Oration by 1995 Helen Newton Turner Medal Recipient - L. R. Piper

Dr Sheridan, Sir William and Lady Vines, Vice Chancellor, distinguished guests, ladies and gentlemen -

It is with a deep sense of pride and a very real warm inner feeling that I stand here today to accept the Helen Newton Turner Medal. I must also confess to some nagging doubts about whether my contributions to the genetic improvement of livestock merit such a prestigious award, but I am pleased and delighted to accept it. This is especially so given that for the first eleven years of my life with CSIRO, I was part of a sheep breeding research team led by Helen Newton Turner.

Helen Turner is a remarkable scientist who had a most unusual career. She began her professional life as an architect, but jobs were scarce in the early years of the depression and she joined CSIRO as a personal assistant to Ian Clunies Ross. He recognised her developing interest in and talent for statistics, and arranged for a period of training in London with R A Fisher and Frank Yeates. Her career in statistics was thus launched and this soon developed into a lifelong interest in the applied statistical sciences of quantitative genetics and sheep breeding. She has been an inspiration to a generation of quantitative geneticists and sheep breeders and is rightly regarded as a world expert in her field. She would very much like to have been present today but her health dictates a less adventurous life.

My own career has been much more conventional. It began with a farming background in the small rural NSW town of Tumut. This was followed by undergraduate studies in Rural Science at the University of New England, a period of work with CSIRO Division of Animal Genetics and then postgraduate studies in quantitative genetics at the University of Edinburgh. I returned to CSIRO in 1972 and have worked since that time as a research geneticist in the sheep and beef cattle industries.

No career is a one person operation and in my case that is especially so. I would therefore like to take this opportunity to publicly acknowledge the help and guidance of a number of people who had significant influences on my development and contributed materially to whatever modest successes may have come my way. These include Scott Dolling, Helen Turner, Arthur Dunlop and Jim Rendel from CSIRO, the late Alan Robertson, Douglas Falconer and Craddock Roberts at the University of Edinburgh and my work colleagues at CSIRO over the past 33 years. They are too numerous to name individually but Michael Brooker, Bernie Bindon, Mick Hillard, Dick Farrell, Mechelle Cheers, Yvonne Benton, Rob Nethery and Grant Uphill must be mentioned. Finally, my wife Priscilla deserves a very special tribute. She has been a tower of strength throughout my career which would have faltered many times without her good humour, forbearance and TLC.

The science of genetics as applied to livestock improvement is based on the fundamental laws of mendelian inheritance and applied statistical methodologies initiated by R A Fisher, Sewall Wright

and others, and further developed by a number of luminaries including J L Lush, Alan Robertson, Charles Henderson and others too numerous to name individually.

The basic genetic model is that for most production traits of economic importance, the genetic variation is controlled by a large number of genes each, on average, of small effect. The eventual observed phenotype is jointly determined by genetic and environmental influences and the expected merit of offspring is equal to the superiority of the parents discounted by the heritability or the proportion of the total phenotypic variation arising from the additive effects of genes underlying the particular trait of interest.

The "genes" in this model are not individually identified and are statistical abstracts of the real genes. Nevertheless the methodology of quantitative genetics has been remarkably successful in transforming the productivity of domestic animal species. However, it has a number of well documented deficiencies including an inability to predict the long term limits to selective breeding programs. What is required instead of the classical approach based on variance component analysis, is a description of the genetic variation for any trait in terms of the contributions of individual genes.

The methods of modern molecular genetics will eventually lead to such a description but in the meantime they will aid in identifying those genes of large effect which happen to be segregating in particular populations. A number of such genes have been identified in the last 15 years including the "Booroola" gene, *Fec B,* which causes spectacular increases in prolificacy in domestic sheep. Perversely, this gene was discovered without the aid of modern molecular genetic technologies, by myself and Bernie Bindon in a flock of Merino sheep developed initially by the Seears brothers of "Booroola", Cooma and further selected to very high levels of prolificacy by Helen Turner.

The science of genetics as applied to livestock improvement has reached an exciting stage of development. The combination of quantitative and molecular genetic technologies including genetic engineering will lead to faster rates of progress in livestock breeding programs and to sharper focus of those programs to meet particular markets and consumer requirements. Greater understanding of the genetic basis of variation in traits of economic importance will also lead to new methods of non-genetic manipulation of productivity which exploit the biological mechanisms associated with major gene products.

It is worth re-emphasising that for the medium term and perhaps for the foreseeable future, the way forward in genetic improvement of domestic livestock species will continue to be based on optimal combinations of quantitative and molecular genetic technologies and not on one to the exclusion of the other.

It has been a very great pleasure to have been associated with some of these developments and I hope that I may get the opportunity and inspiration to make some useful contributions in the future.