

Desmond Wishart Cooper: a life in science

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Professor Desmond Wishart Cooper (Fig. 1) was a leading Australian researcher whose work spanned the fields of genetics, reproduction, conservation and management. From his start in science in 1957 to his death in 2012, Des made significant contributions to the scientific community – not only with his research, but also through his teaching, leadership and mentoring.

Des was born in 1939 in a small country town in South Australia. Despite growing up on a farm, it was clear from the start that farming was not in his future. His sister has remarked that Des was very fond of using his science kit to perform experiments on animals he captured on the farm (perhaps foreshadowing his later interest in animal ethics). As a young boy, Des was already showing signs of the inquisitive, scientific scholar that he would become.

After earning a Bachelor of Science degree (with Honours) at the University of Adelaide, Des stayed to complete a PhD in the field of sheep genetics under the supervision of Dr Jean Mayo. These formative years at the University of Adelaide fuelled his lifelong thirst not only for academics, but also for other important things in life, namely cricket and partaking in a celebratory drink after the match.

After the completion of his PhD, Des and his wife Tina spent time abroad in Sweden and the United States. Des commenced a CSIRO Overseas Postdoctoral Fellowship at the Agricultural University of Sweden and a postdoctoral fellowship at the University of Wisconsin before returning to Australia in 1968 to take a lectureship at La Trobe University. During his time at La Trobe, Des began work on his long-held view that marsupial

and placental mammals constitute independent experiments in mammal evolution and could therefore shed light on gene function and evolution, particularly with respect to the sex chromosomes. This line of inquiry would shape Des' academic pursuits for the rest of his career.

In 1973, Des moved to Sydney to take up a lectureship in the School of Biological Sciences at Macquarie University. He was promoted to Associate Professor within a year and became Chair of Genetics within a decade. Des stayed at Macquarie for 32 years, and played a pivotal role in teaching, research and administrative management. In 2005, he moved to the School of Biological, Earth and Environmental Sciences at the University of New South Wales. During this professorial appointment, Des continued his active research, and developed and implemented the Masters in Conservation Biology degree, jointly taught with Victoria University in Wellington, New Zealand.

During the early years of his career, Des made significant advances in our understanding of the genetic basis of certain wool attributes in the Australian merino. However, by his own admission, his work on the genetic basis of pre-eclampsia was his most notable achievement in that period. Des' research marked the beginning of modern genetic investigations into this human pregnancy disorder, which is still a significant cause of mortality in pregnant women from developing countries.

In the second half of his academic life, Des' passion revolved around marsupial biology and management. What started early in his career as an interest in the use of marsupials as a means to study gene function and evolution shifted to a more general interest in all aspects of marsupial biology. Des was instrumental in the development of the tammar wallaby as a model organism for genetic research, which culminated in the development of the first marsupial genetic linkage map (Zenger *et al.* 2002). This map was integral to the assembly of the recently sequenced tammar wallaby genome (Renfree *et al.* 2011). Des pioneered research into X-inactivation and sex differentiation in marsupials, and was fascinated by the topic of sexual development in intersex marsupials. He led many marsupial population genetics studies and made a strong contribution to conservation genetics of koalas, possums and various macropod species. He also played a significant role in the creation of the field of marsupial immunology, focusing on the development of the immune system in the altricial young, as well as the role of maternal protection for pouch young. In recent years, Des' research interests turned to population management and fertility control in marsupials. At the time of his retirement in 2009, Des reflected on his career and concluded that, in his opinion, his most important intellectual and ethical contribution to science was to point out the likely negative

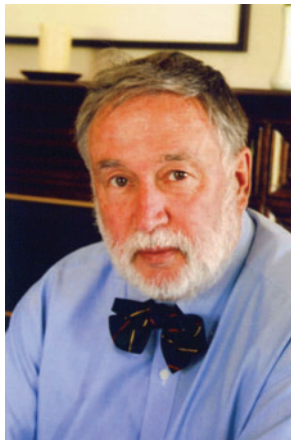


Fig. 1. Professor Des Cooper, circa 2005.

effects of wildlife immunocontraception (for a review, see Cooper and Larsen 2006). Arguably also his most controversial contribution, it was nonetheless important in stimulating debate and additional research into this field of wildlife research.

In this special issue, we present a collection of original research and review articles that were inspired by Des' research in the field of zoology. Professor Jenny Graves gives a fascinating personal insight into Des' early career in her review of kangaroo gene mapping and sequencing (Graves 2013). A review of marsupial X chromosome inactivation provides further insights into mammalian genome evolution (Deakin 2013). In two more contributions focusing on marsupials, Belov *et al.* (2013) review the rapid advances that have been made in the field of marsupial immunology since the advent of molecular genetics and genomics, and Edwards and Deakin (2013) review the implications of the marsupial pouch for reproductive success and mammalian evolution. To highlight the fascination that Des had with health and disease in all native animals, Ng and Baker (2013) review the current state of understanding of diseases in megabats.

In the field of genetics, Neaves *et al.* (2013) provide genetic evidence to show that free-living male western grey kangaroos were able to hybridise with female eastern grey kangaroos, and that at least some of these hybrids were fertile. Deakin *et al.* (2013) review the underlying basis of 1080 tolerance in animals, concentrating on a particular candidate gene. Incidentally, this was one of the last research projects that Des was actively involved with.

Turning to wildlife management and fertility control, Eymann *et al.* (2013) present original research on the effect of contraceptive implants on brushtail possums and Russell *et al.* (2013a) report on the incidence of road-killed possums and the associated risk factors in the bushland suburbs of Sydney. Des always embraced discussion between wildlife management stakeholders, and in this vein, Russell *et al.* (2013b) review the extent to which law, policy and management approaches meet the conservation needs of brushtail possums. In a short communication, Hogg (2013) discusses how zoo-based breeding programs can be used as part of a unified approach to preserve native Australian fauna.

Des made significant contributions to science beyond his own research and even his own country. In 2001, the New Zealand Government announced plans to create a small number of national Centres of Research Excellence. Des was an invited external reviewer of the application to create the Allan Wilson Centre for Molecular Ecology and Evolution (AWC), a research network designed to protect New Zealand's biodiversity and improve human and environmental health. The AWC was one of seven centres selected for funding for a six-year period and quickly grew to a research collaboration of five universities and ~100 researchers (academic staff and students) based at Massey University in Palmerston North. In 2008, Des contributed a follow-up review of the AWC, which resulted in a further seven years of national funding. In the same year, Des joined the Governance Board of the AWC, a role he continued with great enjoyment until his death. Des' request that an Australian Shiraz and a New Zealand Sauvignon Blanc should be served at his wake was symbolic of his affection for, and loyalty to, both countries.

Des was not only an inspirational researcher; he was also a natural leader. In addition to his academic appointments, he

served as President of the Genetics Society of Australasia, as a member of the Australian Research Council Biological Sciences Committee, as Director of Research for the Marsupial Cooperative Research Centre, as scientific representative on the NSW Department of Agriculture's Animal Research Review Panel, and as Chair of Macquarie University's animal ethics committee. His unique combination of scientific knowledge, political nous, social skills, and care and respect for animals made him eminently qualified for such a broad range of roles. He also served three terms as Head of the School of Biological Sciences at Macquarie University.

By any standards, Des' academic achievements are outstanding, but perhaps his greatest and longest lasting legacy will be the critical role he played in mentoring today's Australian geneticists and wildlife researchers. Des was an inspirational mentor to so many people and his passion for research, genetics and marsupial biology will live on in their work. In recognition of Des' mentorship of postgraduate wildlife management students and his part in stimulating debate on wildlife management issues, the Australasian Wildlife Management Society has posthumously established the DW Cooper Student Thesis Award to recognise student achievement in the field of scientifically based wildlife management research.

Des' own research contributions were officially recognised by societies with which he was actively involved. In 2012, for example, the Genetics Society of Australasia awarded Des the MJD White Medal for his lifetime contribution to genetics research in Australia. It was with great joy that we were able to inform Des of this honour before he passed away.

Des' broad and varied career, and the personal impact he had on the hearts and minds of so many, is impossible to capture within a brief biography. Through this special issue, we hope to capture the spirit of the research that Des inspired in all of us – from genetics and immunology to wildlife management and beyond. We dedicate this issue to his memory.

References

- Belov, K., Miller, R. D., Old, J. M., and Young, L. J. (2013). Marsupial immunology bounding ahead. *Australian Journal of Zoology* **61**, 24–40. doi:10.1071/ZO12111
- Cooper, D. W., and Larsen, L. (2006). Immunocontraception of mammalian wildlife: ecological and immunogenetic issues. *Reproduction (Cambridge, England)* **132**, 821–828. doi:10.1530/REP-06-0037
- Deakin, J. E. (2013). Marsupial X chromosome inactivation: past, present and future. *Australian Journal of Zoology* **61**, 13–23. doi:10.1071/ZO12113
- Deakin, J. E., Cooper, D. W., Sinclair, J. J., Herbert, C. A., Renfree, M. B., and Wakefield, M. (2013). Towards an understanding of the genetic basis behind 1080 (sodium fluoroacetate) tolerance and an investigation of the candidate gene *ACO2*. *Australian Journal of Zoology* **61**, 69–77. doi:10.1071/ZO12108
- Edwards, M. J., and Deakin, J. E. (2013). The marsupial pouch: implications for reproductive success and mammalian evolution. *Australian Journal of Zoology* **61**, 41–47. doi:10.1071/ZO12088
- Eymann, J., Cooper, D. W., and Herbert, C. A. (2013). Brushtail possums (*Trichosurus vulpecula*) in metropolitan Sydney: population biology and response to Suprelorin contraceptive implants. *Australian Journal of Zoology* **61**, 78–86. doi:10.1071/ZO13019
- Graves, J. A. M. (2013). Kangaroo gene mapping and sequencing: insights into mammalian genome evolution. *Australian Journal of Zoology* **61**, 4–12. doi:10.1071/ZO13002

- Hogg, C. J. (2013). Preserving Australian native fauna: zoo-based breeding programs as part of a more unified strategic approach. *Australian Journal of Zoology* **61**, 101–108. doi:[10.1071/ZO13014](https://doi.org/10.1071/ZO13014)
- Neaves, L. E., Zenger, K. R., Prince, R. I. T., and Eldridge, M. D. B. (2013). Paternally inherited genetic markers reveal new insights into genetic structuring within *Macropus fuliginosus* and hybridisation with sympatric *Macropus giganteus*. *Australian Journal of Zoology* **61**, 58–68. doi:[10.1071/ZO12087](https://doi.org/10.1071/ZO12087)
- Ng, J. H. J., and Baker, M. L. (2013). Bats and bat-borne diseases: a perspective on Australian megabats. *Australian Journal of Zoology* **61**, 48–57. doi:[10.1071/ZO12126](https://doi.org/10.1071/ZO12126)
- Renfree, M. B., Papenfuss, A. T., Deakin, J. E., Lindsay, J., and Heider, T. *et al.* (2011). Genome sequence of an Australian kangaroo, *Macropus eugenii*, provides insight into the evolution of mammalian reproduction and development. *Genome Biology* **12**, R81. doi:[10.1186/gb-2011-12-8-r81](https://doi.org/10.1186/gb-2011-12-8-r81)
- Russell, T. C., Herbert, C. A., Kohen, J. L., and Cooper, D. (2013a). The incidence of road-killed possums in the Ku-ring-gai area of Sydney. *Australian Journal of Zoology* **61**, 87–94. doi:[10.1071/ZO12118](https://doi.org/10.1071/ZO12118)
- Russell, T. C., Geraghty, E., and Wilks, S. (2013b). Brushtail possums: do present law, policy and management approaches meet the needs of this species in all its contexts? *Australian Journal of Zoology* **61**, 95–100. doi:[10.1071/ZO12125](https://doi.org/10.1071/ZO12125)
- Zenger, K. R., McKenzie, L. M., and Cooper, D. W. (2002). The first comprehensive genetic linkage map of a marsupial: the tammar wallaby (*Macropus eugenii*). *Genetics* **162**, 321–330.