of Adelaide)

Ms Leah Kaslar (CSIRO Summer Student)

Ms Allison Mertin (CSIRO Summer Student)

Ms Susan Nuske (JCU)

Ms Claudia Paz (JCU)

Ms Rismita Sari (JCU)

Ms Lalita Simpson (JCU)

ADJUNCT RESEARCHERS

Dr Charles Clarke

Dr Wendy Cooper

Dr Craig Costion

Dr John Dowe

Mr Bruce Gray

Dr Claire Micheneau

Dr Caroline Pannell

Dr Chris Quinn

Dr Andrew Thornhill

Dr Dorset Trapnell

Dr Fanie Venter

Dr Natascha Wagner

Mr Gary Wilson

VOLUNTEERS

Mr Stuart Biggs

Ms Sonia Bishop

Dr Charles Clarke

Mr Roger Fryer

Mrs Mary Gandini

Ms Megan Grixti

Ms Gemma Horner

Mr Ellis (Kingwa) Li

Mr Bruce Wannan

Ms Heather Winsor

View from above Bell Peak during a mountain plant survey expedition. Photo: Stuart Worboys.

INDIGENOUS KNOWLEDGE IS RECOGNISED GLOBALLY FOR ITS POTENTIAL VALUE IN CONTEMPORARY BIODIVERSITY, CONSERVATION, MANAGEMENT AND BIODISCOVERY.

ATH Ethnobotanist Gerry Turpin with gardening celebrity Costa Georgiadis at the opening of the Wuchopperen Traditional Medicinal and Food Garden in Cairns. Photo:: unknown.

AUSTRALIAN TROPICAL HERBARIUM – THE FUTURE

The ATH joint venture agreement was renewed in early 2015. The Board's strategic vision for 2015–2025 will be enacted through an ambitious agenda of research and engagement activities. Two of the most important initiatives to be developed during the next term are the Tropical Indigenous Ethnobotany Centre (TIEC) Partnership and the Australian Savanna Plant Identification System. We invite potential partners to discuss with us how you can help ensure, through supporting these important initiatives, that development in northern Australia is environmentally and culturally sustainable.

TROPICAL INDIGENOUS ETHNOBOTANY CENTRE (TIEC) PARTNERSHIP

Bridging Indigenous Knowledge and western science in innovative ways for a sustainable future.

Indigenous knowledge is recognised globally for its potential value in contemporary biodiversity conservation, management and biodiscovery. In tropical Australia, Indigenous peoples' strong and diverse presence on country presents an opportunity to work with Indigenous knowledge and management systems and strengthen community awareness of biocultural diversity. The TIEC was established in 2010 to promote and facilitate Indigenous-driven research, and is the only research unit or department dedicated to Indigenous plant knowledge in Australia. The TIEC is a partnership between Traditional Owners, the ATH, JCU's The Cairns Institute, Queensland Government, CSIRO and other government agencies and organisations. Development of the TIEC, housed at the ATH, and research projects undertaken in association with it advance through mutually beneficial partnerships. Projects aim to research and collate existing ethnobotanical data in a respectful and culturally appropriate way, and provide awareness, training and education.

The TIEC seeks substantial funding support to initiate new projects and develop its research and engagement partnerships.

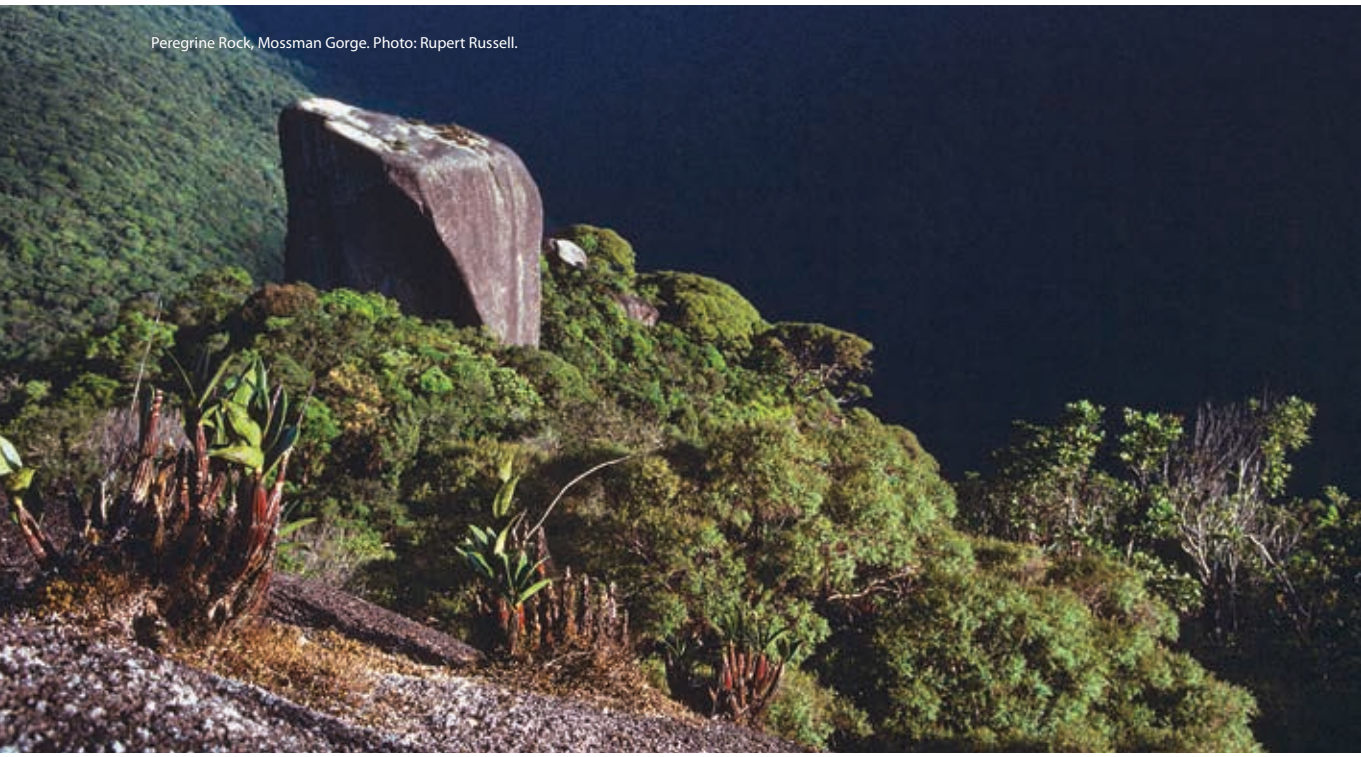
AUSTRALIAN SAVANNA PLANT IDENTIFICATION SYSTEM

Is it a weed? A threatened species? Poisonous? Is it culturally significant, is it new to science?

Australian savannas are globally renowned for their biodiversity, and are amongst the most intact on earth. Sustainability of development depends upon access to knowledge of this biodiversity, and the tools to allow managers and others to identify it.

The Australian Savanna Plant Identification System (ASPIS) project will produce simple and accessible online tools and apps to enable almost anybody, anywhere to accurately identify and learn about Australia's savanna plants. Focused on Australia's north, the ASPIS project will transform existing knowledge, generate new data, and harness cutting edge technologies to deliver authoritative biodiversity knowledge to a broad stakeholder community. ASPIS will be a globally significant, legacy project, the largest and most complete of its kind, covering all plant species (8500+) of Australia's tropical savanna.

The ASPIS consortium is seeking investment partnerships totaling $11.4 million over 7 years.



Peregrine Rock, Mossman Gorge. Photo: Rupert Russell.

Contact us

Public reference collection opening times: Mon-Fri, 9am – 4pm.
Phone: +61 7 4232 1837
Email: enquiry@ath.org.au
Web: www.ath.org.au
Facebook: www.facebook.com/tropicalherbarium
Postal: Sir Robert Norman Building (E2), JCU Smithfield Campus, PO Box 6811, Cairns QLD 4870
Street: Sir Robert Norman Building (E2), JCU Smithfield Campus, McGregor Road, Smithfield Qld 4878
Location: E2.118K (Building E2; Room 118K)

Australian Tropical Rainforest Plants Identification System - free to use online at www.anbg.gov.au/cpbr/cd-keys/rfk/

JAMES COOK UNIVERSITY AUSTRALIA

Queensland Government

CSIRO

Australian Government
Director of National Parks

ATH
Australian Tropical Herbarium