

Australasian Science

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PATRONS: *Australasian Science* is supported by Nobel Laureate Professor Peter Doherty and renowned science broadcaster Robyn Williams, representing excellence in science and its communication.

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PUBLISHED 10 times per year. The opinions expressed in this publication are those of the authors and do not necessarily represent those of the publisher.

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DISTRIBUTION: Gordon & Gotch Ltd

PRINTING: BPA Print Group, 11 Evans St, Burwood, Vic. 3125, Australia.

PRINT POST APPROVED PP 331379/0032

ISSN 1442-679X *RRP \$7.95 incl. GST

Australian immunologists today owe their international reputation to Sir Frank Macfarlane Burnet, who was awarded the 1960 Nobel Prize for Physiology or Medicine for developing the theory of acquired immunological tolerance – the process by which the immune system recognises “self” tissue and does not attack it. Burnet’s theory, demonstrated in mice by joint Nobel-winner Sir Peter Medawar in 1953, provided the platform for today’s organ transplants.

Some have argued that Burnet should have been awarded a second Nobel Prize for his clonal selection theory (see p.34). This month marks the 50th anniversary of the publication of this theory in *The Australian Journal of Science*, which is now published as *Australasian Science*. Burnet’s clonal selection theory, which built on the work of 1984 Nobel Laureate Niels K. Jerne, outlined how the immune system is able to detect and respond to a vast number of foreign pathogens. Indeed, the clonal selection theory explained the mechanisms by which immunological tolerance could work.

While Burnet acknowledged “the speculative character of much of the detail of this modification of Jerne’s theory,” his paper concluded that “the ‘clonal selection hypothesis’... has so many implications calling for experimental enquiry that it has been thought justifiable to submit this preliminary account for publication”.

It took another 30 years until Burnet’s speculative hypothesis could be proved using modern molecular biology technologies. Fortunately he had used his considerable clout to give Australian scientists first crack at the “implications” he had foreseen in the 1950s, when as director of the Walter and Eliza Hall Institute in Melbourne he decided that research there should focus on immunology. This foresight gave Australian researchers a head start on their overseas rivals in this emerging and important field.

Burnet’s work spawned this entirely new field of research, which continues to unravel the extraordinary complexity of our immune system. His legacy endures through the position of eminence held by the Australian immunologists who followed him, such as 1996 Nobel Laureate Prof Peter Doherty.

More practically, Burnet’s theories of immune tolerance and clonal selection inspired research that has had an immense impact on the burden of disease. Not only are organ transplants relatively common, but smallpox has been eradicated, polio has almost been wiped out and we have vaccines against diseases such as diphtheria, hepatitis B and measles. Most recently, Prof Ian Frazer of the University of Queensland developed a vaccine for human papillomavirus, which is responsible for cervical cancer.

Australasian Science is proud to be associated with one of the most outstanding discoveries of the 20th century.

COVER STORY

Medical and military researchers are working on ways to enhance human capabilities, including implanted computer chips that overcome blindness, advanced memory retrieval, more efficient decision-making, direct control of devices by the human brain without using other body parts, and even direct input of skills and information into the human brain without the need for learning. John Weckert discusses the ethical issues involved (p.16).



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