

## Editorial: Snakes, quantum computers, and global risks

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A recent programme on ABC Radio National’s Occam’s Razor introduced me to Professor Christina Zdenek and her perspective on the danger of snakes in Australia. She provocatively called her talk, “Seven reasons why Australia is the lucky country when it comes to snakes.” I asked her for a revised version for the *Journal*, which is included here.

In fact, in Australia, there are five families of land snake: the pythons, file snakes, blind snakes, the rear-fanged snakes or colubrids, and the front-fanged snakes or elapids. Blind snakes (Typhlopidae) are small, shy and rarely seen; file snakes (Acrochordidae) are aquatic and live in northern swamps and billabongs; and pythons (Pythonidae) are widespread and non-venomous. Then there are the other two: elapids and colubrids.<sup>1</sup>

Almost all Australian venomous snakes belong to the Elapidae family, including king browns (*Pseudechis australis*), tiger snakes (*Notechis scutatus*), and the spectacularly patterned Collett’s snake (*Pseudechis colletti*). Globally, elapids include the cobras of Asia and Africa, the mambas of Africa, as well as coral snakes, sea snakes, and, in Australia, over 130 species of land and sea snakes. While many elapids have evolved venom, Australia’s elapids are singular in their potency. The world’s most venomous land snake, the inland taipan (*Oxyuranus*

*microlepidotus*) is capable of killing around 250,000 mice with the venom from a single bite, according to the LD<sub>50</sub> parameter.<sup>2</sup>

Elapids are thought to have arrived in Australia many millions of years ago as a sea snake, according to evolutionary ecologist Rick Shine from the University of Sydney. “In the case of the elapids, the ancestor that has come from Asia to Australia looks to be of a modern-day krait — a sea snake species (*Bungarus* sp.),” Professor Shine said. Today, sea kraits are among the most venomous snakes in the world, so Australia’s elapids likely had a head-start in their development of potent venom.

The fifth group is the Colubridae family, or rear-fanged snakes, like the non-venomous common tree snake (*Dendrelaphis punctulatus*), brown tree-snake (*Boiga irregularis*), and the non-venomous keelback (*Tropidonophis mairii*). The colubrids are the world’s most successful family of snakes, and Australia is unique in being the only continent where elapids outnumber colubrids: only ten species of colubrids occur here, according to the Queensland Museum.

The colubrids are thought to have arrived in Australia after the elapids, but there is still some debate as to exactly when. And the path that they took to get here probably explains why many of Australia’s colubrids are tree specialists. “The colubrids came a

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<sup>1</sup> The next four paragraphs derive from Klivert (2022). See also Sleeth et al. (2021).

<sup>2</sup> LD<sub>50</sub> is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.

lot more recently down through Asia and New Guinea,” said Professor Shine. What that means is that their migration path was a heavily forested one that favoured tree-dwelling species. “There’s probably a connection there where you’re likely to get more tree-dwelling species.” That migration pathway is the likely explanation for why many of Australia’s non-venomous colubrids are climbers. But the snake that most commonly bites Australians, the eastern brown snake (*Pseudonaja textilis*), is an elapid. Read Zdenek’s article.<sup>3</sup>

In 2019 we reported (Marks 2019) the surprising first-ever image of a black hole, about 55 million light years from Earth, at the centre of the galaxy M87. Now we have an image of a much closer black hole, Sagittarius A\*, at the heart of the Milky Way, only 27,000 light years away, which appears as a faint shadow surrounded by glowing material (Kruesi and Conover 2022). The image was created by planet-spanning network of radio telescopes, known as the Event Horizon Telescope.

Last year, the inaugural Warren Prize was awarded to Simon Devitt FRSN of UTS, and he has contributed a long paper based on his work with others on the architectures being explored for building quantum computers. The sensitivity of the set-up (the risk of decoherence due to thermal noise etc.) means that much thought and effort must go in to designing these platforms. We had hoped to print Professor Devitt’s paper in last December’s issue, but it now appears here.

Len Fisher FRSN has a continuing interest in the challenges of global catastrophic risks. In past issues we have published Fisher (2018), in which he outlined his entry in the

Stockholm “New Shape” competition in developing new ideas for the governance of such risks. The paper in this issue (joint with Anders Sandberg), reprinted from *Global Policy* (2022), continues to explore the issue of governance in the face of such risk, without taking into account such outrages as the Russian invasion of Ukraine (see below).

The 2021 Forum was held on 4 November, at Government House, Sydney. It was sponsored by the Royal Society of NSW, together with Australia’s Learned Academies: Health and Medicine, Humanities, Science, Social Sciences, and Technology and Engineering. The theme was “Power and Peril of the Digital Age.”

The focus of the Forum was a conversation about digitalisation and the use of data. It was framed around the future life of a child born on the day of the Forum, into a world of increasingly complex digital systems that holds great value and vulnerability.

In previous years Forum participants have delivered papers, with some discussion from the floor. These papers have then been published here, in the *Journal & Proceedings*. For last year’s Forum, this was changed: in each session two separate presentations were made with a common theme, followed by a discussion between the two presenters moderated by Professor Ian Oppermann, Chief Data Scientist, NSW Government. There were five sessions in the morning, each of which is printed below. But the ten presentations were not papers.

Starting with a technological framing, the Forum explored several major aspects which would impact the journey of that child as we approached 2030 and beyond: aspects of technology, health, defence and

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<sup>3</sup> An earlier paper on Australian snakes is Berncastle (1866).

security in a digital age, and the changing nature of industry as the world and society evolve.

Opened by Her Excellency, the Governor of NSW, the five themes of the sessions were: (1) Science and Technology Underpinning the Digital Age: Past, Present and Future, with Cathy Foley and Hugh Durrant-Whyte; (2) the Digital Lifetime of a Child Born Today, with Frances Foster-Thorpe and Sue Bennett; (3) Avoiding a Digital Dark Age, with Shawn Ross and Theresa K. D. Anderson; (4) the Health of Our Digital Child, with Zoran Bolevich and Louisa Jorm; and (5) the Safety and Security of our Digital Child, with Dale Lambert and Rory Medcalf AM. The discussions of the second morning do not appear here.<sup>4</sup>

With the advent of the COVID-19 pandemic, and the consequent lock-downs and isolations, the Society moved from face-to-face meetings to virtual gatherings in 2020. This facilitated recording meetings and subsequently putting the videos online — in our case, via YouTube. In some cases, we have used these recordings to derive printed papers (see Grant 2021, Holmes 2021, and Milner Davis 2021). In other cases we have tried to derive printed papers for publishing here, but have not succeeded, for various reasons. These include presentations by Michelle Simmons,<sup>5</sup> Saul Griffith,<sup>6</sup> Jason Sharples,<sup>7</sup> and Angela Moles.<sup>8</sup>

As always, we include abstracts from recent outstanding PhD theses. We do not choose these abstracts: selection is left up to the candidates' universities. An exception to this rule, however, is the abstract by Elena Castilla, a doctoral graduate of the Complutense University of Madrid, Spain. Dr Castilla took the initiative of sending us her abstract, suitably formatted. After some investigation, we accepted it.

Geoff Harcourt AC FRSN died last December. We include an obituary of this outstanding economist and man.

### Exchanges in a time of war

The Royal Society exchanges its journal with 66 learned societies around the world, including two in Russia: one in St Petersburg (the Russian Academy of Sciences) and one in Moscow (the Library for Natural Sciences). After February 24, 2022, I wondered whether we should continue the exchanges, given the Russian invasion of Ukraine. We discussed this in Council, but decided to continue the exchanges, given that Russia is an autocracy, and so the scientists of the two institutions are not directly responsible.

My thoughts: We condemn the Russian invasion of Ukraine as a barbaric, unprovoked assault on the values of a liberal democracy and the Ukrainian people which also represents a broader threat to democracy. But we will continue our century-old

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4 The complete Forum can be viewed online, at <https://www.youtube.com/channel/UCoyHmDj2VLkgnpm-t7sIzSQ>

5 The new field of atomic electronics, address to the Annual Dinner of the Royal Society, 10 May 2019.

6 Our energy future, two parts. See [https://www.youtube.com/watch?v=sQthtORLaFg&list=PLYFFwCGj2F1aOm9l-b\\_oreihzfMYI6HnS&index=7](https://www.youtube.com/watch?v=sQthtORLaFg&list=PLYFFwCGj2F1aOm9l-b_oreihzfMYI6HnS&index=7) and [https://www.youtube.com/watch?v=LopP\\_O8\\_dgE&list=PLYFFwCGj2F1aOm9l-b\\_oreihzfMYI6HnS&index=4](https://www.youtube.com/watch?v=LopP_O8_dgE&list=PLYFFwCGj2F1aOm9l-b_oreihzfMYI6HnS&index=4)

7 Extreme bushfires and the age of violent pyroconvection. See [https://www.youtube.com/watch?v=cTRXkM\\_zS8&list=PLYFFwCGj2F1aOm9l-b\\_oreihzfMYI6HnS&index=10](https://www.youtube.com/watch?v=cTRXkM_zS8&list=PLYFFwCGj2F1aOm9l-b_oreihzfMYI6HnS&index=10). Also see O'Connor (2021).

8 The RSNWS Poggendorff Lecture 2020: Are our weeds becoming new native species? See <https://www.youtube.com/watch?v=dMy7VpEzEbs>

exchange of information with Russian intellectuals as an important means to support freedom of thought in Russia and give encouragement to those committed to a free, open society.

In fact, when I tried to post copies of the December issue to Moscow and St Petersburg, I found that the Australian Post Office was not then accepting mail for Russia.

### Important note for member subscribers

Earlier the Society moved to a new database that members and fellows use when renewing their memberships. Previously, if you were a subscriber to the paper copy of the *Journal*, this subscription and its cost were easily rolled over to the new year. For whatever reason, the new system made rolling-over your subscription difficult. As a result the numbers of member subscribers fell from 212 in 2021 to 26 in 2022. After efforts on our parts, the numbers of member subscribers has risen to over 60 — still many fewer than previously.

I hope that no-one misses out on a paper copy of this issue: if you discover too late that you no longer subscribe to the *Journal*, it is too late for this issue: we will not print extra copies. Subscribe now at the Society's Online Shop<sup>9</sup> for the December issue.

### Housekeeping

I'd like to thank Davina Jackson, Lindsay Botten, Rory McGuire and Jason Antony for their thorough help in producing the *Journal*.

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<sup>9</sup> <https://members.royalsoc.org.au/rsnsw-shop/>

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