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Editorial: A new era in vaccinology?

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2020 — a year like few others in the *Journal*'s 154-year history. One noteworthy event has been the development of several vaccines effective against COVID-19 in an impossibly short time — twelve months after the virus was first isolated.

What are the scientific highlights of the year? These focus on the pandemic. The development of novel messenger ribonucleic acid (mRNA) vaccines, in which the shape of the virus is the focus for vaccine elements that stimulate the body's immune system to attack the virus is a revolution and welcome in terms of the speed of development.[1] The extremely low temperatures now necessary to transport the first two mRNA vaccines will, no doubt, be moderated with future research. And it is likely that we will need future vaccines to combat future viral epidemics and pandemics, as our numbers on Earth continue to grow and opportunities for zoonotic viruses to spread from their host animals to human beings also grow, as we spread into new ecosystems. I believe it is a mistake to think of the pandemic as a once-in-a-hundred-years event, just because the last serious pandemic was a century ago. We have been lucky with the various flu epidemics and other contagions that have occurred recently.[2]

The revolutionary mRNA vaccines developed in breathtaking time for inoculating against COVID-19, despite the lack of previous vaccines against other respiratory diseases, such as the common cold, got me thinking. The vaccines prime the immune system to recognise the alien virus and attack it. Recently, new treatments against various cancers have enlisted the immune system to attack cancer cells and tumours, increasingly successfully. My question: could we use mRNA vaccines in the fight against cancer? (Pardi et al. 2018) Let's hope so.[3]

1 *The Economist* reckons that these vaccines "may turn out to be the technology-in-use with the greatest economic impact over a single year ever seen."

2 Indeed, Edward Holmes FRSN, one of the first scientists, with his Chinese colleagues, to map the genotype of SARS-CoV-2, the COVID-19 coronavirus, and publish the structure on January 11, 2020, on the open access Virology website, within a week of its identification, makes the same warning. I have asked Professor Holmes to write a memoir note, when he has time, of the discovery a year ago. See Wu et al. (2020) and Zhang and Holmes (2020). I look forward to publishing it. (I have also invited John O'Sullivan, head of the CSIRO astrophysics team that invented WiFi in 1996, to write a piece on the discovery of that ubiquitous technology, which I will also publish, if he writes it.)

3 Z. R. C. Marks, Ph.D., M.B.B.S. tells me that, despite a large field of research looking at mRNA targeting of cancer directly, fine-tuning the immune response is tricky, whereas specific, targeted approaches seem to hold the most promise, such as CAR-T cells: host immune cells engineered to fight specific tumour cells. BioNTech, joint developer with Pfizer of the first vaccine, is exploring the use of mRNA in treatments for malignant melanoma and prostate, head-and-neck and breast cancers.

The bushfires of last summer, a phenomenon described as the onset of the "pyrocene" by Stephen Pyne in the June issue, have resulted in a wider awakening of the progress of global warming, and the need for a federal energy policy worthy of the name. There is now widespread agreement in Australia that ageing coal-fired electricity generators will be phased out, but the issue of how to transition to renewable energy is not resolved, while reducing greenhouse-gas emissions. This issue of the *Journal* introduces a new section, *Counterpoint*, in which conflicting views are presented: Alan Finkel, the then Chief Scientist, has the view that gas turbine plants should ease the transition to renewables;[4] this is supported (by himself, Richard Bolt of Swinburne UT, and Peter Rez of Arizona State), while the opposite side is taken (by 25 scientists, including three FRSNs, by a past Chief Scientist, Penny Sackett, and by Andrew Blackers of ANU). Read their contributions and decide.

In the year of the COVID-19 plague, other advances fade into the background, but this issue contains some interesting papers, as well as 19 abstracts of recent doctoral theses in N.S.W. and the A.C.T. In a submitted paper, Forbes et al. report on research into differences between recreational fishing in manmade reservoirs and riverine fisheries. In a requested contribution, marking the success of the new Hunter Valley Branch, Kenneth Dutton FRSN describes the Skottowe manuscript, compiled by an early commandant of the Newcastle penal settlement, whose father had mentored the young James Cook in Yorkshire. The MS describes the local fauna and flora, with illustrations.[5] A second commissioned paper, by Steven Patterson, outlines the fascinating history of the development through the centuries of blue pigments. It turns out that chemists can still not design or even predict the colour of a new compound (that is, colour is an emergent property), and blue pigments have been rare in the wild.[6] We publish an obituary of Richard Stanton DistFRSN (1926–2020).

As with past issues, I thank Jason Antony — editor of the Society's *Bulletin* — for his efforts in polishing the appearance of the *Journal*. I also thank Dr Mike Richards and Don Hector FRSN for their assistance with this editorial.

A note: in 1968, the Society published a volume celebrating the centenary of the Royal Charter in 1867: *A Century of Scientific Progress: The centenary volume of the Royal Society of New South Wales — a history of several aspects of Australian scientific development, with particular reference to New South Wales* (Sydney, Royal Society of NSW, 1968). This is now available on-line at the *Journal* archive.

The 2020 Archibald Ollé Prize for the best paper in the Journal was awarded to the late Ann Moyal FRSN (1926–2019), for her paper, "P. A. M. Dirac and the maverick mathematician" (Moyal 2017), reporting war-time correspondence between

4 The International Energy Agency states: "solar PV is consistently cheaper than new coal- or gas-fired power plants in most countries, and solar projects now offer some of the lowest-cost electricity ever seen" (IEA 2020).

5 I thank Jessica Milner Davis FRSN for assisting in the birth of this paper.

6 I thank Pamela Griffith FRSN for assisting in the birth of this paper. Wendy Sharpe FRSN tells me she uses "Ultramarine Blue, Cobalt Blue and sometimes Prussian and Cerulean Blue." Ben Quilty FRSN tells me that his favourite blue is Ultramarine Blue; he adds that "the base colour for the entire Australian continent is Flinders Violet (not blue)."

Paul Dirac (1902–1984), doyen of British physicists, and the young mathematician, José Enrique Moyal (1910–1998), who disagreed about a statistical basis for quantum mechanics, then a revolutionary theory. Moyal, later a professor at Macquarie University, was the author's husband, and has since been vindicated, I believe. This is the first award made since 1997.

Balmain, 23 December 2020.

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