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ANIMAL PRODUCTION IN AUSTRALIA

PROCEEDINGS OF THE AUSTRALIAN SOCIETY OF ANIMAL
PRODUCTION

VOLUME 28

TWENTY-EIGHTH BIENNIAL CONFERENCE

LIVESTOCK PRODUCTION IN A CHANGING ENVIRONMENT

Editors: P. L. Greenwood, R. C. Dobos, J. V. Nolan, C. A. Anderson and H. L. Clements

The University of New England, Armidale, 11–15 July 2010

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ETHICAL CLEARANCE

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

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CITATION OF PAPERS

The papers in this Volume were presented at the 28th Biennial Conference of the Australian Society of Animal Production held at The University of New England, Armidale, 11–15 July 2010.

Papers should be cited as:

Animal Production Science, **50** (followed by the page numbers).

or in the abbreviated form:

Anim. Prod. Sci. **50** (followed by the page numbers).

WELCOME FROM THE 28TH COUNCIL OF THE AUSTRALIAN SOCIETY OF ANIMAL PRODUCTION

On behalf of the 28th Council I commend this special edition of *Animal Production Science* to you for it showcases the great work being done by ASAP members on behalf of our farm animal industries. These peer-reviewed papers, along with short papers published by our Society in the companion edition of *Animal Production in Australia*, were presented to the Society's Biennial Scientific Conference held at the University of New England, Armidale, 11–15 July 2010.

We have chosen the Conference theme: “Livestock production in a changing environment”. We are witnessing change: in the basis of provision of government funding of R, D and E; a move to open competition between tertiary education institutions for students and the funding that comes with them; farmers grappling with increasing regulation and community expectations and a high Aussie dollar that is hurting their export sales; whilst seemingly everyone in the community has an opinion on whether we are witnessing “man-induced” climate change.

It is in this changing environment that the conference committee decided to invite expert speakers to look ahead and present their views on the themes of food security and production, education, extension, and adoption. Progress and looking ahead are also the themes for the traditional ASAP special lectures: the McClymont (Agricultural Systems), Underwood (Livestock Nutrition) and Harry Stobbs (Grazing Management) lectures; and new this conference: the John Barnett lecture (Animal Welfare).

We have strived to build on the initiative of the previous Federal Council to attract new members and to ensure that ASAP remains relevant to researchers and producers alike. This year we welcome to the Armidale conference Ebor Beef members who have chosen to attend our conference, not just to update their knowledge of animal production research, but also to interact and discuss future needs for R&D in their industry. We will present Young Scientists Awards for presentations and up to two Young Member Travel Awards.

We will also welcome four young members from the New Zealand Society of Animal Production. Their attendance is sponsored by our New Zealand counterpart as an initiative to help bring both our societies to work more closely. Both societies are now planning toward a joint scientific conference in New Zealand in 2012.

We have encouraged more papers on poultry science after some years of rather low participation by those working for this important animal industry. We have established the Paul Barnett Lecture to showcase advances in animal welfare science that will be so important to the future of animal farming.

The ASAP conference returns to the UNE campus after 12-years. Delegates will find a modern campus. Alumni may lament the removal of their beloved physiology building and glasshouses from the central campus but should find solace in the much bigger and state-of-the-art replacement glasshouse that overlooks the dairy flats and the big new cattle animal house being built for nutrition and greenhouse gas research.

The Council trusts that you find the two volumes of conference papers an invaluable reference and that the conference achieved the aim of providing the most relevant forum for integration of scientific knowledge into profitable, sustainable farming systems in a changing environment.

Robert Herd
President

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FELLOWS OF THE AUSTRALIAN SOCIETY OF ANIMAL PRODUCTION

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1986	George Alexander Charles Hoani Scott Dolling Ian Lind Johnstone Dennis John Minson William Henry Southcott	2010	Laurie Robert Piper Philip Ian Hynd Dennis Paul Poppi Cyril Richard Stockdale Peter Charles Wynn

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

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

THE UNDERWOOD LECTURE

In honour of **Professor E.J. (Eric) Underwood**, 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. Agricultural Scientist 1905 to 1980.

The Lecturers have been:

1984	R. J. Moir
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	Professor J. C. MacRea
2006	D. Lindsay and B. Paganoni
2008	G. Atwood

The 2010 Underwood Lecturer is **D. Poppi**

THE McCLYMONT LECTURE

The 22nd Federal Council introduced this lecture to honour **Professor G.L. (Bill) McClymont**, AO, BVSc(Syd), PhD(Cantab), Hon. DRurSc(UNE), FAIAS, FASAP, Foundation Professor (1955 to 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 Lecturers have been:

1998	B. E. Norton
2000	A. R. Sykes
2002	G. Grigg
2004	Professor T. Reeves
2006	J. Scott, T. Coventry and H. Sutherland
2008	W. Winter and P. Doyle

The 2010 McClymont Lecturer is **P. Morris**

THE HARRY STOBBS LECTURE

The 27th Council presented a lecture to honour **Professor H. (Harry) Stobbs**, BSc(Agric), Ph.D. Harry was recognised nationally and internationally for his contributions to our understanding of the plant/animal interaction, particularly his work on understanding grazing behaviour on different sward types in the tropical environment.

The Lecturers have been:

2008	G. Edwards
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The 2010 Harry Stobbs Lecturer is **D. Swain**

THE JOHN 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 nationally and 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 2010 John Barnett Lecturer is **P. Hemsworth**



**Laurie Robert
Piper**
BRurSc, PhD

Laurie Piper graduated in Rural Science in 1962 from the University of New England. Laurie came from a rural background and after graduating, began a career with CSIRO Division of Animal Genetics at the CSIRO National Field Station,

“Gilruth Plains”, Cunnamulla, Queensland. He joined the group led by Dr Helen Newton Turner and worked on projects focused on the physiological basis of genetic variation in wool production. These projects demonstrated clearly that the main contributor to increased wool production from genetic selection for that trait was increased efficiency, with only minor contributions from increased body size and appetite. They also demonstrated that genetic differences in efficiency of wool production were not associated with genetic differences in digestive efficiency but may be associated with differences in metabolism of sulfur containing amino acids.

In 1967 Laurie transferred to the headquarters of the CSIRO Division of Animal Genetics at Delhi Road, North Ryde, and in the following year began a period of classical training in quantitative genetics at the prestigious Institute of Animal Genetics, Edinburgh. His PhD studies were concerned with theoretical and experimental studies of the nature of genetic variation underlying continuously distributed traits.

In 1972 Laurie returned to North Ryde and began a long term research partnership with Bernie Bindon focused developing genetic and non-genetic tools for improving reproduction rate in sheep. These projects included large scale studies of the genetics of ovulation rate, litter size and lamb survival in Merino sheep. They also included detailed analysis of the genetics and reproductive biology of the Booroola Merino sheep, known for its highly prolific reproduction rate. Piper and Bindon’s studies of the Booroola Merino established that the extraordinary

prolificacy of this animal resulted from the segregation of a major gene affecting ovarian function, leading to multiple ovulations. This discovery, now confirmed by the cloning of the gene responsible (Fec-B), has re-opened scientific interest by geneticists in major genes affecting other productive traits in domestic livestock.

In 1973, a team including Laurie Piper, Leo le Jambre, and Ian Barger began a new project aimed at investigating genetic alternatives to drenching for control of helminthiasis, a disease of major economic significance to sheep production in Australia. These studies clearly demonstrated that helminth resistance in sheep was moderately heritable and provided the basis for including helminth resistance in modern day breeding objectives for Merino sheep.

Laurie Piper’s research career centred around quantitative genetics and animal breeding and spans wool production, wool quality, sheep reproduction, reproductive biology, parasite resistance, cattle reproduction, aquaculture and sheep genomics. He has had a highly successful career in CSIRO over some 48 years, as a research scientist, research innovator and manager, reflected in his elevation to the CSIRO’s highest research classification of Chief Research Scientist.

He has been mentor to many young scientists. He has been recognized by his peers by election as Fellow of the Australian Academy of Technological Sciences and Engineering; by election as Fellow of the Association for the Advancement of Animal Breeding and Genetics; by being awarded the Helen Newton Turner Medal for outstanding contributions to genetic improvement of Australian Livestock and by election as Life Member of the Society for Reproductive Biology. Laurie has been invited to countless international genetics conferences, congresses and consultancies in Australia, USA, Europe, China, Latin America, Fiji, Kenya, Ethiopia, Israel and New Zealand. He has a distinguished publication record of 72 refereed papers, 13 books or book chapters and 140 conference papers. He has taken leadership in many initiatives, including establishing the CRC for Premium Quality Wool (as CEO and Board Director), as an Adjunct Professor and Council Member at UNE and as Australia’s representative on national and international genetics committees.

Laurie has been a member of ASAP since 1962. He has made a lifetime contribution to animal production in Australia. The Australian Society of Animal Production is pleased to enrol him as a Fellow of the Society.



Philip Ian Hynd
BRurSc (New England), PhD (Adelaide)

Phil Hynd graduated with first class honours in Rural Science from the University of New England in 1978. He completed a PhD in animal nutrition and physiology at the University of Adelaide and was the inaugural JS Davies Postdoctoral Fellow at the Waite Campus in Adelaide. His postdoctoral research focus was on nutrient yields in grazing beef cattle, which required development of novel surgical approaches to multi-fistulation of cattle. He was appointed lecturer in animal nutrition at the University of Adelaide in 1984, and established a research program directed at understanding the cellular and molecular events involved in wool production, and applied the findings to genetic and nutritional improvement of wool production. Phil has been at the forefront of attempts to find alternatives to surgical mulesing and has championed the use of barebreach genetics and was instrumental in the development of intradermal necrotising agents to replicate mulesing. His current research interests are at the interface of genetics and nutrition (functional genomics), particularly in the developing fetus (fetal programming). This work established Phil as an internationally-recognised expert in animal fibre production and he has been invited to 12 international conferences as invited speaker and chairperson. He has also been appointed as a consultant to multinational hair companies to use the knowledge derived from wool research in human hair and skin applications. Phil has authored or co-authored 60 peer-reviewed publications, 12 invited reviews, 4 book chapters, 79 conference proceedings

and holds 2 patents. Phil has led a number of national and international research programs including the education program of the Cooperative Research Centre for Premium Quality Wool, and the wool subprogram of the \$50 million co-investment in sheep genomics.

Phil was appointed to the Chair in Animal Production and Head of the Department of Animal Science at the University of Adelaide in 1997. From 2000 to 2002 he was the interim Head of the School of Agriculture, Food and Wine based at the Waite Campus in Adelaide. He was a Board member of Australian Grain Technologies Pty Ltd from 2003/2004. He was appointed as Director of the Roseworthy Campus in 2004. In his role as Director he was instrumental in establishing the first veterinary science degree in South Australia in 2008. Phil has always been an enthusiastic teacher and has supervised or co-supervised 25 Honour's students, and 22 PhD and Masters students. He and his colleagues established the Animal Science degree program at Roseworthy and this has proven to be a very successful and popular program. Phil teaches into this program, as well as to agricultural science students, and now to veterinary science students.

Phil was State President of the SA Branch of the Australian Society of Animal Production in 1987/88 and was the Federal President in 2000–2002. He is the President of the Australasian Wool and Hair Research Society and he is a member of the Nutrition Society of Australia.



Dennis Paul Poppi

BAgrSc (Queensland), MAgSc (Queensland), PhD (Queensland)

Dennis Paul Poppi graduated in Agricultural Science from the University of Queensland in 1972, and followed on at the same institution to complete a Masters degree on the “Digestive tract metabolism of some phosphorus supplements in sheep” under the supervision of Prof. John Ternouth, and then a PhD on the “Voluntary intake of leaf and stem fractions of tropical forages offered to cattle and sheep”, supervised by Dr Dennis Minson and Prof. Ternouth.

Between 1979 and 1981, he was a Postdoctoral Fellow at Lincoln College, New Zealand, and at The Rowett Research Institute, Scotland, where he worked on quantifying the nitrogen transactions of sheep exposed to internal parasites. On returning to Lincoln he was a lecturer in animal nutrition and commenced a program of research with Prof. Andrew Sykes and a group of postgraduate students on quantifying and ameliorating the nutritional consequences of internal parasites in lambs, quantifying the metabolisable protein supply and use in early weaned lambs on a range of common NZ pastures, and establishing intake regulatory mechanisms for lambs at pasture.

Dennis returned to the University of Queensland in 1990 as a lecturer in nutritional biochemistry and commenced a research program largely focused on improving the nutrition of cattle grazing tropical/sub-tropical pastures in northern Australia. During this period he collaborated with Dr Stuart McLennan and with a large number of postgraduate students they examined the adaptation of cattle to low protein forages and their responses to various supplement types, strategies to increase microbial protein production, mechanisms of intake regulation, and the application and modification of the feeding standards for cattle

in northern Australia. Other collaborative work included studies into tissue protein synthesis and gene expression, low milk protein in dairy cattle in the sub-tropics, and the linkage of microbial protein production with the microbial ecology of the rumen. In recognition of his significant contribution to research and teaching he was appointed Professor of Animal Nutrition at the University of Queensland in 2008 and is a Honorary Research Fellow at the University of Guelph, Canada.

During his academic career, Dennis has supervised 33 PhD and 8 research Masters degree students, and hosted 4 post-doctoral fellows. He has published widely with over 50 internationally refereed journal articles, 25 invited reviews and book chapters and 90 conference papers/abstracts. In addition, he has been associate editor of *Animal Science* (UK) and *Tropical Grasslands*, and on the international committee of the International Symposium on the Nutrition of Herbivores and the International Workshop on Modelling in Farm Animals. He has a large research program with ACIAR in Indonesia, consulted widely with the International Atomic Energy Agency, and is on the Program Administrative Council of the Global Livestock CRSP, UC Davis, USA.

Dennis has been a member of ASAP since his postgraduate days and served on the Queensland branch committee in 1978 and then from 1990 onwards, including two terms as branch president (1992–93 and 2000–02). He was Federal Editor of the ASAP proceedings in 1996 and Federal President in 2006–08, capping off an outstanding contribution to the society. The Australian Society of Animal Production is pleased to enrol him as a Fellow of the Society.



Cyril Richard Stockdale

BAgrSc (Melbourne), MAgSc (Melbourne), PhD (New England), DAgric (Melbourne)

Richard Stockdale was born at Leongatha in South Gippsland, Victoria, and raised on a dairy farm there. One of his fervent hopes as a teenager was that he would not have to milk cows for the rest of his life, a hope that provided the impetus for going to university. He graduated with a BAgrSc from Melbourne University in 1971, and this was followed by a Masters degree from Melbourne in 1983, a PhD from the University of New England in 1992, and a Doctor of Agricultural Science in 2005, again from Melbourne University.

On graduating from university Richard foolishly declared that he wanted nothing whatever to do with dairy cows or the 'Department of Agriculture', and was keeping an eye out for anything associated with beef cattle in northern Australia. It is, therefore, ironic that he ended up with dairy cows in the Victorian Dairy Department, with this coming about because his first job offer was as a dairy extension officer anywhere in Victoria or as a research officer at Kyabram. Thus began Richard's long association with dairying and Kyabram until the closure of the research centre in mid 2009.

Richard's dairy research journey has included almost 40 years of endeavour into various aspects of dairy cow management and nutrition. His research has generally been applied in nature, but always with the need to understand 'how and why' things happened so that results could be extrapolated to other situations and environments. A key focus has been grazing dairy cows. In the beginning, this concerned grazing management and stocking rates, but quickly evolved to what he referred to as 'grazing ecology' – the interaction between cows, the pastures they grazed, and the many supplement options available to improve animal performance and productivity. In the 1970s, there was also a deal of bloat research, and more recently Richard has touched on metabolic disorders through

his research into the nutrition of the 'transition cow', with the period around calving increasingly being considered as the most important in a cow's lactational cycle. Currently, Richard's research focus has shifted significantly, towards human health rather than dairy cows *per se*, with the dairy cow just being used as an intermediary. Selenium associated with milk protein has recently been shown to have significant anti-cancer and immune system properties. Thus, the challenge has been to produce milk with predictable and consistent concentrations of selenium to facilitate the manufacture of selenium-enhanced milk protein products.

Although Richard has long been considered one of the 'quiet achievers' in dairy research, he has also been very active in publicising his work. He is well known and respected in the dairy industry through his many forays into extension, extensively utilising the popular media and regularly speaking at discussion groups and industry meetings and conferences. This comes on top of his science output, where more than 100 articles have been published in refereed scientific journals, and a similar number of papers presented at scientific conferences. Moreover, Richard has contributed to the education of the next generation of animal scientists, particularly in relation to the process of scientific publication.

Finally, Richard has been a staunch advocate for, and an active participant in, the activities of the Australian Society of Animal Production, including with the Victorian branch when it was active. He has attended and presented papers at almost all biennial conferences since 1976, and as a member of Federal Council in 2003–04, he was Editor of the Proceedings of the 2004 Conference. In addition, he has been a member of the Australian Institute of Agricultural Science and Technology for 40 years, and a member of the Australian Agronomy Society.



Peter Charles Wynn

BRurSc, Dip Ed, MRurSc, PhD

Peter Charles Wynn has made an outstanding contribution to both research and teaching in animal science and production since graduating from the University of New England in 1972. He completed a Masters degree with Professor Neil Yeates on meat quality before undertaking a PhD at the University of Sydney with Professor Frank Annison on aspects of the endocrine control of wool growth. After a postdoctoral period in endocrinology at the National Institutes of Child Health and Human Development, Bethesda, Maryland, Peter was appointed as a research scientist in CSIRO Animal Production, Prospect, in 1984. In 1990, Peter became a Senior Lecturer and then Associate Professor in Animal Production at the University of Sydney, where he remained until he accepted the McCaughey Chair in Animal Production in the School of Animal and Veterinary Sciences at Charles Sturt University in 2009.

When Peter returned to Australia his major research areas with CSIRO were biological wool harvesting and immunological modulation of the stress response and growth. The latter area has been a major focus for much of his research career and although the initial emphasis was on sheep, he is now also recognised internationally for studies with pig growth physiology. His group has been able to demonstrate the potential for manipulating growth outcomes immunologically and through neonatal programming in animals maintained in suboptimal environments and to delineate the role of the stress axis in modifying growth performance. In recent years Peter has been working on aspects of lactational physiology. He and his group have investigated nutritional modulation of milk composition in grazing cows through to cellular and molecular studies of mammary epithelial cell viability and gene expression for milk proteins and milk production traits. His research has been supported by industry and government grants and has resulted in the publication of a book and 81 fully refereed journal articles, reviews and book

chapters. Within his research program, Peter has supervised 15 PhD students, 11 Masters students and over 30 Honours students. This a role that he accepts readily and treats very seriously and is regarded by his students as an excellent mentor.

During his tenure at the University of Sydney, Peter developed a passion for undergraduate teaching which he has maintained throughout his career. He is a great believer in the educational philosophy of “science with practice” which is often difficult to achieve in the current tertiary funding environment. In this regard he has been instrumental in the expansion and ongoing success of the annual Australian Intercollegiate Meat Judging Workshop. His interest in education has spread to developing economies, including China and especially Pakistan where he now has an active involvement in dairy extension and research. The latter activities have been funded by the Australian Centre for International Agricultural Research and the Asian Development Bank. He is also a member of the Steering Committee for the newly formed Asian Dairy Network which has been instigated by FAO in Thailand.

Since joining the Society in 1974, Peter has continuous involvement with ASAP as an office bearer or committee member at Branch and Federal level. He has held numerous executive positions including Federal Secretary and is a Past President of the Sydney branch. Peter has continued his international promotion of animal production and those of ASAP as the Australian representative on the board of the Asian-Australasian Associations of Animal Production Societies since 1996. In this role he has contributed significantly to the development of animal science in the region as Chair of AAAP’s Scientific Advisory Committee. For these achievements and his ongoing contribution to education and research in animal science, the Australian Society of Animal Production is pleased to enrol Professor Peter Wynn as a Fellow of the Society.

**Michael Leo Tierney**

BSc (Wool Tech) (NSW), PhD (NSW)

Mick Tierney has made an outstanding contribution to the Australian Society of Animal Production (ASAP) and to the animal industries of Australia. He graduated from the University of New South Wales with first class honours and a PhD was awarded in 1974 for his work on “Genetic Aspects of Puberty in Merino Ewes”.

Mick started work with the Queensland Department of Primary Industries in 1972 where he was the leading animal geneticist for the department in poultry and sheep, and later was a leading contributor to programs with beef cattle, goats, emus and ostriches. His most important contribution in that period was his leadership in the program on developing the Australian Friesian Sahiwal (AFS), a breed of tropically adapted dairy cattle. In all these areas he applied skill and dedication to improving the genetics of livestock and to providing services to farmers seeking to improve their livestock. He also led the QDPI Beef Genetic Improvement Project during the time when all the major tropical breeds began using GROUP BREEDPLAN. He retired from QDPI in 2002 to concentrate on his other major interest – Rugby League administration.

Mick’s work in tropical dairy genetics has seen him work in ten countries, mainly in South East Asia and Asia. He is still continuing with overseas consultancies in his retirement.

Mick has been a long-term member of ASAP, having first joined the Sydney branch when he was at university in the late 1960s. He transferred to the Queensland branch in 1972 and has been Queensland branch secretary (1999–present) and federal branch secretary (2006–2008). He has presented papers at six ASAP conferences over the years. He is also a member of the Association for the Advancement of Animal Breeding and Genetics.

He has been an enthusiastic supporter of ASAP activities at the national and state level. He has many contacts in the industry and he uses these to help ASAP fulfill its goals. Mick has done exemplary work in his various committee roles using his own time and resources generously. His service to ASAP has been well above and beyond what is normally offered and for his contributions to ASAP, and the animal industries in general, Michael Tierney is nominated for Honorary Membership within the Australian Society of Animal Production.