

# ANIMAL SCIENCE IN AUSTRALIA



Proceedings of the Australian Association of Animal Sciences

Volume 34

**Anchoring knowledge – exploring the  
animal science ecosystem**

34th Biennial Conference

Guest Editors: Edward Charmley (lead guest editor), Reza Barekatain, Surinder Singh Chauhan,  
David Innes, Stephanie Muir, Lucy Watt, Cara Wilson



Pullman Cairns International Hotel, Cairns, Queensland  
5–7 July 2022

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### **Refereeing of Papers**

The papers in this volume have been refereed to the journal standards. The material is subject to copyright and may not be presented elsewhere.

The criteria for acceptance of papers are that the material is of interest to members and industry, has some innovation aspect, is sound, advances scientific knowledge or its application in any field of animal science or animal production, and is presented in a form consistent with instructions to authors. It is also expected that one of the authors of a paper would be present at the conference to present the material as an oral or poster presentation.

### **Ethical Clearance**

It is incumbent upon the authors, where necessary, to have had experiments approved by a relevant animal ethics committee.

### **Authenticity**

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### **Citation of Papers**

These papers were presented at the 34th biennial conference of the Australian Association of Animal Sciences (AAAS) held at the Pullman Cairns Intentional Hotel, Cairns, Queensland (5–7 July 2022).

Invited papers are published in a special issue of Volume 62 of *Animal Production Science*. The one-page papers are published online only as an accessory publication to the special issue of the Proceedings of the 34th Biennial Conference of the Australian Association of Animal Sciences.

Papers should be cited as:

*Animal Production Science*, **62** (followed by the page numbers).

or in the abbreviated form:

*Anim. Prod. Sci.* **62** (followed by the page numbers).

## Welcome from the Australian Association of Animal Science Federal Council President

Welcome to the 34th conference of the Australian Association of Animal Sciences (AAAS, formerly ASAP). This marks an important milestone in the development of the Association with the hard work of the previous Federal Councils now culminating in a new structure and focus on delivering value to members. The AAAS core values of professional integrity, evidence-based science, ethical, sustainable animal enterprises and lifetime support continue to guide our direction and activities. The Federal Council has held two Special General Meetings during the biennium to garner member support to continue the transition of AAAS into the pre-eminent national professional association for animal industry scientists, consultants, industry professional and students.

AAAS members have endorsed the formation of National Committees to advise the Federal Council on partnerships, events, awards, communication and build a network for our early career members. The Association now has a new simplified Constitution that meets the requirements of the relevant legislation and regulatory body and provides the Federal Council with sufficient latitude to continue to transition and provide meaningful benefits for our members at each stage of their professional career.

AAAS was invited to coordinate an issue of *Animal Frontiers*, a journal that publishes discussion and position papers that present international perspectives on high-impact global issues affecting animal agriculture. The AAAS edition (Volume 11, Issue 5) focused on the importance of taking a multidisciplinary approach to solve new world animal science problems. As part of our commitment to building capacity in the next generation of animal scientists, a team of AAAS early and mid-career professional members curated this issue with mentoring and support from AAAS Fellows.

In an exciting development for AAAS members, we have joined the British Society of Animal Science's (BSAS) Global Partnership. BSAS Global supports the continued development of animal science around the world and provides AAAS with the opportunity to form an active collaboration with a like-minded society. This partnership provides AAAS members with the opportunity to participate in BSAS activities (symposia and webinars) at discounted rates. This partnership has already proven fruitful with AAAS facilitating a global session during the BSAS conference in April with the theme Recent developments in climate change policy: A global perspective for livestock agriculture. This conference provided AAAS with a global platform to be involved in the discussion regarding animal breeding objectives, improved property management and animal welfare outcomes and a producer's perspective on the impact of climate policy on a farm business.

In association with the Asian-Australian Association of Animal Production (AAAP) we have provided a top-up scholarship to an Australian AAAS postgraduate student member to present their research at the 19th Animal Science Congress to be held in Jeju in Korea. One of our focus areas is partnerships both domestically and internationally and AAAS will continue to support students to attend conferences wherever possible.

A key focus of all discussions at the Federal Council are the benefits that the association can provide to our members. Over the past few years, the member benefits continue to increase and include webinars, access to journals such as *Animal Production Science*, our monthly newsletter and our biennial conference. This has seen our membership grow more than 25% over the past 2 years.

I wish you all a thought-provoking conference, that will no doubt rekindle old mateships, establish the foundation for new collaborations and inspire you all to be part of the future of Animal Sciences.

A huge thank you from the Federal Council goes to the conference organising committee, these hardworking volunteers are the core of the Australian Association of Animal Sciences.

**Dr Michael Campbell**  
AAAS Federal President

## Welcome from the Australian Association of Animal Science 2022 Conference Chair

A warm tropical welcome to the 34th AAAS Conference in Cairns! A place where the rangelands meet the rainforest, and the rainforest meets the sea. With the conference theme 'Anchoring knowledge, exploring the animal science ecosystems' we are expressing our vision for this event. With a record number of participants expected this year, the conference will hopefully be a place to share newly acquired wisdom, challenge standing hypotheses, ratify existing ideas, and anchor scientific knowledge in innovative solutions for the livestock industry and animal science more generally.

Animal Science has always been an integral part of ecosystem management and there is an enduring demand for comprehensive solutions to improve our production systems whilst minimising environmental impact. With the multi-species nature of our association, we have planned the program to foster learning and amicable discussions amidst a broad range of topics, as well demonstrated by the manuscripts in this special issue. The full papers showcase excellent work in cattle production, land management, goat production, small ruminants and drought resistance, microbiome investigation in both ruminants and aquaculture, forage crop nutritional qualities, precision livestock, virtual fencing, animal (and human) behaviour, and heat stress tolerance. The long list of one-page papers further enriches the conference program, undoubtedly indicating the breadth and high quality of the animal sciences being presented at this conference. Indeed, the number of keen young scientists presenting gives great hope for the future of Animal Science in Australia. I am also particularly excited about the upcoming presentations from our keynote speakers, bringing different perspectives to our conference.

The conference would not be possible without the incredible voluntary effort from the organising committee, and I am truly grateful to all involved. Special thanks to the exemplary leadership demonstrated by Maree Bowen (publication sub-committee), Di Mayberry (program sub-committee), and Cara Wilson (field trip and other events sub-committee). We also appreciate the generous support from the sponsoring organisations.

I hope this conference will allow you the long-awaited opportunity to catch up in person with other animal enthusiasts in a friendly environment favouring amicable discussions and creative thinking. Thank you for enriching this event with your presence.

Enjoy your stay!

**Dr Luis Prada e Silva**

AAAS 2022 Committee Chair

Associate Professor

The University of Queensland

## **AAAS Federal Council 2020–2022**

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## **AAAS Conference 2022 Committee Members**

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## Presidents of the Australian Association of Animal Sciences

M. C. Franklin	1954–55	Armidale
D. S. Wishart	1956–57	Melbourne
T. K. Ewer	1958–60	Brisbane
H. J. Lee	1960–62	Adelaide
H. N. Turner	1962–64	Sydney
R. H. Watson	1964–66	Melbourne
N. T. M. Yeates	1966–68	Armidale
G. I. Alexander	1968–70	Brisbane
F. H. W. Morley	1970–72	Canberra
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C. H. S. Dolling	1974–76	Adelaide
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J. H. Shepherd	1978–80	Perth
D. J. Minson	1980–82	Brisbane
J. L. Corbett	1982–84	Armidale
W. J. Pryor	1984–86	Canberra
G. E. Robards	1986–88	Sydney
J. C. Radcliffe	1988–90	Adelaide
A. R. Egan	1990–92	Melbourne
I. P. Barrett-Lennard	1992–94	Perth
J. H. Temouth	1994–96	Brisbane
C. J. Thwaites	1996–98	Armidale
F. W. Nicholas	1998–00	Sydney
P. I. Hynd	2000–02	Adelaide
A. R. Egan	2002–04	Melbourne
C. M. Oldham	2004–06	Perth
D. P. Poppi	2006–08	Brisbane
R. M. Herd	2008–10	Armidale
R. D. Bush	2010–12	Sydney
R. D. Bush	2012–14	Sydney
P. I. Hynd	2014–16	Adelaide
P. I. Hynd	2016–18	Adelaide
M. A. Friend	2018–20	Wagga Wagga
M. A. Campbell	2020–22	Wagga Wagga

## Fellows of the Australian Association of Animal Sciences

Fellowship of the Association shall be awarded to persons who have rendered eminent service to animal science or animal production in general or within Australia in particular.

1956	Charles Euston Young	1986	George Alexander Charles Hoani Scott Dolling Ian Lind Johnstone Dennis John Minson William Henry Southcott
1962	Mervin Clarence Franklin Hedley Ralph Marston		
1964	Philip Gurner Schinckel	1988	John Lovick Corbett Haydn Lloyd Davies Peter Everard Geytenbeek Geoffrey Roger Pearce Laurence Cecil Snook
1966	Helen Newton Tumer		
1968	Keith Valentine Leighton Kesteven Archibald James Vasey Rodger Henry Watson	1990	Allan Axelsen James Philip Hogan Trevor William Scott Robert Humphrey Weston
1970	Eric John Underwood David Sutcliffe Wishart		
1972	Hector John Lee George Russell Moule	1992	Michael Freer Hugh McLeod Gordon John Ryves Hawker David Roy Lindsay Mary Esther Rose
1974	Frederick Harold William Morley		
1976	Alan Charles Hassall Lancelot Hamilton Lines Ian Wilbur McDonald Patrick Reginald McMahon	1994	Russel William Moubray Hodge Keith Johnston Hutchinson James Patrick Langlands Douglas Barrie Purser John Edward Vercoe
1978	Albert Henry Bishop Victor Gordon Cole Leslie Alfred Downey Reginald John Moir Robert Lovell Reid Wallace Carl Skelsey Percival James Skerman Dudley Martin Smith Neil Tolmie McRae Yeates	1996	Ronald Alfred Leng John Clive Ratcliffe Frank William Nicholas
1980	Graham Ian Alexander Gordon Lee McClymont Terence James Robinson Derek Edward Tribe	1998	Robert Thomas Cowan David James Farrell Justin Joseph Lynch John Lionel Wheeler
1982	Sydney John Miller Norman McCall Tulloh Henry Greig Turner William Maxwell Willoughby	2000	Bernard Michael Bindon Barrie John Restall Geoffrey Edward Robards John Hardy Ternouth
1984	William George Allden Robert Henry Hayman James Irwin Faithfull Maple-Brown Jim Harcourt Shepherd	2002	Ernest Frank Annison John Vivian Nolan Barry William Norton
		2004	Keith William Entwistle Neil Patrick McMeniman William Anthony Pattie

2006	Norman Royce Adams Heather Burrow Graham John Faichney David Gordon Masters David William Pethick	2014	Frank Rowland Dunshea Robert Maxwell Herd
		2016	Alan William Bell John Langtree Black Robert Menzies Dixon
2008	David Blair Coates Hugh Dove Peter Thomas Doyle Adrian Roderic Egan Christopher Morris Oldham	2018	Bruce Lipson Hancock Susan Faye Hatcher David Lawrence Hopkins Athol Victor Klieve Christopher Simon McSweeney
2010	Philip Ian Hynd Laurie Robert Piper Dennis Paul Poppi Cyril Richard Stockdale Peter Charles Wynn	2020	Edward Charmley Roger Stephen Hegarty Robert Arthur Hunter Graeme Bruce Martin
2012	Wayne Leslie Bryden Geoffrey Norman Hinch Stuart Ross McLennan Victor Hutton Oddy	2022	Brian Joseph Leury Robyn Dorothy Warner



## Honorary Members of the Australian Association of Animal Sciences

Honorary Members shall be those who, in the opinion of the Federal Council, have rendered eminent service to the Association.

1976	Joseph Phillip Kahler
1980	Clarence James Daley
1982	Ian Neville Southey
1986	John Murray George Andley George Ward
1988	Edward (Ted) Ben Byers John Terrell Williams
1990	Barry Graham Lukins
1994	Christopher John Thwaites Edmund Wyndham
1996	Eric John (Jack) Hilder
1998	Narelle Yvonne Morse Evan Hollinworth Macdonald Barnet
2000	Gordon Terrell Williams
2002	David Macfie Richard Moss
2004	David Hennessey
2006	Anthony (Tony) Charles Schlink
2010	Michael Leo Tierney

## The Underwood Lecture

In honour of **Professor E. J. (Eric) Underwood** (1905–1980), AO, CBE, BSc(Agric)(Hons)(WA), PhD(Cantab), Hon. DRurSc(UNE), Hon. DSc(Wis), Hon. DSc(Agric)(WA), Hon. DSc(Melb), FRS, FAA, FFA, FAIAS, FASAP, Hon. FACVS. He was Hackett Professor of Agriculture, Dean of the Faculty of Agriculture, and Director of the Institute of Agriculture at the University of Western Australia and a world authority on mineral nutrition.

The Underwood Lecturers have been:

1984	R. J. Moir
1986	H. J. Lee
1988	I. W. McDonald
1990	A. D. Robinson
1992	J. Stocker
1994	K. W. Entwistle
1996	D. E. Beever
1998	H. Dove
2000	N. F. Suttle
2002	J. E. Vercoe
2004	J. C. MacRea
2006	D. Lindsay and B. Paganoni
2008	G. Atwood
2010	D. P. Poppi
2012	R. S. Hegarty
2014	J. L. Jacobs
2016	J. L. Black
2018	D. G. Masters
2020	M. Gill
2022	J. J. Loor

## The McClymont Lecture

The 22nd Federal Council introduced this lecture to honour **Professor G. L. (Bill) McClymont** (1920–2000), AO, BVSc(Syd), PhD(Cantab), Hon. DRurSc (UNE), FAIAS, FASAP, Foundation Dean (1955–1976) of Rural Science at the University of New England, and a pioneer in the development and application of ecological principles to the teaching and practice of agriculture.

The McClymont Lecturers have been:

1998	B. E. Norton
2000	A. R. Sykes
2002	G. Grigg
2004	T. G. Reeves
2006	J. Scott, T. Coventry and H. Sutherland
2008	W. H. Winter and P. T. Doyle
2010	P. Morris
2012	W. L. Bryden
2014	A. W. Bell
2016	H. Dove
2018	F. D. Provenza
2020	M. R. F. Lee
2022	C. M. Thornton

## The Stobbs Lecture

To honour **Professor H. (Harry) Stobbs** (1932–1978), BSc(Agric), PhD, the Harry Stobbs Memorial Fund established a Lecture that was to be presented at an appropriate conference and if possible published in *Tropical Grasslands*. The 27th Federal Council was invited to include the lecture in its biennial conference and has done so since 2008 with the exception of a lecture presented to the 8th Australian Tropical Pastures Conference in 2009. Harry was recognised internationally for his contributions to our understanding of the plant/animal interaction, particularly his work on grazing behaviour on different sward types in tropical environments.

The Stobbs Lecturers have been:

1980	F. H. W. Morley
1981	R. E. Blaser
1982	V. R. Squires
1984	R. F. Barnes
1985	R. E. Harrison
1987	R. J. Jones
1990	C. Lascano
1993	S. Archer
1994	L. 't Mannetje
1995	J. W. Stuth
1996	F. D. Provenza
1997	J. B. Schiere
2002	W. H. Burrows
2008	G. R. Edwards
2009	M. J. Fisher
2010	D. L. Swain
2012	P. Gregorini
2014	D. Pacheco
2016	A. de Vega
2018	J. M. B. Vendramini
2020	H. C. Norman
2022	D. J. Augustine

## The Barnett Lecture

The 28th Federal Council inaugurated this lecture on animal welfare to honour **Associate Professor J. L. (John) Barnett** (1949–2009), BSc (Zool)(Hons)(Sheffield), PhD (Monash). John was internationally recognised for his outstanding contributions to stress physiology and stress-related problems of animal welfare. Over 30 years, his research provided a timely balance on discussions within science on the scientific assessment of animal welfare and its interpretations.

The Barnett Lecturers have been:

2010	P. H. Hemsworth
2012	G. M. Cronin
2014	I. Veissier
2016	A. J. Tilbrook
2018	P. H. Hemsworth
2020	C. Lee
2022	R. E. Doyle

## Fellows elected 2022



### Brian Joseph Leury

BAGrSc (Hons) (La Trobe University), PhD (La Trobe University)

Brian Leury graduated with a degree in Agricultural Science (Honours) in 1981 and obtained his PhD in ruminant nutrition and physiology in 1987, both from La Trobe University.

Brian is an honorary Professorial Fellow at the University of Melbourne having recently retired after almost 30 years with the University and a research career spanning over 35 years in livestock nutrition, growth and development, and nutritional physiology. Over this time Brian has maintained a balanced approach to research, combining fundamental with applied research, providing commercial and public good outcomes. Brian has also been a leading University administrator having been Acting Dean and Deputy Dean of the Faculty of Veterinary and Agricultural Sciences, Head of the School of Agriculture and Food, as well as making a significant contribution to animal welfare as Chair of Animal Ethics committees and as the Faculty Animal Experimentation License holder. In addition, Brian represented the Faculty on several University-wide committees and on the Australian Council of Deans of Agriculture. Prior to joining the University of Melbourne, he spent six years in the State Departments of Agriculture in Western Australia and Victoria undertaking applied research within the sheep wool and meat industries.

Brian is an internationally recognised scientist and has made some outstanding contributions to our understanding of ruminant nutrition, nutrient partitioning in pregnancy and lactation, energy metabolism and body composition and reducing the effects of environmental stress on livestock performance. Two examples of this include the widespread international adoption of dietary magnesium to reduce stress around slaughter and ensure meat quality and advancing our knowledge of the physiology underlying efficiency of feed conversion. A real strength of Brian's is his ability to use complex analytical tools, including investigating biology at a cellular and molecular level, to

answer quite applied questions and to then present these findings to scientific and farmer audiences.

Brian's research has an impressive breadth and quality, and he is held in high esteem nationally and internationally. He has published over 400 journal, book, conference, and technical articles including over 170 refereed journal and conference papers, around 40% as a senior author, indicating leadership and stewardship of this research and an h-index of 39. Brian has a demonstrated ability to work effectively in multidisciplinary groups and to enhance collaborations, which is seen in his impressive list of co-authors and collaborating organizations. He has published in a broad range of journals and, where relevant, in high impact percentiles for the respective discipline. An example of this is a co-authored paper published in *Proceedings of the National Academy of Science* which has accrued 790 citations.

Brian has a passion for capacity building and nurturing and mentoring young scientists. Over his research career he has supervised or co-supervised and mentored many early career scientists, PhD students, masters students and undergraduate students, many of whom have gone on to leadership roles in industry and academia. He has always had a substantial teaching and curriculum development role, including stints as coordinator of Agricultural Science and Animal Science and Management degrees. He has exhibited dedication and enthusiasm for students and their welfare and maintained a strong nexus between his teaching and research. He is the Editor in Chief of *Ruminants* and on the Editorial Board of *Animals*. Brian has provided service to AAAS being Treasurer of the Victorian and Tasmanian Branch of ASAP in the late 1990's and early 2000's and was on the organising committee for the Biennial meeting in Melbourne in 2004.

In recognition of his contribution to animal science and the animal industries of Australia through education, research and leadership, the Australian Association of Animal Sciences is pleased to enrol Professor Brian Leury as a Fellow.

**Robyn Dorothy Warner**

BAgrSc, (La Trobe University), MAgrSc (University of Melbourne), PhD (University of Wisconsin-Madison)

Robyn Warner is a meat scientist and a Professor in the Faculty of Veterinary and Agricultural Sciences and Chair of the multidisciplinary Future Food Hallmark Research Initiative, at the University of Melbourne (UoM). A Melbourne-raised girl, Robyn had many animals as pets and also developed her love of animals and agriculture through her regular holiday visits, to a farm in Christmas Hills. On graduating from LaTrobe University with a Bachelor in Agriculture, Robyn tutored at UoM, then joined the Victorian Department of Agriculture (Vic-DA). Her early research on dark-cutting in beef carcasses enabled her to complete a Masters in Agricultural Science at UofM and initiated her research interest, and many publications, on the topic which continues today.

Further studies supported by Vic-DA and the pork industry enabled Robyn to undertake a PhD at the University of Wisconsin-Madison. She became Section Leader and Principal Research Scientist at Vic-DA until she joined CSIRO as a Senior Principal Research Scientist. She recently joined UofM and in each place of employment, she built up the meat science group and attracted funding through her food and agricultural company connections. Robyn has an excellent and sustained track record in leadership and conducting multi-disciplinary research and her research uses knowledge of bio-physical aspects of muscle to investigate important issues for the meat industry.

Robyn has over 200 peer-reviewed publications and is associate/section editor for *Animal Production Science*, *Encyclopedia of Meat Science*, *Meat and Muscle Biology* and *MDPI-Foods*. Robyn is Australia's contact person for the International Congress of Meat Science and Technology (ICOMST) and has had many roles for the annual ICOMST including conference co-chair of the Melbourne-ICOMST. She is an inaugural member of the Meat Standards

Australia (MSA) scientific committee, assuring quality to Australian consumers of red meat. Robyn has been recognised with awards including American Meat Science Association International Research and Lectureship Award, the National Eureka Science prize and the International Meat Secretariat Millenium Prize.

Robyn's work has had impact on the quality systems implemented for red meat in Australia and overseas, the packaging of red meat and pork on the supermarket shelves and the management of cattle, sheep and pigs pre-harvest, and carcasses post-harvest, to improve meat quality. Her research with colleagues demonstrated the negative effect of high oxygen modified atmosphere packaging on muscle protein degradation and eating quality of white and red meat and changed how meat is packaged. Results from experiments conducted with Drewe Ferguson (CSIRO), on effects of saleyards on beef eating quality, are implemented in the MSA model for predicting eating quality, along with the guidelines for preventing dark-cutting in beef carcasses. Knowledge translation to the public is evident through appearance on radio, TV and in local, national and international press. In her Masters subject, Meat and Meat Products, as well as with PhD students, Robyn uses her industry experience to inspire the future animal and meat scientists. Robyn has always had a strong nexus between her teaching and research and her list of PhD graduates includes many who are placed in senior industry, government and academic positions.

In recognition of her exceptional record in research and research application both nationally and internationally that has transformed the Australian meat industry towards new quality standards, the Australian Association of Animal Sciences is pleased to enrol Professor Robyn Warner as a Fellow.

## AAAS Conference 2022 Sponsors

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### Registration



### Welcome Reception



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