WA Herbarium
turns over a new leaf

This year the Western Australian Herbarium moved into new premises in the WA Conservation Science Centre in Kensington, Perth. The move marks a new chapter in a long and fascinating history for WA's premier botanical institution. The work occurring within its laboratories and vaults today builds on its long history, yet is now characterised by new science and complex technology.

by Kevin Thiele


IDENTIFICATION LABEL
ISOTYPE & current name of
Syn.
Cited by J.A. Chappill et al. in
(2008)
Signed: L. Biggs
Gompholobium scab
DETERMINAVIT
Western Australian
01633
Verticordia
plicata
MDC 878-08
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Verticordia
albida
MDC 891-28

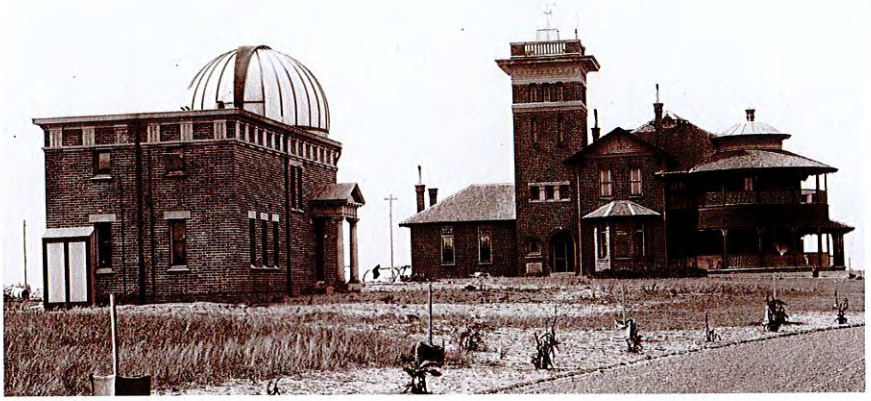
Visitors to the Department of Environment and Conservation's (DEC's) Kensington site are unlikely to miss the Western Australian Conservation Science Centre (WACSC), an imposing new building set among landscaped grounds in Technology Park adjacent to Curtin University. Even more imposing than the building, however, is the scientific research that goes on within its walls and the priceless collection of specimens of plants, algae and fungi it houses. The WACSC, as the core of DEC's Science Division, is at the hub of enormous efforts to understand and conserve Western Australia's unique and marvellous flora.

A priceless resource

The story of the Conservation Science Centre begins just over 80 years ago in 1929, when the WA Herbarium was established through the amalgamation of a number of smaller, special-purpose collections of plant specimens. These collections included specimens of weeds, agricultural plants and poisonous plants from the Department of Agriculture, of native forest plants maintained by the Forests Department, and of various native plants held at the WA Museum.

After some early tussles over which department should be responsible for botanical research in WA, the government finally decided to create a state herbarium and to appoint a government botanist in the Department of Agriculture. Charles Gardner, the first appointee, was charged with documenting, describing, classifying and studying all native and introduced plants in WA, a task he embarked on with diligence and enthusiasm. By 1947 the herbarium comprised nearly 30,000 specimens collected throughout WA, maintained and studied by four staff. It was housed in the State Observatory building in West Perth, because space was available there rather than because this was an appropriate facility.

Herbaria by their nature grow steadily, especially in a biologically rich area such as WA. By 1959 the WA Herbarium had outgrown the observatory building and was moved to a floor of the then new Department of Agriculture buildings in South Perth. However, facilities there were inadequate, and within a few years proposals were formulated to build a special-purpose herbarium on nearby vacant land. In March 1970 the new

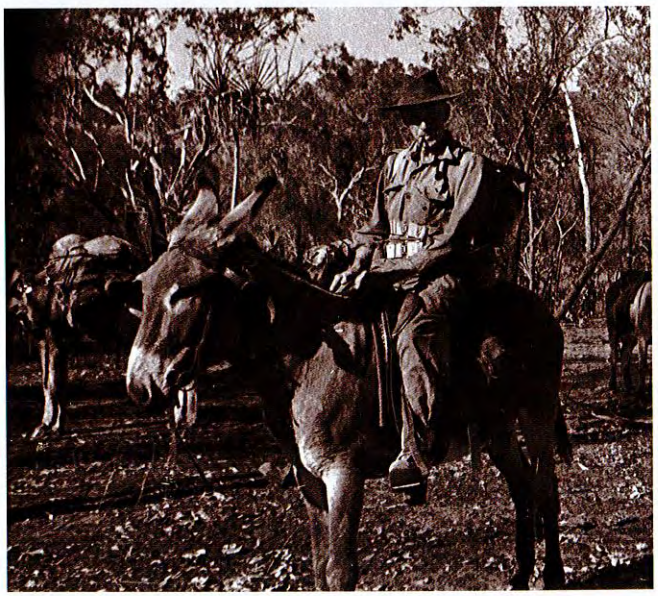


Previous page
Main The new Western Australian Conservation Science Centre.
Inset top A specimen of painted lady (*Gompholobium scabrum*) collected from King George Sound, now Albany, in 1791.
Inset centre Seeds of rare and threatened plants in the Threatened Flora Seed Centre.
Inset bottom Seedlings for use in translocation programs and for testing susceptibility to *Phytophthora* dieback.
Photos – Peter Nicholas/DEC

Above Old State Observatory buildings, West Perth, photographed between 1896 and 1900.
Photo – Battye Library [007157D]

Below Charles Gardner on field work in the Kimberley, *circa* 1950.
Photo – Howard Coate, courtesy of Kevin Coate

Below right The specimen vaults, WA Herbarium, Kensington, in the 1970s.
Photo – Western Australian Agriculture Authority



Above The WA Conservation Science Centre.

Right The 750,000 specimens in the WA Herbarium are stored in special boxes in climate-controlled vaults.
Photos – Peter Nicholas/DEC

building was officially opened by the then Premier of WA, Sir David Brand. With special vaults for the specimens and offices fitted out for botanical research, the WA Herbarium building in South Perth was at the time ranked among the top botanical research facilities in Australia. It lasted for 40 years.

Despite being designed to allow for expansion of the ever-growing research collection, a time came in the late 1990s when the vaults were filled to the brim, with about 600,000 specimens, and expansion was necessary. However, extension of the building on the same site was deemed too expensive and plans to create a new building began, continuing the tradition of investing in such research in WA. These plans became the WACSC.

Once again, the opening of the WACSC has seen the WA Herbarium jump to the forefront of herbarium facilities in Australia. With space for 1.2 million specimens, climate-controlled vaults and excellent research and curation laboratories, the herbarium continues the tradition first tasked to Charles Gardner to catalogue, document and study our flora. Since Gardner's day, algae, fungi, mosses, liverworts and lichens have been added to the herbarium's research focus. And just as in Gardner's day, new species are being discovered and scientifically named by the herbarium's botanists regularly. In fact, more new species of plant are named every year in WA than in almost any other part of the world, a result of the combination

of a globally mega-diverse flora and excellent facilities and capabilities in botanical taxonomic research.

A living bank

While the herbarium stores desiccated and dead, but still scientifically priceless, voucher specimens of our flora, the Threatened Flora Seed Centre in the WACSC stores living seeds as an insurance policy against environmental catastrophes. Established in 1992, the Threatened Flora Seed Centre is a crucial component in DEC's efforts to prevent extinction of plants in WA, and is closely integrated with research and on-ground management of some of the state's rarest plants.

The idea behind seed banks is deceptively simple. If a plant is threatened by extinction in the wild—through land clearing, weed invasion, dieback or salinity—then storing seeds in a seedbank can help when all else fails. To this end, staff from the Threatened Flora Seed Centre have visited most regions of the state, carefully collecting valuable seeds from

Above Banksia cones drying after being burnt to open follicles to extract seed.

Above left Extracting banksia seeds for storage and future translocations.
Photos – Peter Nicholas/DEC

Left At work on a species translocation site in the wheatbelt.
Photo – DEC

almost 75 per cent of WA's threatened plant species. Back in the WACSC's laboratory facilities, the seeds are carefully cleaned, weighed, tested and counted, then prepared for long-term storage. Research has shown that seeds of most species can be stored very well if adequately dried and kept in cold, dry conditions. After cleaning, seed lots are carefully air-dried under controlled conditions until they contain around five per cent moisture, then sealed in air-tight foil bags and frozen at -20 degrees Celsius. Germination tests before and after such treatment show that well-collected samples of mature seeds of a wide range of species will survive for many hundreds of years in such conditions.

However, a bank is useless if the investment it represents is never drawn upon. For this reason the Threatened Flora Seed Centre is closely linked with DEC's translocation program. Translocation involves establishing new populations of our most vulnerable plant species in areas carefully selected as suitable for them to live in, but far away from the threats that have caused them to decline elsewhere. So far 97 new populations of 57 species have been established under this program. The Threatened Flora Seed Centre provides a crucial facility for seeds awaiting germination and translocation to their new homes, as well as a vital laboratory for studying how to successfully germinate seeds of the many species in WA with specialised and complex requirements.

What's where—the Biogeography Program

Discovering, naming, classifying and conserving plants, the work of the herbarium's and Threatened Flora Seed Centre's botanists, are critical first steps in conserving WA's flora. Equally important is understanding where plants grow and how they and the animals that live in and with them associate into ecological communities. Understanding the patterns of plants and animals in the landscape helps DEC choose which areas should be set aside for protection in parks and reserves. Such work is the role of the Biogeography Program.

Scientists from the Biogeography Program conduct in-depth surveys of specified areas throughout WA. A good example is the recent Pilbara Biological Survey. Covering all 178,500 square kilometres of the Pilbara Bioregion, this $14 million, 10-year program saw teams of scientists studying the distributions of plants, birds, insects, mammals, reptiles and invertebrates. Plants and other organisms were surveyed in about 1,000 quadrats (standard plots used for measuring and monitoring biodiversity), carefully sited to encompass all the major landforms and soil types occurring in the region.

The survey phase provided a vast amount of information on the Pilbara's plants, birds, mammals, reptiles and invertebrates on the land, in water bodies and underground. This information is being used to produce a classification and maps of ecological communities—assemblages of plants and animals that co-occur and are adapted to specific habitats. DEC and the Australian Government aim to ensure that the national park and reserve system across

Right A herbarium botanist studying specimens of the pea genius *Tephrosia*, one of many groups of WA's plants that still has numerous scientifically undescribed species.
Photo – Peter Nicholas/DEC

Below Sampling a flora quadrat in Karijini National Park during the Pilbara Biological Survey.
Photo – Bob Bromilow/DEC

Australia is comprehensive, adequate and representative, and only studies like these can guide policy and assess how well such goals are being met.

While some biological surveys target very broad areas such as the Pilbara and provide broad-scale information, others are more specifically targeted to meet urgent needs. For example, a second recent study from the Biogeography Program surveyed 22 islands off the coast of the Kimberley, once again collecting and observing plants and animals in diverse groups (see 'A little gecko tells a big story' on page 59 and 'Treasures of a sunken coastline: a biological survey of the Kimberley islands', *LANDSCOPE*, Winter 2008). The aim of this survey, as well as providing invaluable baseline data—many of the islands surveyed had never before been visited by scientists—was to assess areas that may help preserve Kimberley biodiversity from the coming onslaught of cane toads (*Bufo marinus*). Islands may become refuges for many species if toads dominate mainland habitats, perhaps even offering areas where toad-threatened species such as northern quolls (*Dasycercus hallucatus*), snakes and goannas can be introduced to prevent their extinction. Understanding the current biodiversity of the islands is necessary before such programs can be attempted.

That marvellous molecule

While the Biological Survey Program focuses on big pictures and broad patterns, other parts of the WACSC study the smallest, but in many ways the most important, aspect of biodiversity—the DNA molecule. Two genetics labs in the WACSC enable Science Division staff to extract, purify and study DNA from plants and other organisms, to help solve puzzles and understand how evolution in WA has given us the biodiversity we now enjoy.

DNA can't be seen, but it both drives and records evolution. All the changes that occur as new species evolve, flourish and eventually die out are produced by changes in DNA. Equally, mutations that occur during evolution may persist in a species' DNA for millions of years. This makes it an ideal molecule for studying both the processes of evolution and the patterns that evolution produces.

For example, many species of WA plants are found in very small, scattered populations. Conserving such species requires a clear understanding of how these populations differ. In one species, all populations may be genetically very similar; in another, they may be very different. Conserving a species with genetically distinct populations is a difficult challenge, as loss of any population means the species loses genetic diversity. DEC's goal is to conserve not only species, but also the potential of species to continue to flourish into the future, particularly in the face of threats such as climate change. Understanding genetic patterns in nature is especially important if we are to fulfil this goal.

Gems in the garden

Visitors to the WACSC may be struck by the gardens that surround the building, and this brief tour of the building would not be complete without a tour of the gardens. These have been designed to reflect, and link to, the scientific research that goes on inside the building's walls.

The garden design has several broad elements. Surrounding the building on two sides are landscaped grounds

Left Preparing samples for DNA extraction. *Photo – Peter Nicholas/DEC*

Above The WA Conservation Science Centre is home to the WA Herbarium.

Right Librarians with one of the rare and precious books in the the WACSC Science Library.
Photos – Peter Nicholas/DEC

that represent the flora of the Pilbara (the west side) and the Goldfields (the east) regions, using simplified plantings of a few distinctive species to help establish the theme and provide a palette of form and colour. The Pilbara plantings are dominated by coolabahs (*Eucalyptus victrix*) underplanted by spinifex (*Triodia basedowii* and *T. pungens*), while the Goldfields plantings have an overstorey of *E. forrestiana* over a range of grey-leaved shrubs such as saltbushes (*Atriplex* spp.) and emu bushes (*Eremophila* sp.).

While the landscaped grounds use a simple palette of relatively few species to evoke their respective landscapes, scattered around the building are raised planter boxes in which much richer plantings can be maintained. Many of these are in the courtyard to the east of the building, while others are at the two main entrances. Different beds feature different groups of plants, such as emu bushes, triggerplants (*Stylidium* sp.) and rushes in the family Restionaceae. With flowers on at least some plants all year round and a range of species rarely or never before seen in cultivation, the beds are always worth a visit. Over time, staff at the WACSC plan to change the plantings in these beds frequently, showcasing important WA groups of plants and species that are being studied by the botanists within.

A long journey

This year's move to the new Conservation Science Centre marks a new era for the WA Herbarium, the Biogeography Program, Threatened Flora Seed Centre and other aspects of DEC's Science Division. But the work occurring in the new building is very much a continuation of a long history. For, despite the high-tech science underpinning today's botanical research programs, staff from DEC's Science Division continue to build upon the work of their predecessors—from the men and women who first collected specimens of bizarre and bewildering plant species on the great seafaring voyages of discovery before settlement, to the pioneering botanists of colonial WA and the modern scientists of today. Together, they have built one of the world's premier botanical research institutions, held in high esteem among botanists from across the globe.

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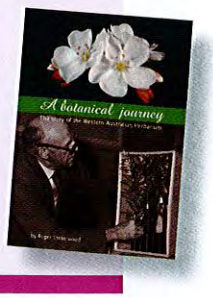
Discover more about the fascinating history of botanical research in WA with the new book *A botanical journey: The story of the Western Australian Herbarium*. Visit www.dec.wa.gov.au/shop to order or use the form in this magazine.



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