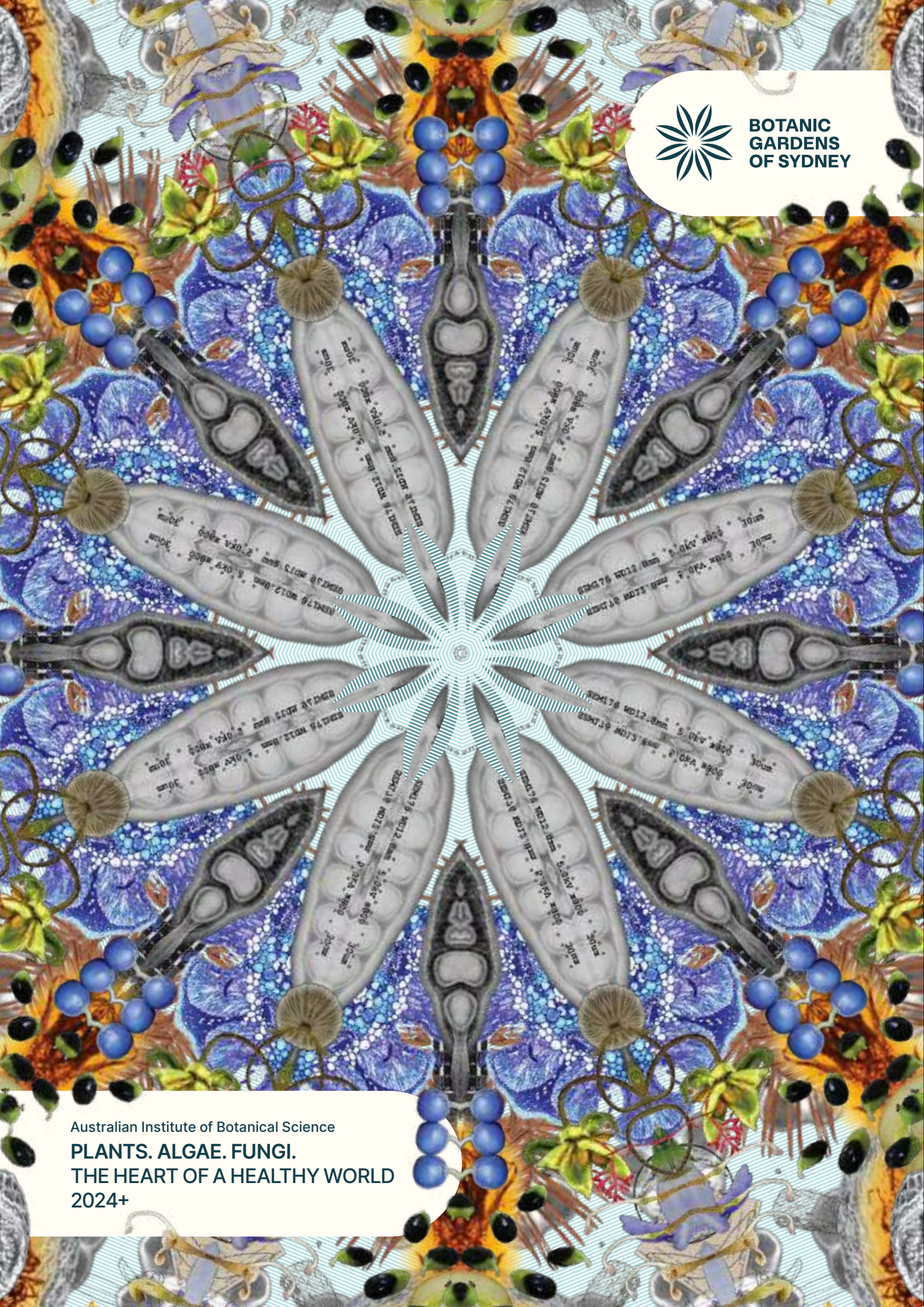

BOTANIC GARDENS OF SYDNEY

Australian Institute of Botanical Science

PLANTS. ALGAE. FUNGI.
THE HEART OF A HEALTHY WORLD
2024+

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BOTANIC GARDENS OF SYDNEY

Australian Institute of Botanical Science

PLANTS. ALGAE. FUNGI.

THE HEART OF A HEALTHY WORLD

2024+

"I love weaving together the intersections of community care and country care."

Cliodhna Maguire — First Nations Youth Community Greening Officer

Cliodhna standing on Gadigal Country. S. Daniel

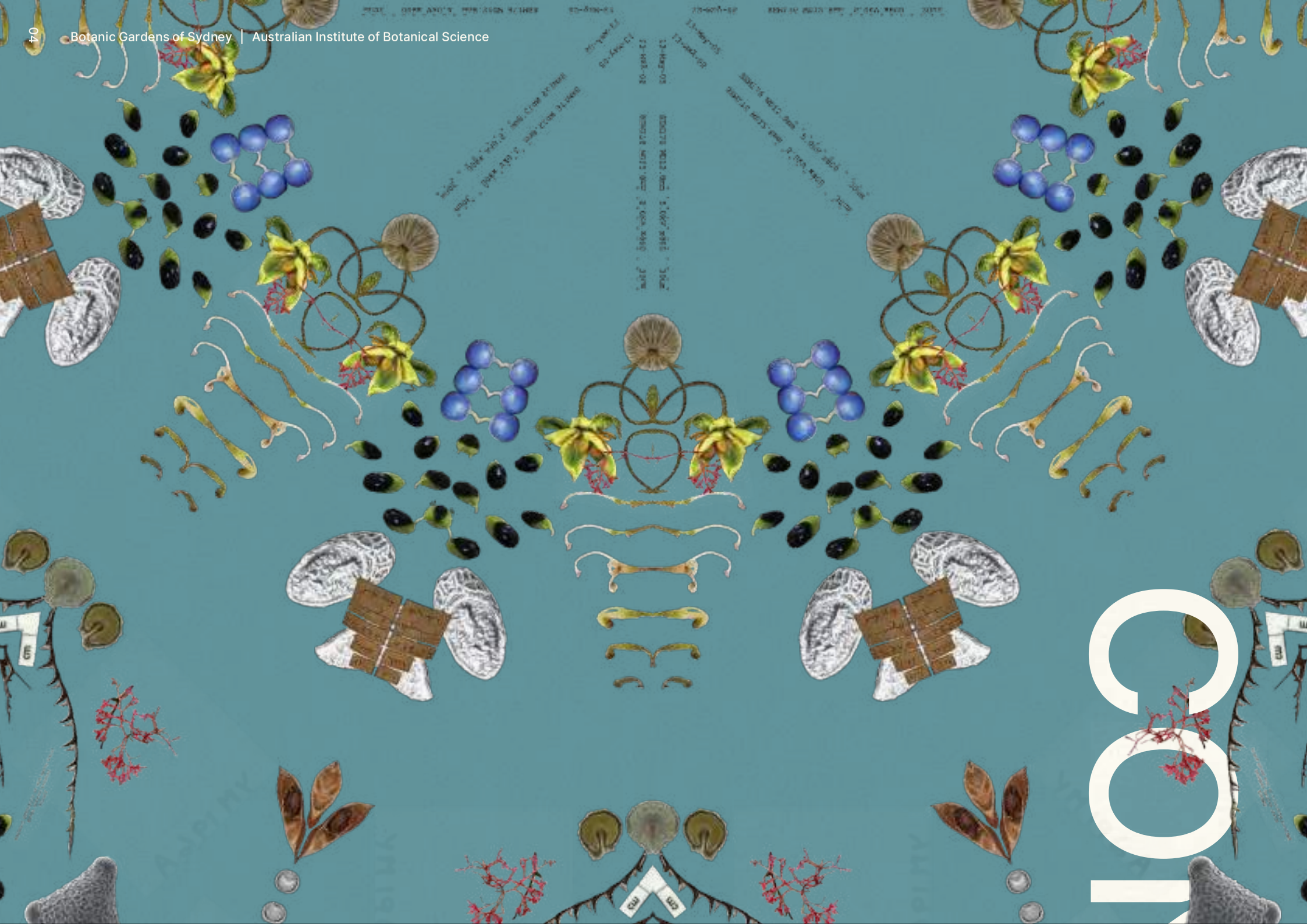
ACKNOWLEDGEMENT OF COUNTRY

We acknowledge that Botanic Gardens of Sydney stand on significant historical, ceremonial and traditional trade grounds for the local Gadigal, Dharawal and Darug peoples.

We pay respect to all Elders and Traditional Custodians of these lands and water on which our Botanic Gardens sit, including their continuous custodianship, protection and management of these sacred lands.

Over tens of thousands of years, First Nations peoples have developed complex scientific systems, deep understanding and rich connections between people, plants, animals and place. We collaborate with traditional knowledge holders, reaching for a sustainable future together.

Aboriginal and Torres Strait islander cultures are the oldest living continuous cultures in the world. Botanic Gardens of Sydney acknowledges that this land always was, and always will be, Aboriginal land.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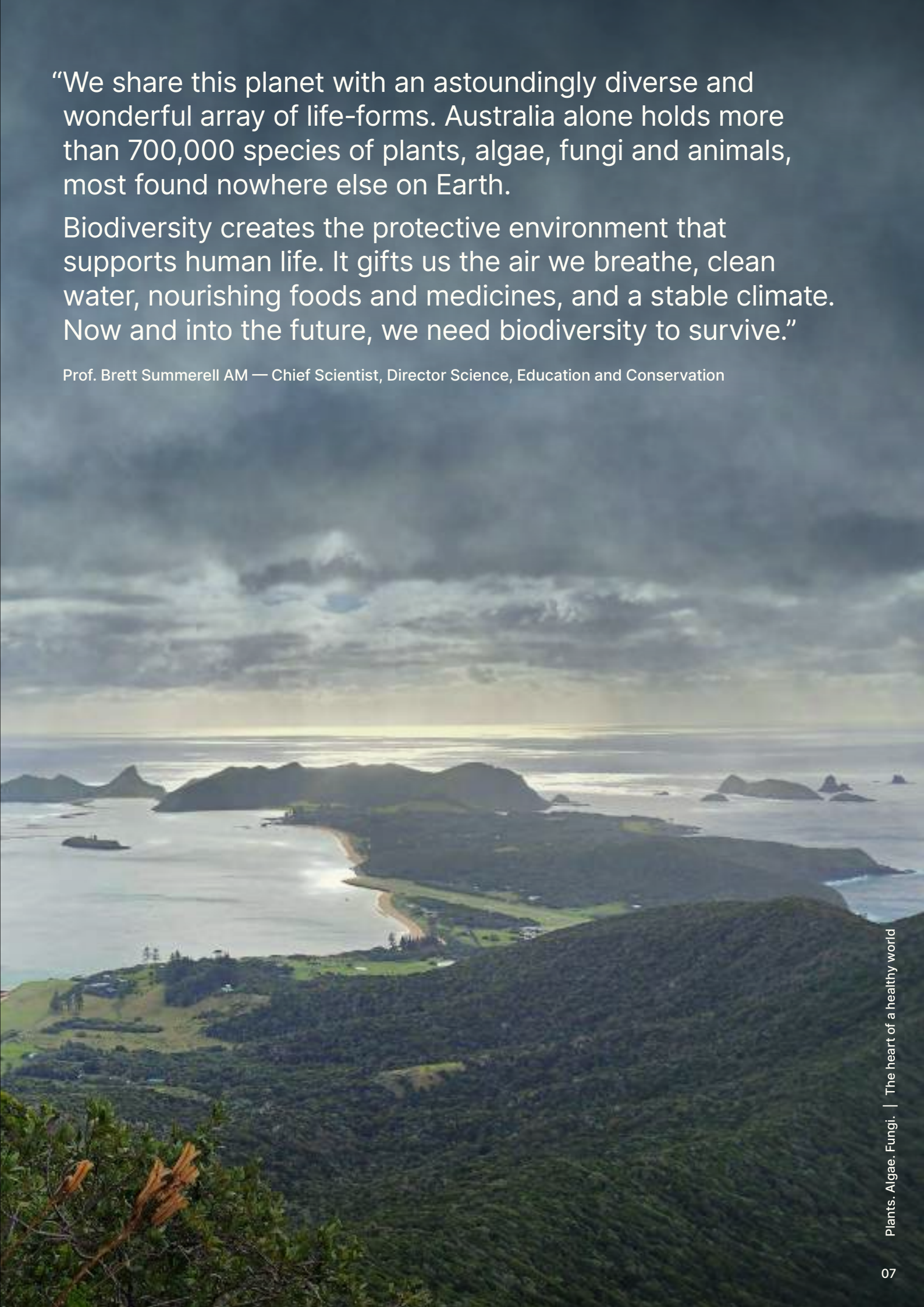
OUR VISION

People, communities, institutions and industries are informed and inspired by our botanic gardens, public spaces and the Australian Institute of Botanical Science, and are motivated to recognise the importance of plants in their lives and to support their conservation.

Brett during a biodiversity survey on Lord Howe Island. J. Cohen



“We share this planet with an astoundingly diverse and wonderful array of life-forms. Australia alone holds more than 700,000 species of plants, algae, fungi and animals, most found nowhere else on Earth.

Biodiversity creates the protective environment that supports human life. It gifts us the air we breathe, clean water, nourishing foods and medicines, and a stable climate. Now and into the future, we need biodiversity to survive.”

Prof. Brett Summerell AM — Chief Scientist, Director Science, Education and Conservation

PLANTS. ALGAE. FUNGI.

Black Bean (*Castanospermum australe*) and Bunya (*Araucaria bidwillii*) trees standing tall in the Bunya Mountains National Park, Queensland. M. Fahey

The Australian Institute of Botanical Science (Institute) is Australia's premier botanical research institute encompassing the education, science, conservation programs; the living, preserved and digital collections; and the associated infrastructure of Botanic Gardens of Sydney (Botanic Gardens).

With our collaborators and global networks, we deliver critical science and conservation outcomes.

Join us as partners and supporters in our work towards a healthy and sustainable future to protect and nurture our planet's rich and unique biodiversity — through living and preserved collections, research, protection, restoration and education.

"The work of the Institute is vital not only to the healthy continuation of Australian ecosystems, but to their very survival. We have gladly provided support to the Institute's work on a matter we are passionate about, the conservation of rainforests, and in particular the Illawarra Rainforest. Their research on seed biology and seed-banking is world class and is needed urgently. We are proud to be part of it."

Dr Ann Long and Dr Geoffrey Long —
Major Donors supporting the Institute

FOUNDATIONS

"I work on global-scale research projects with international collaborators. Together, we apply contemporary research techniques and outputs, that help inform decisions regarding the conservation of biodiversity and safeguarding it from the impacts of climate change."

Dr Trevor Wilson — Systematic Botanist

Our research and conservation work is underpinned by strong credentials: We have a 200+ year history of excellence, a long-term vision and a commitment to building our scientific collections, infrastructure and expertise.

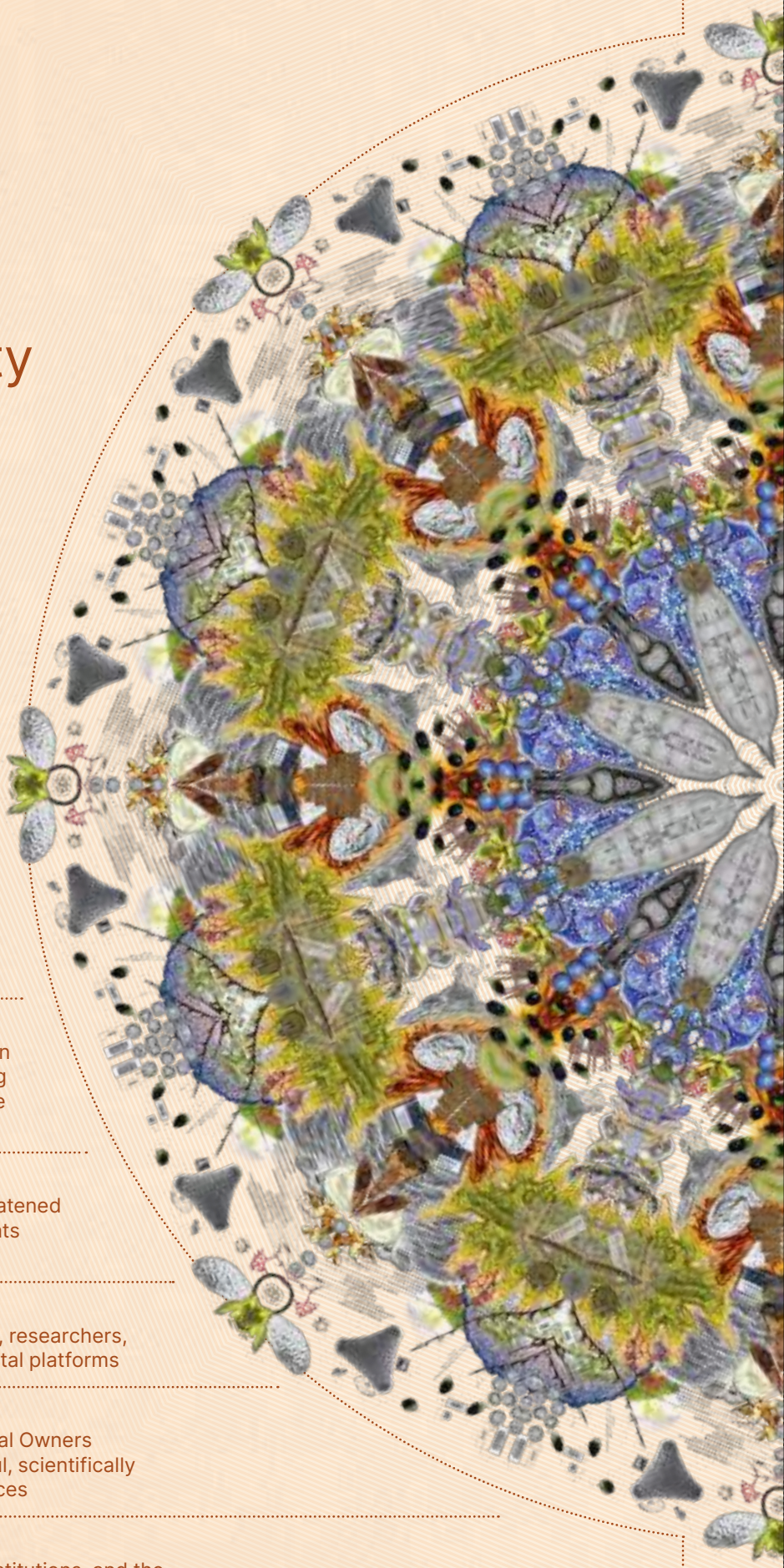
We invest in world-class facilities, technology and resources to preserve our collections and support our skilled and knowledgeable people. We open our rich and precious collections to the world through digitisation and emerging Artificial Intelligence technologies.

We share our research and knowledge through expert advice, conferences, scientific publications, workshops, the media and both physical and online resources. Believing in the power of partnerships and collaboration, we create innovative and sustainable conservation outcomes.

Trevor reviewing specimens of the Mint family (Lamiaceae) in one of the six Vault vestibules in the National Herbarium of New South Wales. G. Dixon

OUR PROMISE

We will work to protect biodiversity — the foundation of a healthy and sustainable future for all life on Earth.



Discovering, understanding and documenting biodiversity
Continued research helps us predict how plants, algae, fungi and ecosystems will cope with future challenges

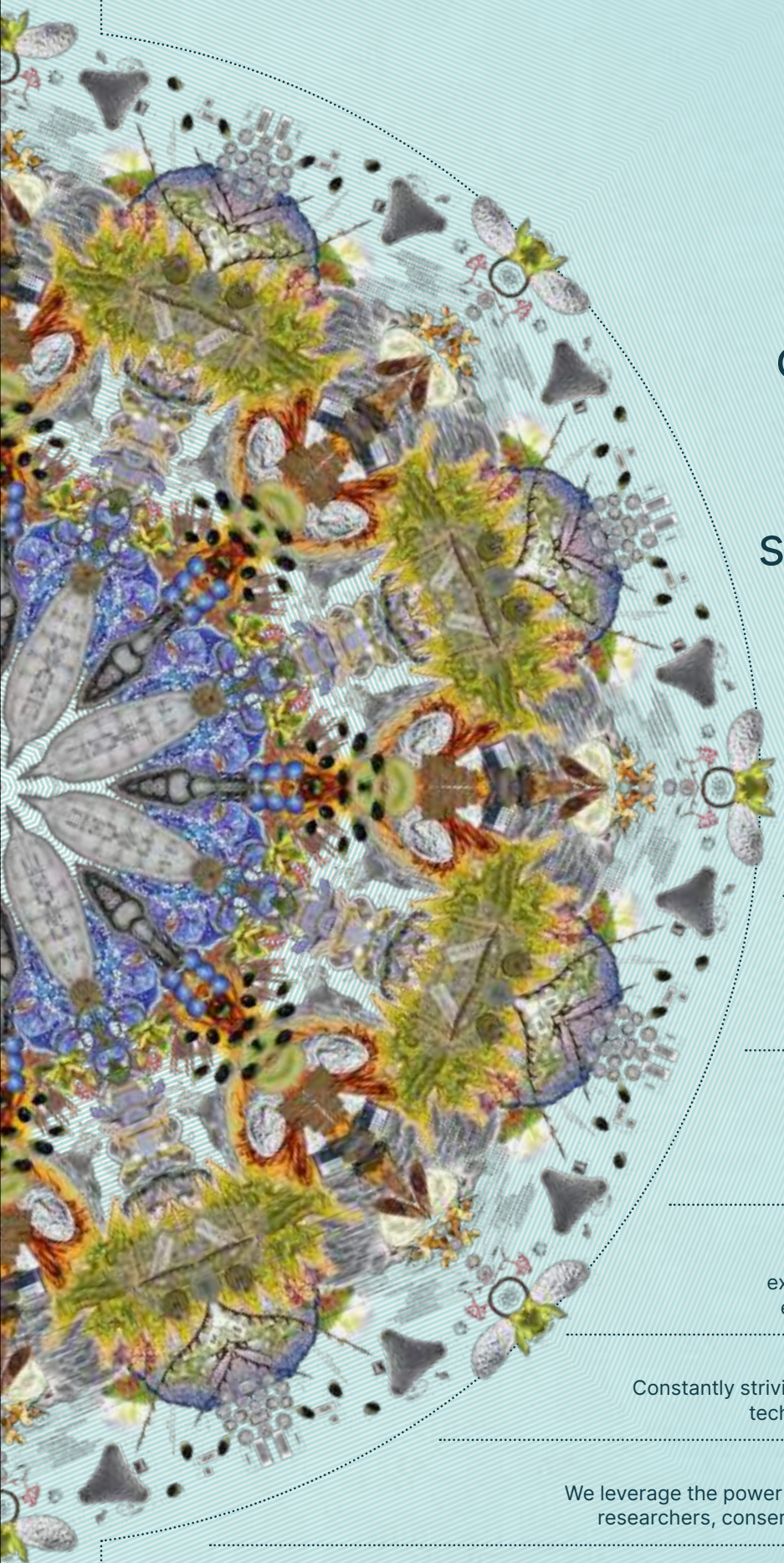
Long-term conservation
We investigate new ways to conserve plants in the natural environment as well as in our living collections — as growing plants, seeds, tissue cultures and in cryogenic storage

No species need ever go extinct
Our most urgent efforts are focussed on threatened species and ecosystems, and the environments that support them

Unlocking our collections
We enhance collection access for community, researchers, and partners both physically and through digital platforms

Ensuring resilient ecosystems
We collaborate with land managers, Traditional Owners and conservation groups to ensure successful, scientifically informed management and restoration practices

Greening the urban environment sustainably
We work with local government, education institutions, and the green-life industry to future-proof our urban and rural plant-life



We have a proven commitment and a long-term vision to seeking and sharing knowledge, inspiring and contributing to conservation solutions.

Legacy
Australia's oldest scientific institution, with over 200 years of collecting, documenting, researching and conserving plants, algae and fungi

Facilities
World-class infrastructure protects and makes available our invaluable collections — enabling scientific research by our teams, partners and the global community

People
We celebrate and support the rich knowledge, expertise and skills of our science, conservation, education, living collections and support teams

Innovation
Constantly striving for improvement, we combine cutting-edge technologies and techniques with proven methods

Partnerships
We leverage the power of collaboration with community, First Nations, researchers, conservation organisations, government and industry

Supporters
Generous financial and in-kind support from partners, donors and grants is vital for our ongoing work

OUR CHALLEN

The resilience of life on Earth is rooted in diversity, but this is in grave danger. Climate change, loss of species, invasive species, diseases, and the loss, fragmentation and degradation of habitats — these challenges are dire.

Loss of biodiversity is the largest threat that faces humanity today. Without biodiversity, the support-systems of our planet will fail.

Many species are currently on the brink of extinction. We must act now to save them.

There is still hope, and we won't give up.

Following is a selection of our current Actions, an overview of our internationally significant Collections, and the Services we provide to the community.

Eucalyptus tree regenerating after fire in the Greater Blue Mountains World Heritage Area. J. Plaza


GES

OUR ACTIONS

Saving species. Supporting ecosystems. Empowering people.

Our most urgent mission is to protect plants, algae, fungi and ecosystems — ensuring the foundation of a healthy and sustainable future.

We are growing our knowledge, applying our unique expertise to find practical outcomes. We are collaborating and sharing our scientific expertise to build science-based, sustainable solutions.

We invite you to join us. Be part of the bold actions we are taking to protect biodiversity and the future wellbeing of our planet.

"Most life forms, including humans, would not exist if flowering plants had not evolved and revolutionised terrestrial environments. Finding out how, why, and when is critical to protect the extraordinary plant diversity we have today."

Dr Hervé Sauquet — Head, Plant Discovery and Evolution Research

Hervé with a Red Silky Oak (*Alloxylon flammeum*). G. Dixon

"Our cross-cultural research into ancient human dispersal of Black Bean and Bunya Pine revealed that the seemingly natural distributions reflect the habits and travels of the first Australians."

Dr Monica Fahey — ReCER Research Fellow

Monica holding seeds, fruit and leaves of the Black Bean (*Castanospermum australe*). G. Dixon

BIOCULTURAL RESTORATION

Goal

Incorporation of First Nations' cultural guidance into restoration practices

Target

Culturally-significant plant species identified within newly developed, regional cross-cultural partnerships

Key issues

Marginalisation of First Nations knowledge, potential loss of culturally significant plants, separation of scientific and biocultural knowledge

Outline

As a positive step to improve the accessibility and inclusivity of science, biocultural restoration science guides strategic ecological restoration and revitalises human and cultural relationships to place. In these projects, Traditional Owners are involved in species and site selection, decision-making and practical actions such as seed collecting, propagation, planting and monitoring.

Outcome

Biocultural restoration protocols and strategies that include cultural empowerment and engagement.

Project leaders

Our Teams: Research Centre for Ecosystem Resilience (ReCER), Aboriginal Strategy and Programs

Key Collaborators: *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water, Macquarie University, Local Aboriginal Land Councils, Traditional Owners and Knowledge-holders

COLLECTING FOR THE FUTURE

Goal

A secure future for New South Wales plant species through a genetically representative Seedbank collection

Target

All seed plants native to New South Wales, with a focus on threatened species

Key issues

Biodiversity loss, extinction risk, genetic erosion, disease, climate change, and habitat loss

Outline

The rich biodiversity of New South Wales is under threat. Of around 6,000 native plant species, more than 10% are threatened with extinction in the near future. We work to ensure threatened species are maintained in representative living seed collections — long term insurance against extinction. These collections provide essential living material for research, restoration and conservation management.

Outcome

All bankable threatened species native to New South Wales with representative and viable seed collections stored in the Seedbank by 2030.

Project leaders

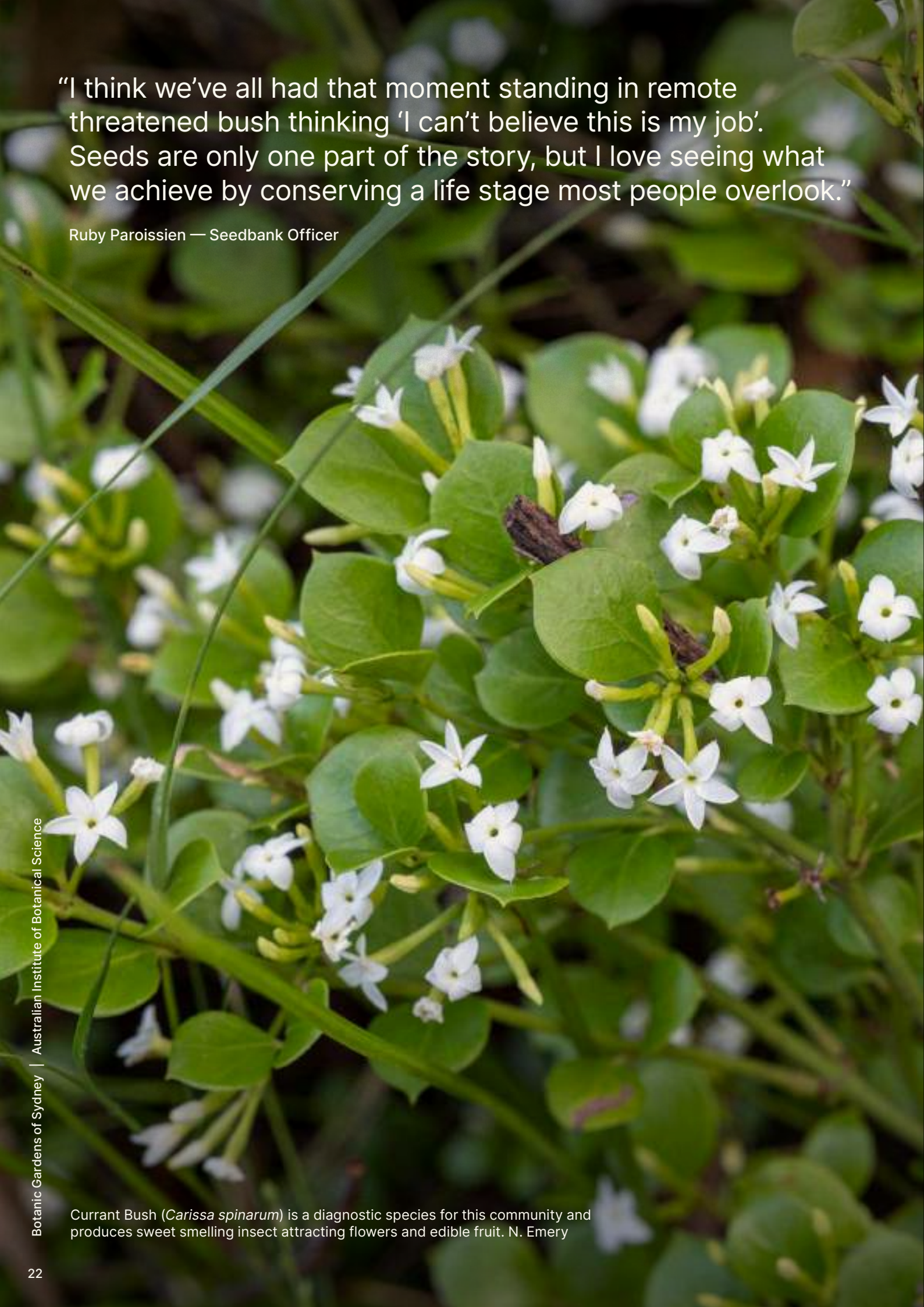
Our Teams: Seedbank and Conservation Collections, Australian PlantBank Research, Research Centre for Ecosystem Resilience (ReCER), Horticulture and Living Collections

Key Collaborators: *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water, Australian Seed Bank Partnership, Australian Network for Plant Conservation, Millennium Seed Bank — Royal Botanic Gardens Kew, United Kingdom

“I’m lucky I get to see the immediate real-world application of my work. Using genetic data improves the effectiveness of our conservation efforts and the survival of species.”

Eilish McMaster — Scientific Officer, Biodiversity Research

Eilish collecting fruits of the Endangered subtropical rainforest species Southern Ochrosia (*Ochrosia moorei*). G. Dixon



“I think we’ve all had that moment standing in remote threatened bush thinking ‘I can’t believe this is my job’. Seeds are only one part of the story, but I love seeing what we achieve by conserving a life stage most people overlook.”

Ruby Paroissien — Seedbank Officer

Currant Bush (*Carissa spinarum*) is a diagnostic species for this community and produces sweet smelling insect attracting flowers and edible fruit. N. Emery

REVITALISING THE VINE THICKETS

Goal

Increased resilience of a local threatened dry rainforest community

Target

Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions in the north-west of New South Wales

Key issues

Habitat loss and isolation, genetic erosion, climate change, ecosystem dysfunction

Outline

This Semi-evergreen Vine Thicket community is a unique dry rainforest found in isolated patches and restricted to New South Wales. It is listed as an Endangered Ecological Community as it has been heavily cleared and degraded. We share research-based guidelines and recommendations on genetic diversity and seed germination with restoration practitioners to facilitate successful translocation and restoration activities. These include the establishment of new plant communities, as well as supplementing existing remnants with additional genetic diversity.

Outcome

The long-term survival of this dry rainforest community assured. Published techniques and guidelines that can be utilised by restoration practitioners.

Project leaders

Our Teams: Seedbank and Conservation Collections, Research Centre for Ecosystem Resilience (ReCER)

SEEDS OF THE WOODLAND

Goal

Recovery and protection of native plant species to support the restoration of ecological communities in western Sydney

Target

Cumberland Plain Woodland in the Sydney Basin Bioregion

Key issues

Habitat loss, invasive species, genetic erosion, climate change, ecosystem dysfunction

Outline

A mighty woodland once covered much of western Sydney. The Cumberland Plain Woodland is listed as a Critically Endangered Ecological Community as less than 13% of the original forest remains and much of this in poor condition. Remnants of this community are managed at the Australian Botanic Gardens Mount Annan. We also secure and protect genetically representative seed collections of Cumberland Plain Woodland species in the Seedbank and make these available for research, conservation and restoration actions.

Outcome

The long-term survival of this ecological community assured.

Project leaders

Our Teams: Seedbank and Conservation Collections, Research Centre for Ecosystem Resilience (ReCER), Horticulture and Living Collections

Key Collaborators: NSW Department of Planning, Housing and Infrastructure, Western Sydney University

"Using genetics to unlock information on plant populations better informs our seed collection strategies to maximise genetic representativeness of our stored seeds. It's a privilege to be part of a team working to conserve some of our most threatened native plants."

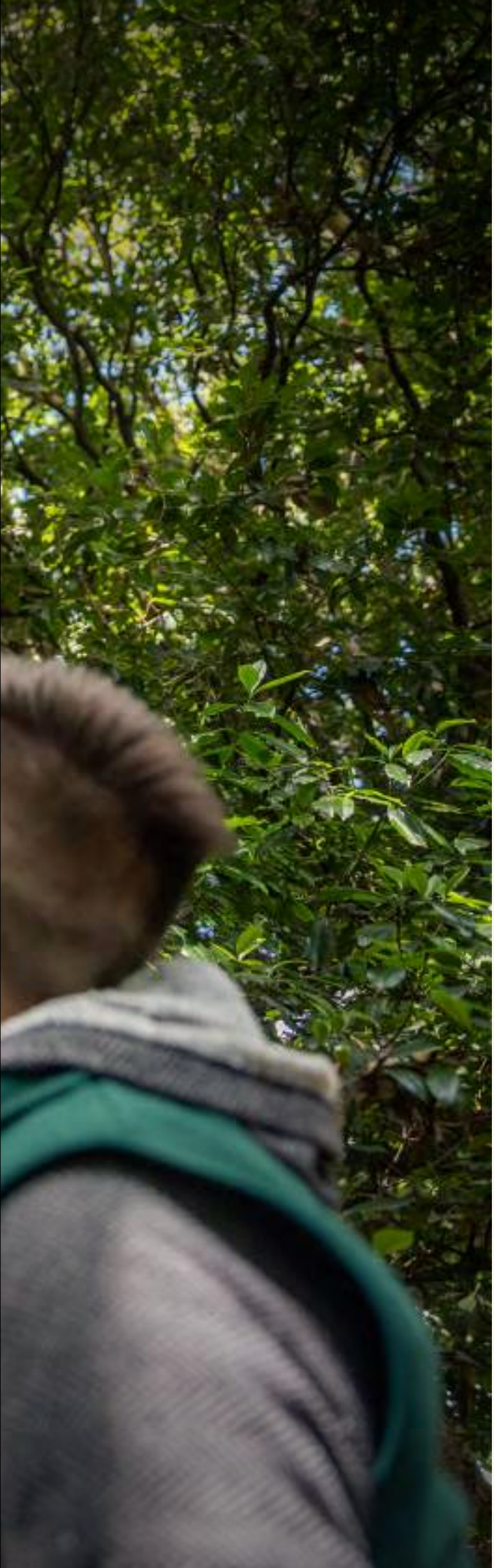
Stefanie Carusi — Seedbank Officer

Ruby Paroissien, Seedbank Officer, and Stefanie assessing and cleaning fruit of Kangaroo Grass (*Themeda triandra*). G. Dixon

"It's very rewarding to contribute to the conservation of some of Australia's rarest plant species. I find great fulfillment in preserving genetic diversity for future resilience."

Richard Dimon — Technical Officer, Biodiversity Sampling

Richard collecting leaf-material from White Booyong (*Argyrodendron trifoliolatum*) for genetic analysis. G. Dixon



SAVING RAINFORESTS

Goal

Establishment of long-lasting, self-sustaining, climate-resilient plant populations

Target

Lowland subtropical rainforest

Key issues

Habitat fragmentation and isolation, threatened species, climate change, loss of biodiversity

Outline

Among the most diverse rainforests of Australia, the 'Big Scrub' in north-eastern New South Wales is facing extinction — only 1% of the original forest remains. We incorporate DNA technology and data analysis to guide the design of Seed Production Areas for 30 key species. Our guidelines ensure that chosen plants are adapted to local geology, soil and climate, as well as to future conditions. This results in genetically diverse, climate-ready seeds that can be used in successful and sustainable restoration of resilient and adaptable subtropical rainforest.

Outcome

The long-term survival of the 'Big Scrub'. Restoration protocols for the development of Seed Production Areas.

Project leaders

Our Team: Research Centre for Ecosystem Resilience (ReCER)

Key Collaborators: Big Scrub Rainforest Conservancy, NSW Environmental Trust, *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water

FIGHTING MYRTLE RUST

Goal

Species saved from extinction and disease resistant plants reintroduced back into the wild

Target

The plant family Myrtaceae — including species of Eucalyptus, Lilly-pilly, Tea-tree, Paperbark and Bottlebrush

Key issues

Extinction crisis, introduced threats, destruction of ecosystems

Outline

Myrtle Rust is a devastating fungal pathogen recently introduced into Australia. It is threatening many species in one of Australia's largest plant families with extinction. To save some species it is necessary to create genetically diverse living collections that are representative of wild populations. We hold conservation collections in our nurseries and in tissue culture, and are conducting research on cryopreservation. Our breeding program will be underpinned by genomic data with the aim to increase species resistance to Myrtle Rust.

Outcome

Species protected from extinction in our living collections. Plants with resistance and genetic diversity reintroduced to bolster wild populations.

Project leaders

Our Teams: Research Centre for Ecosystem Resilience (ReCER), Australian PlantBank Research, Seedbank and Conservation Collections, Horticulture and Living Collections

Key Collaborators: Australian National University, Australian Network for Plant Conservation, Curtin University, *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water, Kings Park and Botanic Garden, University of NSW, University of Sydney, University of Queensland, Western Sydney University, NSW Department of Primary Industries, QLD Department of Agriculture and Fisheries, Australian Research Council

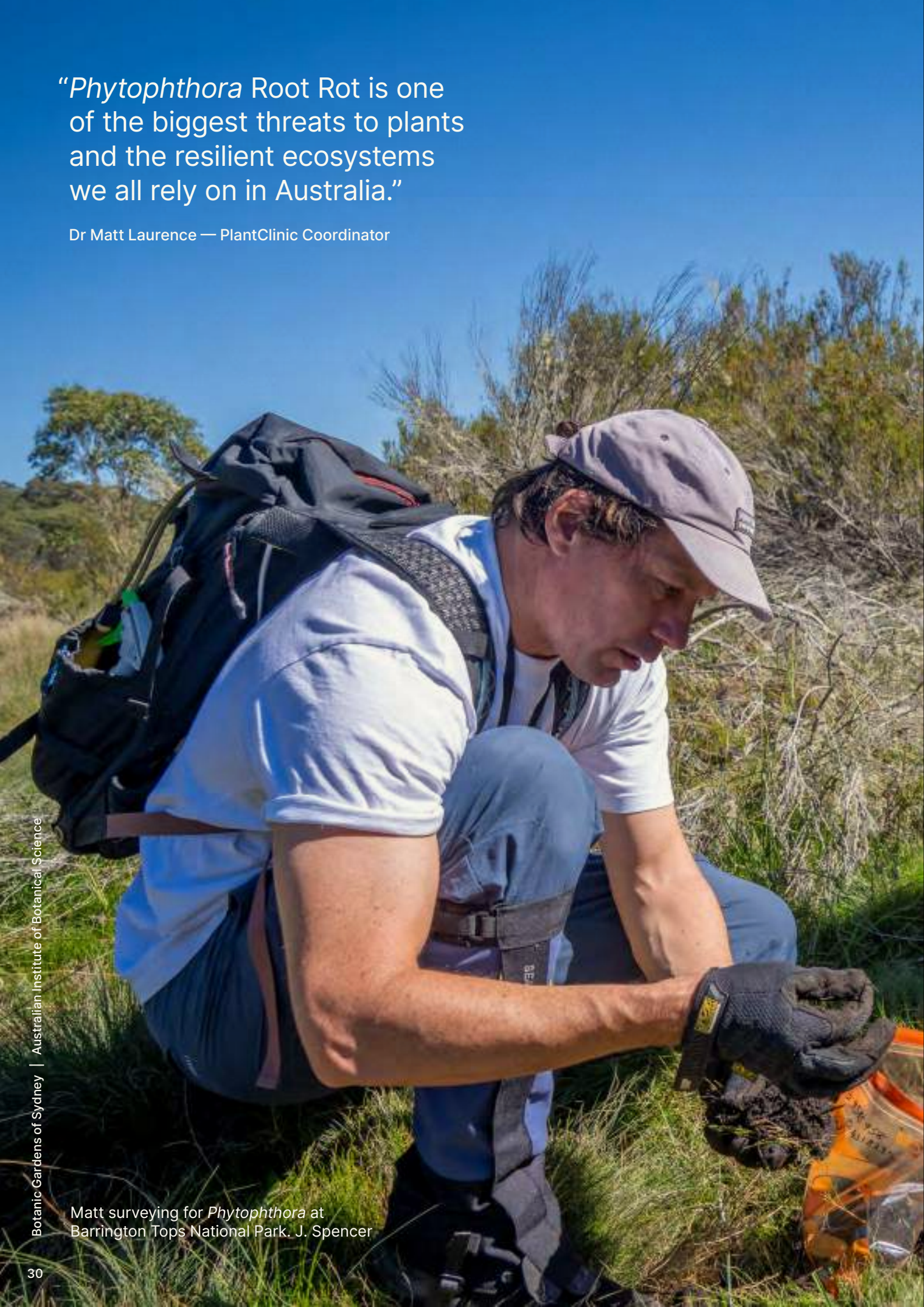
"It's very rewarding when a threatened species succeeds and proliferates in culture."

Amanda Rollason — Rainforest Conservation Project Technical Officer

Amanda with the Critically Endangered Native Guava (*Rhodomyrtus psidioides*) in tissue culture at the Australian PlantBank. G. Dixon

"*Phytophthora* Root Rot is one of the biggest threats to plants and the resilient ecosystems we all rely on in Australia."

Dr Matt Laurence — PlantClinic Coordinator



Matt surveying for *Phytophthora* at Barrington Tops National Park. J. Spencer

STOP THE ROT

Goal

Reduce the spread of the plant pathogen *Phytophthora* by the live plant trade to urban forests and natural ecosystems

Target

Phytophthora Root Rot

Key issues

Plant conservation, urban forest decline, biosecurity threat, live plant trade

Outline

Phytophthora is a deadly plant pathogen in nurseries, urban areas and natural ecosystems that is spread in soil and with plants. It destroys roots, making them unable to absorb water and nutrients. We aim to establish the extent and diversity of *Phytophthora* in tree nursery stock. We will also develop cost effective detection methods for use in both the nursery industry and on a landscape scale. With NSW National Parks and Wildlife Service we are investigating the use of scent detection dogs to detect *Phytophthora* in National Parks and nurseries.

Outcome

Clear protocols and tools developed to assist in the detection of plant pathogens.

Project leaders

Our Team: PlantClinic

Key Collaborators: *Growing Friends* — Foundation and Friends of the Botanic Gardens, City of Sydney, Woollahra Municipal Council, North Sydney Council, NSW National Parks and Wildlife Service, *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water, TATE Animal Training Services, University of Sydney

NSW PLANT TREE OF LIFE

Goal

Creation of the first complete evolutionary tree for all native seed plants of New South Wales

Target

All native seed plants of New South Wales

Key issues

Extinction crisis, biodiversity loss, climate change

Outline

Knowledge of diversity is critical for effective conservation. We are building the first complete reference evolutionary tree for all native seed plants of New South Wales (around 6,000 species and 1,000 subspecific taxa). Once complete, it will provide a robust picture of seed plant diversity in the state and place it in a world context. NSW Plant Tree of Life will enhance our ability to discover species new to science, assess the status of threatened species and undertake swift conservation actions where needed.

Outcome

A resource on seed plant diversity in New South Wales that will be freely available to all — for research, conservation and education.

Project leaders

Our Teams: Plant Discovery and Evolution Research, Herbarium Collection Management, Horticulture and Living Collections

Key Collaborators: Genomics for Australian Plants Initiative, *Plant and Fungal Trees of Life* — Royal Botanic Gardens Kew, United Kingdom

“This project will transform the way we undertake research to scientifically name, understand and conserve our native flora.”

Dr Russell Barrett — Systematic Botanist

Natalie Karbowiak and Alex Daydé, Technical Officers Biodiversity Sampling, collecting samples of *Correa alba* in cultivation at the Botanic Gardens. R. Barrett

“I love working with our beautiful Australian plants, learning new things about them, and developing ways to ensure their survival.”

Dr Lyndle Hardstaff — Postdoctoral Researcher

Lyndle placing plant embryos into cryo-storage at the Australian PlantBank. G. Dixon

RAINFOREST SEED STORAGE SOLUTIONS

Goal

Development of long-term storage solutions for rainforest seeds

Target

Rainforest seed plants

Key issues

Threatened species, ecosystem loss, challenges with traditional seed-storage methods

Outline

Australian rainforests are threatened ecological communities comprising only 2.7% of Australia's total native forest but provide habitat for about 15% of our native plant species. While many rainforest plants can be preserved by traditional seed banking, many produce seeds that do not tolerate drying and freezing. We are developing innovative solutions to conserve those species by investigating the effect of moisture content and storage temperature on seed survival, and by investigating the potential for cryopreservation of embryos and shoot tips.

Outcome

Representative and viable material for all rainforest species indigenous to New South Wales held in long term storage, and this material available for research and conservation.

Project leaders

Our Teams: Australian PlantBank Research, Seedbank and Conservation Collections, Horticulture and Living Collections

Key Collaborators: Kings Park and Botanic Garden, University of Queensland, Curtin University, *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water

AUSTRAITS — AUSTRALIA'S PLANT TRAIT DATABASE

Goal

To build a national database on the traits of Australia's entire flora

Target

All native Australian vascular plants

Key issues

Extinction crisis, climate change, biodiversity loss, data fragmentation

Outline

Australia's unique biodiversity faces unprecedented threats. AusTraits is an ambitious project that facilitates the collection, compiling and sharing of plant trait data — information on the morphology and ecology of plants. By bringing these data into a consolidated, open access platform, AusTraits increases and strengthens links across the research community and enables us to share information quickly and easily. It supports collaboration, automates some processes, enables research on trait evolution and ecology, and will lead to better conservation outcomes for our rich flora.

Outcome

AusTraits an actively growing, freely available and heavily utilised resource for research on the Australian flora.

Project leaders

Our Teams: Plant Discovery and Evolution Research (PDER), Australian PlantBank Research, Research Centre for Ecosystem Resilience (ReCER), Herbarium Collection Management

Key Collaborators: Atlas of Living Australia, Australian Research Data Commons, Hawkesbury Institute for the Environment — Western Sydney University (WSU), University of NSW (UNSW)

"AusTraits has been essential to my PhD on the ecology of pollination across Australia. It is a world-leader in making high quality plant data accessible to all so that we can better understand the flora that makes this country so unique."

Ruby Stephens — PhD candidate, Macquarie University

AusTraits lead team: Dr Hervé Sauquet (Head, PDER), A/Prof. Rachael Gallagher (WSU), A/Prof. Dan Falster (UNSW), Dr Elizabeth Wenk (UNSW). R. Nowytarger

"I find a great deal of satisfaction in contributing to the conservation of Australia's amazing biodiversity. The outcomes of our research are directly applicable to orchid conservation projects around the world."

Dr Zoe-Joy Newby — Conservation Scientist

Zoe-Joy with the Endangered Sydney Plains Orchid (*Pterostylis saxicola*) in the Australian Botanic Garden Mount Annan nursery. G. Dixon

GROWING AWKWARD ORCHIDS

Goal

Conserve unique and endangered orchids

Target

Underground Orchids (*Rhizanthella* species)

Key issues

Rarity, conservation of cryptic species, accidental destruction, habitat loss

Outline

Endangered *Rhizanthella* orchids can complete their entire life-cycle underground and are very hard to find. They are difficult to cultivate as they have complex associations with particular fungi and plants. We are researching different combinations of orchid seed, fungi and plants to identify a combination that will allow us to grow the orchids successfully in cultivation. This will enable us to build a living collection, restore wild populations, as well as train detection dogs to find them in the wild.

Outcome

Protocols and guidelines to successfully grow *Rhizanthella* developed and utilised. Establishment of representative living collections at Botanic Gardens of Sydney for research, conservation and reintroduction.

Project leaders

Our Team: Australian PlantBank Research

Key Collaborator: *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water

WOLLEMI PINE META-COLLECTION

Goal

Ensuring the long-term conservation of the Wollemi Pine through a global meta-collection

Target

Wollemi Pine (*Wollemia nobilis*)

Key issues

Critically Endangered species, introduced threats, genetic diversity

Outline

Last survivor of an ancient line, the Wollemi Pine is a species of high conservation priority. Naturally known only from a single gorge in the Blue Mountains near Sydney. Genomic tools have enabled us to ensure we have a genetically diverse cultivated collection that reflects the diversity found in the wild. These collections have been distributed to botanic gardens around the world to form a global meta-collection. This collection complements the original wild population plus other recently established and translocated populations, ensuring a long-term future for this species.

Outcome

Long term survival of an iconic species. A successful international collaboration in conservation.

Project leaders

Our Teams: Australian PlantBank Research, Research Centre for Ecological Resilience (ReCER), Seedbank and Conservation Collections, Horticulture and Living Collections

Key Collaborators: *Saving our Species* — NSW Department of Climate Change, Energy, the Environment and Water, Forestry England — United Kingdom, Botanic Gardens Conservation International, 45 Botanic Gardens and arboreta

"We are at an exciting point in plant conservation where threatened plants can be conserved through our network of botanic gardens around the world."

Dr Cathy Offord — Head, Australian PlantBank Research

Cathy with Maureen Phelan, Horticultural Research Assistant, monitoring the Wollemi Pine collection in the Australian Botanic Garden Mount Annan nursery. G. Dixon

“I love observing and recording the smallest botanical details that are crucial for the understanding of plants, their identity, how they relate to each other and their ecology more broadly.”

Catherine Wardrop — Botanical Illustrator

“Through a beautiful visual language which talks to all communities, botanical illustration plays a critical role in communicating the urgent need to protect the diverse Australian flora.”

Lesley Elkan — Botanical Illustrator

Catherine and Lesley working in their studio at the National Herbarium of New South Wales. G. Dixon

SCIENTIFIC ILLUSTRATION

Goal

Production of high quality scientifically accurate illustrations of plants for use in scientific publications, interpretation and education

Target

Plants new to science, *Flora of New South Wales*

Key issues

Documenting and illustrating biodiversity

Outline

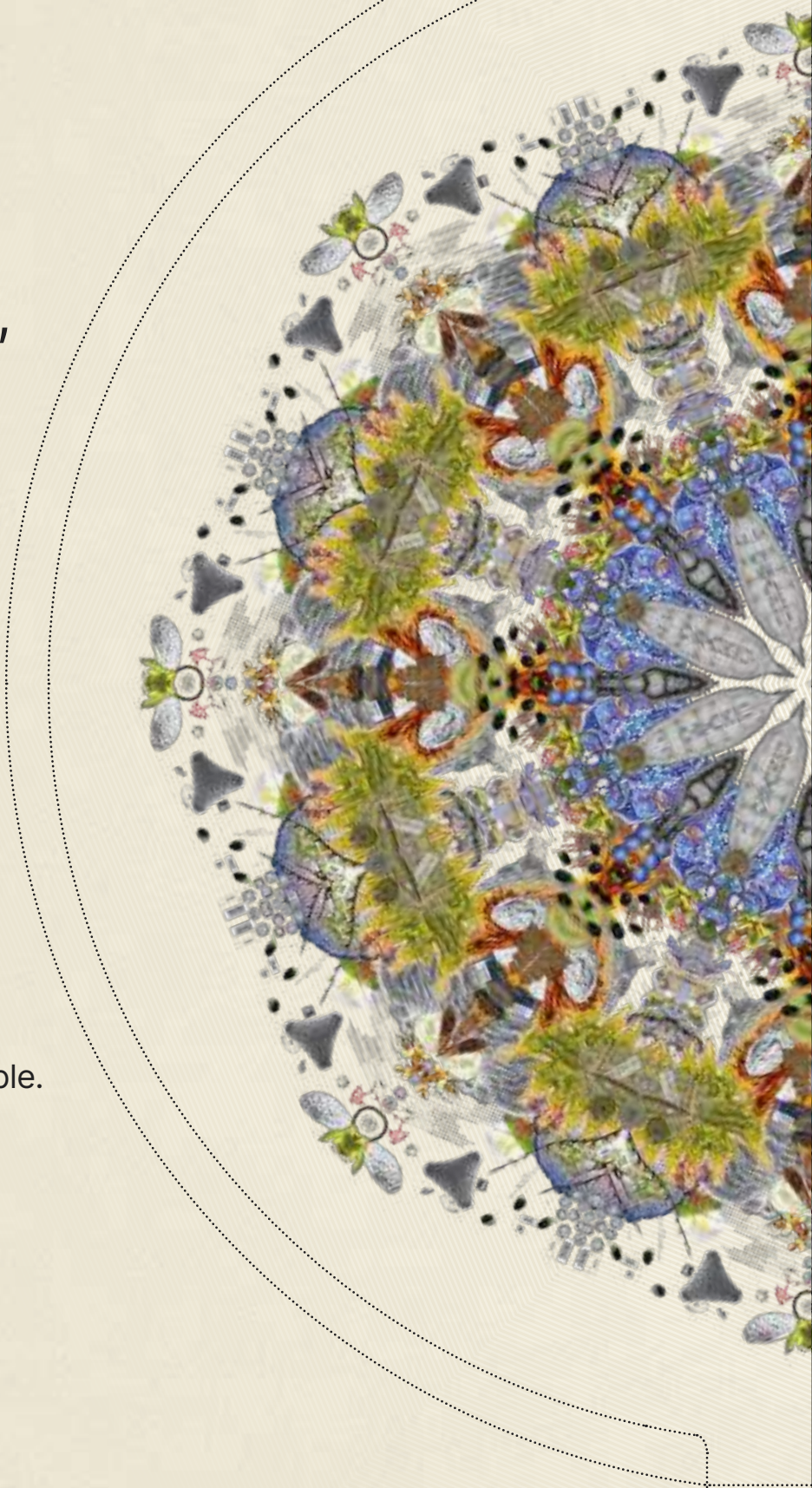
Clearer than any photo, scientific illustrations lay out the crucial features that make every plant unique. Our Illustrators produce internationally recognised high quality illustrations that are published in scientific papers and are an integral component of the *Flora of New South Wales*. On completion, the works are lodged in the Daniel Solander Library. This resource is used for interpretation, education and the promotion of scientific research and discoveries.

Outcome

High quality scientific illustrations documenting our flora.

Project leader

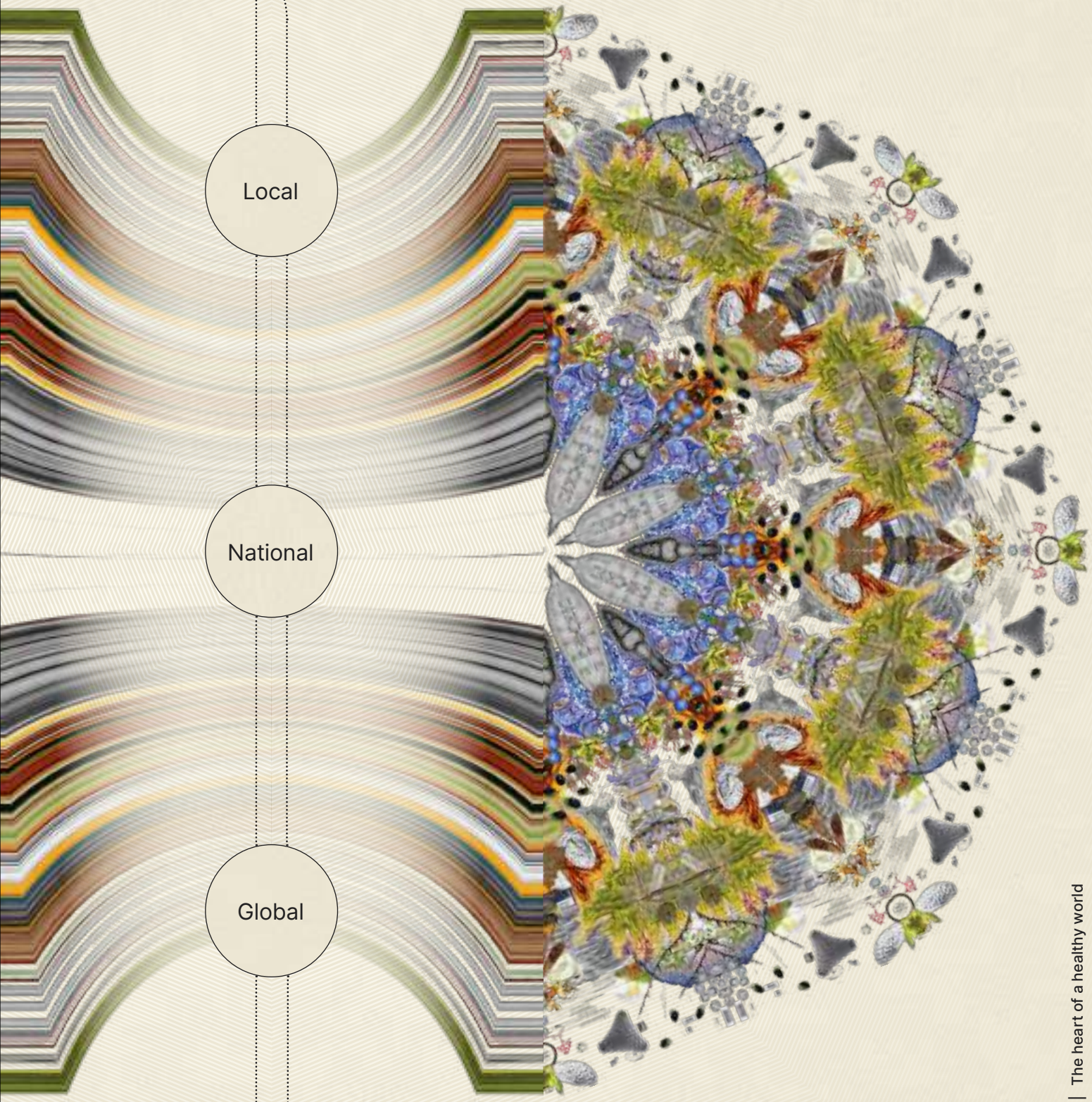
Our Team: Plant Discovery and Evolution Research



We look outwards, offering expertise while respecting and listening to others through consultation and collaboration.

Our networks are diverse, and are active locally, nationally and globally. We are part of a united community of change-makers — reaching for a better future for plants, algae, fungi, animals, places and people.

COLLABORATION


Local
National
Global

Pat preparing plant samples for DNA analysis in the Extraction Laboratory at the Herbarium. G. Dixon

COLLABORATION — WEED BOTANIST

"Plants are incredibly fascinating and important organisms. Effective biodiversity management can only come from effective understanding. It is such a privilege to get to study plants every day and improve our understanding of them."

Dr Pat Lu-Irving — Weed Botanist

Our partnership with the New South Wales Department of Primary Industries has seen the recent creation of a new shared Weed Botanist role, based at the National Herbarium of New South Wales (Herbarium). This has strengthened our shared focus on monitoring, managing, and controlling invasive species.

Weeds cost the Australian economy billions of dollars each year and are one of the biggest threats to biodiversity.

THE COLLECTI

Separating seeds from the pods of the wattle *Acacia leiocalyx*. N. Emery

IONS

THE COLLECTIONS

"Our collections are absolutely fundamental for understanding our biodiversity and how we can conserve it. It is wonderful to care for these important specimens and make them available to researchers from all around the globe."

Dr Hannah McPherson — Manager, Herbarium Collections

Botanic Gardens of Sydney holds and manages invaluable living, preserved and digital collections of plants, algae and fungi, the important data associated with these collections, as well as literature and cultural items.

Our collections are built on the pillars of quality and representativeness. This ensures their enduring value for scientific research and conservation action. The living collections are a safety net for threatened species held in cultivation and storage, and with the preserved and digital collections, are the foundation of scientific research done by our teams and researchers globally.

Careful curation and management done in conjunction with strategic planning and development ensures the collections are constantly growing and evolving to support ours and other's vital research and conservation actions.

Hannah inspecting herbarium specimens preserved in ethanol and on public display in the foyer of the Herbarium. G. Dixon

Aniuzka with Guy Lowe, Collection Curator,
organising specimens in Herbarium Vault Six. G. Dixon

NATIONAL HERBARIUM OF NEW SOUTH WALES — PRESERVED COLLECTIONS

"I have the privilege of curating our remarkable Herbarium collection. Each specimen holds immeasurable scientific value – adding to our understanding of the environment and changes through time."

Dr Aniuzka Kazandjian — Collection Curator

The six Vaults and the Spirit Collection of the National Herbarium of New South Wales hold a rich and extensive collection of over 1,400,000 preserved specimens of plants, algae and lichen.

Specimens act as permanent vouchers for observations, research and significant discoveries. The collection contains over 18,000 *types* — herbarium specimens that scientific names are permanently anchored to and are central to the stability of these names. The Herbarium is a vital resource for understanding Australia's and the world's biodiversity.

We are always finding new ways of looking at the collection and making them readily available to the world. With new technologies we can now explore patterns across 100,000's of digital images of specimens or analyse the wealth of information stored in the DNA of preserved or living material. The collection's value to scientific research and conservation is always increasing.

NATIONAL HERBARIUM OF NEW SOUTH WALES — DIGITAL COLLECTIONS

"I love that I get to see the families of plants and algae and then share them. The high-resolution pictures give researchers and botanists all over the world access to our collection."

Marie-B Foyard — Collection Officer

Investment in digitisation technology has unlocked the Herbarium's collections, expanding information exchange locally, nationally and globally. High resolution images of the specimens and the associated collection data can be viewed online by anyone via the *Atlas of Living Australia* (ALA).

With over one million unique, delicate and significant specimens already digitised, we continue to add new specimen images to the digital collection almost daily. This creates more opportunities to share knowledge — collaborating across Australia and around the world, while preserving the precious physical collections for future generations.

A collaboration between the Research Centre for Ecosystem Resilience (ReCER) and the University of New South Wales used a selection of our digital collection to train machine-learning models to recognise and measure features on herbarium sheets. This innovative technology will allow large volumes of information to be integrated easily and quickly into scientific research projects.

Marie-B photographing a specimen of *Kallymenia cribrogloea* (a marine red-algae) for the Digital Collection. G. Dixon

Margaret Heslewood, Plant Molecular Project Officer, and Emily Butler, Collection Curation Officer, curating bryophyte collections in Vault One of the Herbarium. G. Dixon

NATIONAL HERBARIUM OF NEW SOUTH WALES — GROWTH

"Each collection record is a moment in time that can never be repeated, and so each one is important. I love that each specimen tells part of a story, and that you can understand a greater story through them."

Guy Lowe — Collection Curator

The Herbarium collections are not static – constantly growing and curated to the highest standards. Scientific names and data are being continuously updated, keeping the collection in line with the latest research.

Over 8,000 new specimens and associated data are received every year. They are databased, curated, imaged, incorporated and made available to the global community. Staff, field officers, consultants, researchers, the public and other herbaria all add specimens to the collections.

Most species in the Herbarium are represented by multiple specimens, collected over the species' geographic range, at different times of the year, and in successive years — building a picture of our flora through time and space. Each specimen is irreplaceable, and all have equally high scientific value whether collected hundreds of years ago or today.

DANIEL SOLANDER LIBRARY

"Science, history and culture are the foundations on which the Daniel Solander Library's collections are based. They reflect the very nature and activities of the Botanic Gardens."

Miguel Garcia — Librarian

A unique repository of horticultural and botanical knowledge since its beginning in 1852, the collections hold a wealth of information from some of the earliest botanical publications up to the latest scientific research.

The library collection holds over 250,000 items — scientific literature, botanical illustrations, images, maps, archives, archaeological artefacts and memorabilia. It is part of a worldwide network of institutions that share knowledge.

The Library is embracing digital technology to make the collections available to online users. Collaboration with open access libraries such as the Biodiversity Heritage Library, the world's largest open access digital library for biodiversity literature and archives, is planned for the near future.

Miguel with Aylmer Bourke Lambert's 1803 folio, *A Description of the genus Pinus* in the Library. G. Dixon

“Living collections are fundamental to the work of botanic gardens. Our collections provide an abundance of unique opportunities for science and conservation horticulture to underpin global biodiversity conservation efforts.”

Damian Wrigley — Manager, Living Collections and Conservation

The Calyx showcases Botanic Gardens of Sydney’s living collections through award-winning exhibitions that celebrate the diversity and wonder of the natural world. J. Plaza

LIVING COLLECTIONS

Our living collections are diverse in form, content and function, and are closely associated with our preserved and digital collections.

Living Collections are for:

Displaying diversity — garden displays, interpretation, education, connection with community;

Potted protection — cultivated conservation collections of threatened species in our nurseries, facilities and on display;

Saving seeds — banking diversity through seeds (see *The Seedbank*, p 62); and

High-tech help — tissue culture and cryopreservation (see *Banking the Exceptional*, p 64), as well as freeze-dried fungi and cultures of symbiotic organisms maintained by PlantClinic.

The living collections are the foundation for much of our contributions to biodiversity conservation, community engagement and scientific research. They include some of the rarest plants on the planet, some that are now extinct in the wild, as well as common and spectacular horticultural forms.

Botanic Gardens of Sydney also manages natural ecosystems on site, including the Critically Endangered Cumberland Plain Woodland, the Endangered Western Sydney Dry Rainforest, and the World Heritage-listed Blue Mountains Basalt Rainforest.

For more information:
Botanic Gardens of Sydney Living Collections Strategy 2023+ — botanicgardens.org.au/about-us/our-vision-and-values/living-collections-strategy

THE SEEDBANK

The Seedbank makes the Australian PlantBank one of the most biodiverse places on the planet. It holds over 200 million seeds from more than 5,200 Australian plant species. Its state-wide seed collection program is well established and operates with a conservation focus.

We follow international best-practice guidelines to capture the genetic diversity of species. Curating and retesting is crucial to monitor the viability of seed collections over time and requires sustained commitment and investment. Our collections are backed-up at the Millennium Seed Bank (Royal Botanic Gardens Kew, United Kingdom) and we hold duplicate collections from other jurisdictions.

The Seedbank fulfils a critical conservation role serving to preserve threatened species against extinction, providing seeds for research and restoration, and generating the expertise and data needed to support conservation programs.

"I have been privileged to be involved in the development of what has become an internationally significant, long term, seed conservation resource. More recently, it has been gratifying to be part of an equally significant expansion of our seed biology research program, making an immediate contribution to the conservation of plant species in their natural environment."

Graeme Errington — Seedbank Curator

Graeme placing collections into one of the Seed Vaults at the Australian PlantBank. G. Dixon

Karen bags a fruiting branch of Scrub Turpentine (*Rhodamnia rubescens*) as part of a breeding project for Myrtle Rust resistance in the Nursery, Australian Botanic Garden Mount Annan. G. Dixon

BANKING THE EXCEPTIONAL

"Potted and garden collections are the only way to preserve some species from extinction. They give us the breathing space and materials we need to investigate the causes of decline and work on long-term solutions."

Dr Karen Sommerville —
Rainforest Conservation Scientist

Exceptional Species – those species with seeds that are not suitable for conventional seedbanking. Some seeds are intolerant of drying or freezing, are difficult to collect, or are no longer produced in the wild.

At the Australian PlantBank, research on developing ways to preserve Exceptional Species outside the natural environment is ongoing. For some species cultivated collections are effective. Tissue culture and cryopreservation offer additional high-tech means for preserving these species for the long term. As each species is unique, developing these techniques is research-intensive. However, once developed, they provide a means of preserving species indefinitely.

Our living collections of Exceptional Species fulfil a critical conservation role, and provide material for research and restoration programs, and generate the expertise, processes and data to support conservation in the long-term.

COMMUN
CONN

Seedlings early learning program: Children learning and playing in the Yellowwood nature play garden at Royal Botanic Garden Sydney. J. Manning

NITY
NECTIONS

COMMUNITY CONNECTIONS

“The Herbarium team have welcomed the opportunity to inspire the next generation of plant scientists, and the students have enjoyed contributing to our work.”

Dr Claire Brandenburger — Digital Curator

Our doors are open. We have unique knowledge and expertise, collections and technology; all available to support community, industry and government. We are always willing to explore the potential for collaborations and partnerships to further science and conservation outcomes.

Our services are not-for-profit. All revenue received through our paid services is reinvested in our collections, staff, and research and conservation programs.

To learn more, visit:
botanicgardens.org.au
/our-science/our-services

Claire (left) with university student interns Lucas Lun and Harrison Windsor, sharing information about plant identification and collecting at the Herbarium. M.-B Foyard

Jan Brownlie, Herbarium Mounting Room Volunteer, sewing a specimen of *Dracophyllum secundum* (a native heath) onto a herbarium sheet. G. Dixon

VOLUNTEER PROGRAMS

"Their time and energy are such an asset for the collections and our organisation. I feel very lucky to work so closely with them."

Jude Wright — Herbarium Volunteer Coordinator

Volunteers provide invaluable support to our work. They share information about science, conservation and horticulture with visitors through tours and workshops, and contribute to numerous science, conservation, education and community programs.

The dedication, skill and meticulous patience that the Herbarium's specimen-mounting volunteers bring is priceless. Their work preserves and protects the specimens, while optimising display of botanical features and the critical accompanying data of each collection.

BOTANICAL IDENTIFICATION SERVICE

"The range and scope of the daily enquiries I encounter improves our knowledge and understanding of the flora. The specimens we retain for the Herbarium better develops our understanding of naturalised species, threatened species, and distribution patterns."

Andrew Orme — Senior Technical Officer

Our expert team located at the National Herbarium of New South Wales provides a plant identification and botanical information service to the community, land managers, industry, government and other organisations.

The Public Reference Collection — a mini-herbarium — is available to everyone. We are happy to train people in the use this public resource for their own research.

To learn more, visit:
botanicgardens.org.au/our-science/our-services/plant-identification-service

The Botanical Identification Service team (left to right) — Andrew, Seanna McCune, Senior Technical Officer Identification Counter, and Peter Jobson, Information Botanist — working in the Public Reference Collection. G. Dixon

TAFE NSW students being trained in the use of the Flora, plant identification and collecting herbarium specimens. A. Orme

FLORA OF NEW SOUTH WALES

"The online version of the Flora has made this valuable resource widely and freely available. New information acquired from active research allows staff to update the keys and species profiles, and incorporate new species, thus always making it current."

Peter Jobson — Information Botanist

New South Wales Flora Online is a freely available resource that describes the native and introduced plants found in the state. Closely tied to the Herbarium's specimen database, the flora is constantly updated to align with the current scientific understanding of plants.

It has an easily searchable interface with identification keys, descriptions and images of plants. The flora is used by government, industry and the community to learn about and identify plants anywhere, anytime.

To learn more, visit:
botanicgardens.org.au/
our-science/our-services/
nsw-flora-online-plantnet

PLANTCLINIC

"I enjoy the problem-solving aspects of science. Each day presents a different problem to solve which then presents new questions to ask. The aim being to better understand and care for our world."

Allison Mertin — Diagnostic Scientist, University of Melbourne PhD candidate

Plant diseases threaten our biodiversity and have a devastating impact on our native flora and fauna as well as in our rural and urban landscapes. Diagnostics is the first step in plant disease management.

PlantBank, based at the Royal Botanic Garden Sydney, offers a wide range of plant disease diagnostics, pathogen detection and plant DNA identification services to the community, industry and government. This service is not-for-profit. All revenue goes towards the development of new diagnostic techniques and research into the plant diseases that threaten our native plant communities, agriculture, parks and gardens.

To learn more, visit:
botanicgardens.org.au/our-science/our-services/plantclinic-plant-disease-diagnostics

Allison identifying fungal pathogens at PlantClinic. G. Dixon

Maurizio and Dr Marlien van der Merwe, Scientific Officer Biodiversity Research, surveying seed production areas near Albury. T. Hogbin

RESTORE AND RENEW WEBTOOLS

"Through the implementation of Restore and Renew, New South Wales is a global leader in the adoption of genomic information for guiding resilient restoration practices and mitigating the decline of gene-level biodiversity."

Prof. Maurizio Rossetto — Head, ReCER

Successful and sustainable restoration of damaged or degraded ecosystems is complex. The team at the Research Centre for Ecosystem Resilience (ReCER) uses genetic, climate and herbarium specimen data to predict how plants cope in new locations, and how they might adapt to a changing future.

This valuable knowledge is shared through free Restore and Renew webtools. Community groups and land managers are supported to incorporate innovative science into their work, empowering them to restore diverse, resilient and adaptable ecosystems.

To learn more, visit:
botanicgardens.org.au/our-science/what-we-do/research-centre-ecosystem-resilience/recer-key-projects

SCHOOL AND COMMUNITY EDUCATION

We engage students, visitors and community members of all ages in learning about botanical science, gardening, histories and cultures at each of our unique sites.

Appreciating the importance of First Nations cultures and histories, and the power of connection to, and respect for Country is an important element of our programs. By sharing our knowledge and collections we ignite curiosity about plants, algae and fungi — their importance, and the need for their conservation. We raise awareness of the critical role biodiversity plays in the health and happiness of people and the future of life on Earth.

To learn more, visit:
botanicgardens.org.au/
teachers-and-schools

Relle Mott, Learning Officer, with students from Springwood Public School in the Succulent Garden at the Royal Botanic Garden Sydney. J. Horan

Botanist Dr James Clugston (second from left) and Digital Curator Dr Claire Brandenburger (second from right) braving the weather with University of New South Wales interns (left to right) Andres Bartnitzky, Dylan Petrozzi, Jasmine Lau and Monique Lush. C. Brandenburger

TERTIARY EDUCATION AND UNIVERSITY INTERNSHIPS

Our staff play an active role in tertiary education and early career training. They are associated with diverse institutions locally, nationally and internationally.

From the beginning of 2023, we have been partnering with the University of New South Wales to host undergraduate students as part of the Science Work Placement program.

A successful pilot program has been launched by Herbarium staff. Students receive ten days of hands-on work experience with historic and contemporary botanical collections. They also gain an understanding of the role of the Herbarium in supporting scientific research and conservation.

FIRST NATIONS EMPLOYMENT

"I am a proud Barkindji man. I love teaching Aboriginal knowledge and culture to people. I enjoy learning about my culture, I'm learning so much from the other educators."

Yarren Allameddine — First Nations Learning Trainee

We are committed to promoting and strengthening First Nations cultures through the creation of employment pathways at Botanic Gardens of Sydney. Our new Trainee Learning Officer positions will be filled and supported with several new recruitment and training initiatives such as the recently piloted 'Deadly Tracks' program.

We are now seeking funding to support initiatives such as the First Nations Cultural Burning program at the Australian Botanic Garden Mount Annan and the First Nations postgraduate student program.

Yarren in the Cadi Jam Ora Garden at
the Royal Botanic Garden Sydney. S. Daniel

LET'S MA DIFFEREN TOGETHE

Ooline (*Cadellia pentastylis*) is the only member of its genus and confined to dry rainforests of eastern Australia. N. Emery

KE A CE R

Nathan holding fruit of the Endangered *Persoonia hindii* in the Australian PlantBank garden. G. Dixon

OUR THANKS TO YOU

"We are leaders in plant conservation and seedbanking. Our Seedbank serves as a repository of immense scientific significance dedicated to safeguarding our native flora. What we discover and learn from all our collections will play an important role in advancing conservation and restoration efforts."

Dr Nathan Emery — Manager,
Seedbank and Conservation Collections

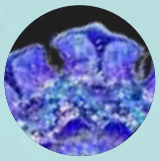
We offer our deep gratitude to generous supporters, donors, partners and collaborators. Together we continue to build strong, science-based solutions for a biodiverse, healthier and more sustainable future.

To learn more about the Australian Institute of Botanical Science and Botanic Gardens of Sydney, visit:
botanicgardens.org.au/

To get involved, visit:
botanicgardens.org.au/get-involved

KALEIDOSCOPE TAXONOMY

Line drawing – Blue Quandong (*Elaeocarpus grandis*). E.A. King



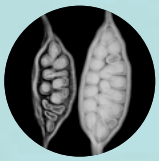
Cross section of branchlet – Drooping Sheoak (*Allocasuarina verticillata*). G. Burrows

Spore – *Antrophyum austroqueenslandicum* (a fern). K. Sommerville

Herbarium sheet – Many-headed Dryandra (*Banksia polycephala*).
National Herbarium of New South Wales

Herbarium sheet barcode.
National Herbarium of New South Wales

Flower – Cockspur (*Coleus australis*).
T. Wilson



X-ray of fruit – *Brachychiton* sp.
Australian PlantBank

Cross section of seed – Narrow-leaved Orangebark (*Denhamia silvestris*).
Australian PlantBank

Fruit – Blue Quandong (*Elaeocarpus grandis*).
S. Cottrell

Flowers – Linear-leafed Grevillea (*Grevillea linearifolia*). B. Makinson

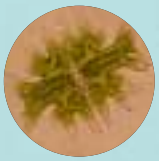
Stem and flower – *Hibbertia fumana*.
A. Orme

Flower – *Hibbertia fumana*.
A. Orme

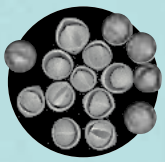
Fossil flower – *Icacinanthium tainiaphorum*.
C. Del Rio

Phylogenetic tree of *Lomandra* (Matt-rushes).
R. Barrett & T. Wilson

A desmid (a microscopic green algae) – *Micrasterias decemdent*. S. Skinner



A desmid (a microscopic green algae) – *Micrasterias mahabulesh*. S. Skinner



X-ray of nuts – *Macadamia jansenii*.
Australian PlantBank

Seeds – Snow Wood (*Pararchidendron pruinosum*). K. Sommerville

A vibrant, eclectic collection of imagery has been arranged to cultivate interest in a diverse array of projects. The kaleidoscope sprouts from the page with vivid intricacy and precise geometry. Much like the scientific endeavours of Botanic Gardens of Sydney the pattern reveals more and more the closer it is investigated.

Seedbank seed packet.
Australian PlantBank

Oil bodies – *Plagiochila baileyeyana* (a liverwort).
M. Renner

Drawing of seed – Austral Bugle (*Ajuga australis*).
L. Elkan

Scientific drawing – *Zieria wilhelminae*.
L. Elkan

Pollen equatorial view – Holly Grevillea (*Grevillea aquifolium*). H. Sauquet

Pollen polar view – Holly Grevillea (*Grevillea aquifolium*). H. Sauquet

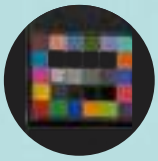
SEM data for image of pollen grain – Holly Grevillea (*Grevillea aquifolium*). H. Sauquet

Herbarium sheet – Black Bean (*Castanospermum australis*).
National Herbarium of New South Wales

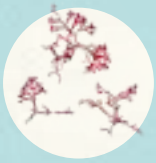
Transverse section of the primary axis – *Corynecladia* sp. (a red algae). Y. Metti

Herbarium sheet – Wollemi Pine (*Wollemia nobilis*).
National Herbarium of New South Wales

Herbarium specimen – Wollemi Pine (*Wollemia nobilis*).
National Herbarium of New South Wales



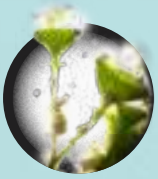
Colour Card, Digitisation.
National Herbarium of New South Wales



Habit – *Corynecladia clavata* (a red algae).
National Herbarium of New South Wales

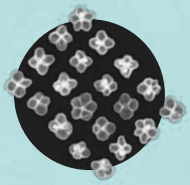
Fruit – Red Muttonwood (*Myrsine subsessilis*).
Australian PlantBank

Cross-section of seed – Snake Vine (*Stephania japonica*). K. Sommerville



Habit – *Acetubularia* sp. (a green algae).
S. Skinner

Flowers – Golden Spray (*Viminaria juncea*).
J. Plaza



X-ray of fruit – *Achronychia* sp.
Australian PlantBank

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Content

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Boronia fraseri, an endemic of the Greater Sydney area. M. Duretto