

PROCEEDINGS OF THE ROYAL SOCIETY OF QUEENSLAND



VOLUME 128

PROCEEDINGS OF
THE ROYAL SOCIETY OF QUEENSLAND

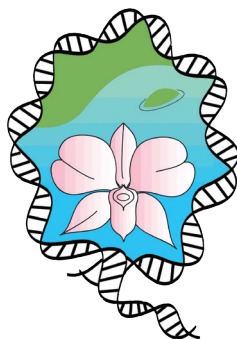
Editor: Angela H. Arthington

Special thanks are extended to the anonymous referees who reviewed papers submitted for publication in this volume of the *Proceedings*.

2020

The Royal Society of Queensland

*Queensland's first scientific society
Established 1884*



The Royal Society of Queensland

Patron
His Excellency the Governor of Queensland
the Honourable Paul de Jersey AC

COVER ILLUSTRATION

YACHATDAC Logo and Banner

The Yumbanguku Aboriginal Cultural Heritage and Tourism Development Aboriginal Corporation (YACHATDAC) based in Barcaldine has been formed by key members of the Traditional custodian families of the Iningai lands in Central West Queensland. Further information is available in the paper by Brown & Thompson (2020), 'Gracevale, a Case Study on Caring for Country and Rediscovery of Culture and Language by the Iningai People in Central West Queensland' (PRSQ 128, pp. 23–27).

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GOVERNOR OF QUEENSLAND

Message from the Governor of Queensland

As we navigate the challenges of COVID-19, I extend my support to all members of the Royal Society of Queensland.

The Society is justly proud of its long tradition of bringing together scientists and interested lay people to advance our understanding of the world, and I know Society members are saddened by the interruption to these engagements as we abide by social distancing. These dialogues and fora have played a significant role in the progress of science in our State. But even the most superficial survey of the Society's long and illustrious history reveals an organisation that has weathered many storms, emerging each time with renewed resolve to advance the cause of human understanding. It is my firm view that this will also be the case with the current situation.

I have been encouraged to see that many members of the Society have been able to continue their important work within the current limitations and note that many of the important collaborations promoted by the Society have been postponed rather than cancelled. I share with the members the hope they can be resumed as soon as it is safe to do so.

The emergence of the novel coronavirus has brought into sharper focus the critical importance of science to human flourishing. Yet science will continue to need advocates throughout the community, a need which the Royal Society remains uniquely qualified to fulfil. I remain immensely proud to serve as your Patron, and look forward to the time when we can meet again.

A handwritten signature in cursive script, reading "Paul de Jersey".

His Excellency the Honourable Paul de Jersey AC
Governor of Queensland

The Royal Society of Queensland

The Royal Society of Queensland has an honourable history as the senior scientific institution in the state. It was established in 1884, with royal patronage continuing unbroken from 1885. The Governor of Queensland His Excellency The Honourable Paul de Jersey AC is the present Patron.

The Society seeks to increase respect for intellectual enquiry. It encourages original research and the application of evidence-based methods to policy development and decision making. The Society provides a forum for scientists and lay people to involve themselves in the progress of science in society, with ‘science’ defined broadly. As a non-partisan, secular, learned group, the Society is committed to the Enlightenment tradition of curiosity-led, knowledge-based enquiry that arguably was born with the Royal Society in London in 1660.

The centrepiece activity of the Society is the production of the annual scientific journal *Proceedings of The Royal Society of Queensland*, supplemented from time to time with Special Issues on specific themes.

Proceedings of The Royal Society of Queensland

The *Proceedings* publishes original scholarship and investigation in natural history relevant to Queensland, including the biodiversity, conservation, use, management and economic significance of natural resources. All aspects of the natural sciences, including astronomy, geology, hydrology, botany and zoology, biomedicine, introduced species and dynamic land and water processes, are considered. The journal will also publish papers on general science, including science-related history, policy, education and philosophy. Papers written from within the social sciences, such as sociology, culture and heritage that deal with the use or management of a natural resource, are welcome.

Following initial appraisal by the Editor, all submitted papers are peer reviewed by a single-blind process. The following types of manuscript are considered:

Scientific Papers, Short Communications, Historical Reviews, Opinion Pieces, Dissertation Abstracts, Book Reviews.

Authors are required to follow the instructions given in the *Guide to Authors PRSQ 2020* which is available on the Society website or from the Honorary Editor. The timeline to allow print publication by the end of each year requires authors to submit papers to the Editor by 30 June.

From Volume 124, papers are being placed online free of charge as they emerge from the editorial and typesetting procedures. Print publication will follow when the volume is completed.

A complete archive of the *Proceedings* with full search capability back to 1884, and the preceding three volumes of the *Transactions of the Queensland Philosophical Society*, are available online.

Scholarly Debate Invited

From 2 December 2019 (Volume 124), articles accepted for the annual *Proceedings of The Royal Society of Queensland* and Special Issues have been published online with free public access. The advent of digital scientific publishing means that it also becomes practicable to publish scholarly debate over published articles. The Society welcomes critical responses to articles that have been published in this edition (Volume 128), if addressing matters of scientific substance and expressed in a scholarly manner. Please refer to the *Guide to Authors PRSQ 2020* for guidance as to style and submit all such responses the Honorary Editor. All critical responses will be subject to the review process undertaken for other submissions.

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EDITORIAL FOREWORD

The centrepiece activity of The Royal Society of Queensland is the production of the annual *Proceedings*, supplemented from time to time with Special Issues on specific themes. Whilst the year 2020 has been difficult in so many ways, it has been exceptional for the Society. Two volumes of the annual *Proceedings* and three Special Issues have been published online with free public access, as well as in print.

The present volume, PRSQ 128 2020, is divided into two main sections that serve to differentiate peer-reviewed papers from important Society reports. The first section of Volume 128 features diverse contributions from across the natural and social sciences. They include studies on forest ecology and vegetation change, the productivity and biomass of Australian rangelands, marine invertebrate and fish ecology, freshwater fish communities and river health monitoring, and historical perspectives on astronomy and tsunami hazards in Queensland. A paper on the concept of One Health and its role in the control of COVID-19 brings human health into sharp focus in a particularly timely contribution. Another paper describes plans for the recovery of Indigenous cultural knowledge through research and community activities of YACHATDAC, based in Barcaldine. Finally, a review on the legacy of the International Biological Program in Australia honours Emeritus Professor Raymond L. Specht AO, a member of the Royal Society since 1957 and a Life Member since 2015.

Royal Society reports form the second section of Volume 128. The Presidential Address “Science Through a Big Window” delivers the powerful message that “a ‘business as usual’ approach in scientific research will not solve our current ‘big’ problems, e.g. global warming, sustainable energy to drive human societies, COVID-19 and the inevitable onset of further zoonotic impacts”. The Society’s Annual Report (16 November 2019 to 15 November 2020) follows, with news of the continuation of activities by means of frequent Newsletters, virtual meetings and voluminous email traffic, keeping the Society in business during this extraordinary year. Reports from the Society’s Research Grant program, a PhD dissertation Abstract and an Obituary honouring a dedicated scientist and teacher conclude this volume. I encourage all research students completing their degrees to take advantage of the Society’s policy to publish dissertation abstracts free of charge.

I have enjoyed my year as Honorary Editor and thank the Society most sincerely for the privilege and enjoyment of working with so many enthusiastic authors and dedicated reviewers, whose insights have enriched my days and many nights throughout 2020. I have been supported at every step of the publication process by Council members, office-holders and the exceptional professional services of Darryl Nixon, Managing Director, Sunset Publishing Services Pty Ltd.

On behalf of the Royal Society, I wish all Society members and readers good health, relaxing holidays and the deep enjoyment of reading.

Angela H. Arthington
Editor, PRSQ Volume 128, 2020

The Royal Society of Queensland acknowledges the Iningai Nation, their long custodianship and inherent connection to country, its springs and waterways, plants and animals.

We pay respect to the knowledge and cultural values of First Peoples of
Australia and acknowledge Elders past, present and future.

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