



Australian Government

# THE PRIME MINISTER'S PRIZES FOR SCIENCE



## RICHARD SHINE PRIME MINISTER'S PRIZE FOR SCIENCE



### Defending Australia's snakes and lizards

Northern Australia's peak predators—snakes and lizards—are more likely to survive the cane-toad invasion thanks to the work of Professor Richard Shine.

Using behavioural conditioning, Rick and his team have successfully protected these native predators against toad invasion in WA.

He has created traps for cane toads, taught quolls and goannas that toads are 'bad,' and now plans to release small cane toads ahead of the invasion front, a counterintuitive 'genetic backburn' based on old-school ideas that his hero Charles Darwin would have recognised.

Following in the footsteps of Darwin, Rick loves lizards and snakes.

"Some people love model trains, some people love Picasso; for me, it's snakes."

For his work using evolutionary principles to address conservation challenges, Professor Richard Shine from The University of Sydney has been awarded the 2016 Prime Minister's Prize for Science.

One of the world's most influential evolutionary ecologists and conservation biologists, Rick Shine was studying snakes on the Adelaide River floodplain near Darwin a decade ago when the cane toad invasion arrived at his study site.

Marching west, this amphibian had fatally poisoned up to 95 per cent of goannas, freshwater crocodiles, and quolls within months of arriving. So the snake biologist transformed himself into a toad biologist, with a view to reducing cane toad numbers and impact.

First he and his team worked out how to stop cane toads from reproducing, exploiting the chemicals, or pheromones, that toad tadpoles use to find and kill the developing eggs of their competitors.

Rick eliminated toad tadpoles by placing funnel-traps baited with the pheromones in spawning pools. His approach proved successful and has since been patented.

The next big breakthrough came when Rick devised a behavioural conditioning method to protect our native predators that were dying from eating the toads. He found that quolls and lizards are discouraged from eating cane toads if the first one they eat is too small to poison and kill them. A single nausea-inducing meal discourages any further interest in the toxic toad.

By exposing these predators to small, non-lethal toads ahead of the main invasion front of larger, lethal toads, he and his team have successfully buffered goannas against cane toads. They have also reintroduced quolls into Kakadu National Park.

After the toad front passes and toads begin to breed, abundant small 'teacher toads' give the next generation of predators a chance to learn toad avoidance rather than die. This means a single generation of education can virtually eliminate cane toad impact on predators, in perpetuity.

Snakes and lizards are critical to Australia's ecosystem, according to Rick.

"Australia is a hard place to make a living; the soils are poor, the rains are infrequent and it is the cold-blooded animals that can wait out the bad times. The creatures like snakes and lizards that dominate our ecosystems, they're the ones we have to focus on, they're the ones we need to understand if we want to keep Australia's ecosystems functioning."

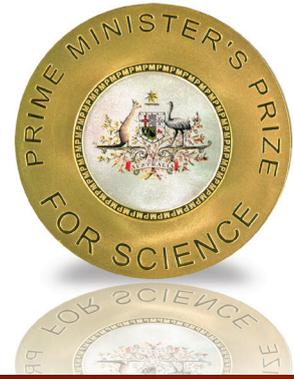
Rick joins his brother John in receiving this honour. John Shine received the 2010 Prime Minister's Prize for Science for his leadership in biomedical research. John also helped Rick in his early exploration of reptiles.

"I was the kid who brought bluetongue lizards to school," Rick says.

"When my big brother learnt to drive, he took me out into the bush where I could capture snakes and bring them home."

"The Prime Minister's Prize for Science is an incredible recognition of the value of basic, simple science, it's the kind of thing that Charles Darwin did when he wandered around the world. You go out into the bush and you see what the animals are doing, there's nothing more sophisticated than a notebook involved," Rick says.

Richard Shine is a Professor of Biology with the School of Life and Environmental Sciences at The University of Sydney. He is an Australian Research Council Laureate Fellow. He has been awarded every major prize for natural history science in Australia and is the only person ever to win Australian Museum Eureka Prizes in three categories.



## Career profile, Professor Richard Shine, AM

### QUALIFICATIONS

1988	Doctor of Science, The University of Sydney	2010	Walter Burfitt Prize for research excellence, Royal Society of NSW
1976	PhD (Zoology), University of New England	2010	Lifetime Achievement Award, Australian Wildlife Expo
1971	Bachelor of Science (Honours) (Zoology), Australian National University	2010	Honorary Foreign member, Herpetologists' League
<b>CAREER HIGHLIGHTS</b>		2010	Award for research excellence, Co-operative Research Centre for Invasive Species
2016	NSW Scientist of the Year	2009	Australian Natural History Medallion, Field Naturalists Club of Victoria
2016	Chair, Margaret Middleton Research Fund Committee, Australian Academy of Science	2009	Appointed to IUCN/SSC Sea Snake Specialist Group
2015	President-elect, Society for the Study of Amphibians and Reptiles	2008	Vice-Chancellor's Award for Excellence in Postgraduate Supervision, The University of Sydney
2015	Fellow of the Royal Zoological Society of New South Wales	2008	One of Sydney's 100 most influential people, <i>The Sydney Magazine</i>
2014	Robert Whittaker Distinguished Ecologist Award, Ecological Society of America	2008	Macfarlane Burnet Medal and Lecture, Australian Academy of Science
2014	Appointed to Scientific Committee, Eighth World Congress of Herpetology	2006–2010	ARC Federation Fellow, The University of Sydney
2013	Eureka Prize for Outstanding Mentor of Young Researchers, Australian Museum	2006	Eureka Prize for Biodiversity Research, Australian Museum
2012–ongoing	Australian Research Council (ARC) Laureate Fellow, The University of Sydney	2005	Mueller Medal for research excellence, ANZAAS
2012	Profiled by <i>Science</i> magazine, 15 June 2012, 1375-1377	2005	Member of the Order of Australia
2012	Honorary Member, Ecological Society of America	2005	Fellow of the Linnean Society of London
2011	Environment award, Australian Innovation Challenge Awards	2004–2007	Member of the Board of Governors, Society for the Study of Amphibians and Reptiles
2011	Plant and Animal Research award, New South Wales Science and Engineering Awards	2002–2005	ARC Australian Professorial Fellow, The University of Sydney
2011	Eureka Prize for Promoting Public Understanding of Science Research, Australian Museum	1993–ongoing	Professor in Biology, The University of Sydney
2011	Elected to the Council, Australian Academy of Science	<hr/>	
2011	Appointed to International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) Boa and Python Specialist Group	<b>Further reading</b>	
		<a href="http://sydney.edu.au/science/biology/shine">sydney.edu.au/science/biology/shine</a> <a href="http://www.canetoadsinoz.com">www.canetoadsinoz.com</a>	