fostering research into the biology and cultivation of the Australian flora

Newsletter *No. 9* *New Series*

January 2009

Annual General Meeting 2008

The Annual General Meeting was held on 24th November 2008. The AGM supported the award of grants to these six new projects which will commence in 2009:

- Phillip Ainsley 'Developing a screening procedure to determine the impact of climate change on seed germination in threatened native plant species'.
- Brian Atwell 'Can the phenology of Australian wild relatives of cultivated rice be modified for human use?'
- Dion Harrison 'Understanding the biochemical basis of flower colour in Australian native *Ptilotus* and *Gomphrena*'.
- Robert Henry 'Impact of climate on the genetic diversity of native species using *Microlaena stipoides* as a model'.
- Catherine Lovelock 'The capacity of native saltmarsh halophytes to remove salt from saline wastewater discharge – an experimental assessment of salt uptake mechanisms in common Australian saltmarsh chenopods'.
- Nicholas Paul '"Green caviar" and "sea grapes": Targeted cultivation of high-value seaweeds from the genus *Caulerpa*'.

Three Councilors retired by rotation and were re-elected, Richard Williams, Ian Cox and David Murray. Paddy Lightfoot who was appointed as a Councillor by the Council during the year retired in accordance with Article 43 and was re-elected.

The new Council is:

President:	Dr Peter Goodwin
Secretary:	Mr Ian Cox
Treasurer:	Dr Jenny Jobling
Vice President:	Professor Richard Williams
Vice President:	Dr E. Charles Morris
Members:	Dr Paddy Lightfoot
	Dr David Murray (ASGAP representative)
	Mr Ross Smyth-Kirk
	Professor Acram Taji

President's Report for 2008

Here is the President's Report delivered by Dr Peter Goodwin at our AGM.

The objective of the Australian Flora Foundation is to 'Foster research into the biology and cultivation of Australian plants'. Progress in the past 12 months is illustrated by the final reports received:

- Conomikes, McLean and Moore's final report (grant in 2002) on the propagation and genetic fingerprinting of *Epacris impressa*. They found that *E. impressa* has a high level of both intra-race and inter-race genetic diversity. Propagation of the species is difficult, but they have developed an improved technique for rooting cuttings: 'Soft new tip cuttings should be collected from plants approximately six weeks after flowering ceases and placed under fog for twenty weeks. The lower leaves should be manually removed from the stem with a sharp blade or scissors prior to sticking'.
- Price, Wong and Morgan's (2004) final report on the effect of removal of sheep grazing in Red Gum woodlands on native understorey species, showed that removal of sheep had positive benefits for understorey diversity, but recovery of native species was only found in woodlands which had been free of grazing for at least 20 years.
- Marchant, Perkins, Orel and Tower's (2003) final report 'Exploring the horticultural potential of native Australian flowering shrubs in the *Solanum brownii* group' described two species that show prospects of being developed into horticultural ornamentals – *S. nobile* and *S. curvicuspe*.
- Morris and Briggs (2005) final report 'Do heat and smoke affect the permeability of the *Grevillea* seed coat to large molecular weight compounds?' describes a detailed investigation into seed coat dormancy in *Grevillea*, and concludes that seed coat impermeability is not the major cause of seed dormancy.

The full final reports, as well as nearly all previous final reports and publications arising from them, can be accessed on the Foundation's website at http://www.aff.org.au.

In 2008 the Call for Applications added, within the area of plant diversity conservation … 'particularly where there are threats from climate change'. As a result there were a number of applications related to climate change.

New research grants have been awarded to:
Phillip Ainsley 'Developing a screening procedure to determine the impact of climate change on seed germination in threatened native plant species'
Brian Atwell 'Can the phenology of Australian wild relatives of cultivated rice be modified for human use?'
Dion Harrison 'Understanding the biochemical basis of flower colour in Australian native *Ptilotus* and *Gomphrena*'
Robert Henry 'Impact of climate on the genetic diversity of native species using *Microlaena stipoides* as a model'
Catherine Lovelock 'The capacity of native saltmarsh halophytes to remove salt from saline wastewater discharge – an experimental assessment of salt uptake mechanisms in common Australian saltmarsh chenopods'
Nicholas Paul '"Green caviar" and "sea grapes": Targeted cultivation of high-value seaweeds from the genus *Caulerpa*'.

My thanks to each person who has contributed to the success of the Foundation in 2008.

Peter Goodwin

24th November 2008

Summaries of Final Reports

Each year the Australian Flora Foundation funds a number of grants for research into the biology and cultivation of the Australian flora. While the grants are not usually large, they are often vital in enabling such projects to be undertaken. Many of the projects are conducted by honours or postgraduate students, hopefully stimulating their interest in research into Australia's flora. This work is only made possible by the generous support of donors and benefactors.

Presented here are brief summaries of completed projects. Full reports of these and other projects can be accessed on the Foundation's website www.aff.org.au

Do heat and smoke affect the permeability of the Grevillea seed coat to large molecular weight compounds?
E. Charles Morris, and Candida Briggs
School of Science, Food and Horticulture, University of Western Sydney Hawkesbury.

Seeds of east Australian Grevillea species germinate in response to fire-related cues such as heat and smoke. The seed coat is responsible for dormancy in *G. linearifolia*: a possible dormancy mechanism is the existence of barriers to diffusion of large molecular weight compounds in the seed coat. Such internal barriers are known to be involved in the dormancy of fire-responsive seeds overseas e.g. *Emmenanthe pendulioflora*, and the permeability of these barriers is altered by smoke. This model was tested for *G. linearifolia* by investigating the permeability of the seed coat to diffusion of large molecular weight compounds, and whether this changed after exposure to fire cues. The germination characteristics of seeds to heat, smoke, and combined exposure was tested. The penetration of the dye Lucifer Yellow into intact seeds was examined after 24 and 48 hours of exposure, and the penetration of the dye from the inside of the seed

coat outwards was examined after 24 hours. Histochemical staining with Nile Red and Acridine Orange was used to locate cuticles, suberin and lignin.

About one-fifth of untreated seeds germinated; both heat by itself, and smoke by itself, increased germination; greatest germination (up to 80%) was observed after treatment with both fire cues. The seed coat of untreated seeds was impermeable to Lucifer Yellow, irregardless of whether the dye was diffusing inwards or outwards, and three barriers to diffusion were identified. Treatment with heat or smoke slightly increased penetration of the dye, but did not completely remove the barriers. Suberin was identified in secondary walls of exotestal and mesotestal cells, and was absent from primary cell walls. Movement of Lucifer Yellow occurred through the middle lamella and primary cell wall of suberized cells; movement of the dye was impeded where suberin was absent.

The Emmananthe model was not supported: fire cues did not significantly decrease barriers to diffusion of large molecular weight compounds in the seed coat of Grevillea, and must be breaking dormancy by another mechanism.

Publication from Grant: Briggs, Candida L., Morris, E. Charles. (2008) Seed-coat dormancy in *Grevillea linearifolia*: little change in permeability to an apoplastic tracer after treatment with smoke and heat. Annals of Botany 101: 623 – 632.

Exploring the horticultural potential of native Australian flowering shrubs in the *Solanum brownii* group
Adam Marchant, Andrew Perkins, George Orel, Gillian Towler
Royal Botanic Gardens, Sydney.

The flowering shrubs in the *Solanum brownii* group consist of ten closely related species. They are endemic to coastal temperate Eastern Australia. They have attractive blue or purplish flowers of around three centimetres diameter, and are all prickly to a greater or lesser extent.

We attempted to select for plants with combinations of characters desirable for development as a horticultural ornamental, particularly, large flower size, reduced spiny-ness, attractive leaf form, and attractive growth habit.

Vegetative propagating material was collected from the New England tableland and escarpment, representing four species – *S. neoanglicum*, *S. curvicuspe*, *S. brownii* and *S. nobile*. Two species may have a prospect of being developed into horticultural ornamentals – *S. nobile* and *S. curvicuspe*. *S. nobile* comes from the tableland east of Glen Innes, and *S. curvicuspe* from the rainforest inland from Wauchope. *S. nobile* is the more attractive plant, with oak-shaped leaves, and upright, well-branched habit. Specimens differ widely in their pricklyness. *S. curvicuspe* has relatively large flowers, and fewer spines. We discovered a previously-undocumented white-flowering form of this species.

At the time of writing (May 2008), flowering in cultivation of our selected plants has occurred only sporadically, and we have not had fruit formation and seed set. Discovering how flowering can be induced in cultivation is our current goal in the investigation of these plants.

Call for Applications for Grants from the Foundation

We are now calling for applications for grants to begin in 2010. The Foundation expects to support between two and four projects at $5000 - $12,000 each in 2010 with possible extension into 2011. Preliminary applications (2 A4 pages) will be accepted until 23rd March 2008. Short listed applicants will be asked to submit a full application. The Call for Applications details can be accessed from our website www.aff.org.au

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The Australian Flora Foundation is a not-for-profit voluntary organization with the sole objective of fostering scientific research into Australia's flora.

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