

Editorial

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We live in exciting times. No sooner had this year's Nobel prize for physics been awarded to the team leaders of the LIGO gravity-wave observatories that had earlier in the year reported the first detections of gravity waves — of two black holes fusing (what do they do? holes colliding?) — than Virgo, a third observatory, helped to triangulate the source of a new gravity-wave burst: two neutron stars colliding (definitely colliding) to form a black hole. Whereas not much if any radiation escapes a black-hole encounter, neutron stars colliding produce light, radio waves, X-rays, and gamma rays, which can be independently observed. But not yet neutrinos. This was accomplished with optical observatories and others corroborating the event.

A hundred years after Einstein's prediction of these ripples in space-time, mankind has developed a completely new way to observe activity in the cosmos. Moreover, the observations from the neutron-star encounter appear to confirm predictions that elements heavier than iron — gold, platinum, uranium and many of the rare-earth elements — are created during neutron star collisions.

This issue contains an absorbing report from Brynn Hibbert, the President, on the revision of the International System of Units (SI) to send the “Big K,” the reference kilogram mass in Paris, to oblivion, or at least to a museum, by defining the metre, kilogram, second, and ampere (etc.) using the so-called fundamental physical constants.

There are five submitted papers, and three invited or contributed papers. The lead author of the first of the submitted papers,

on the impacts of the new environmental flows on the Snowy River, is Wayne Erskine. The paper had been reviewed and revised and accepted, when I learnt of Professor Erskine's sudden death. His co-authors have written an obituary of him, which appears at the end of the paper.

The second submitted paper is a study from across the Pacific, into the use of distance sensing on Easter Island (Rapa Nui), that sad example of a land now completely denuded of the extinct Rapa Nui Palm (*Jubaea sp.*) and all other endemic trees. (Hunt and Lipo, 2006).

The third and fourth submitted papers are of historical interest, introducing a long-lost report by the geologist (and 1888 Clarke Medalist of the Royal Society), Fr. Julian Tenison-Woods (1832-1889), one of several nineteenth-century clergyman-scientists active in the Society. As Roderick O'Brien describes it, he came across the report as the appendix to an 1885 report published in the Straits Settlements (Singapore). It is here reproduced, and joins 15 earlier papers by Tenison-Woods in the *Journal*, from 1877 to 1888.

Ann Moyal, a more recent Royal Society prize-winner, has taken some 70-year-old correspondence between her late husband, the mathematician José Moyal (1910-1998), and the Nobel Laureate Cambridge physicist, P. A. M. Dirac (1902-1984), which shows Dirac struggling with the radical approach to quantum mechanics of the young, unpublished mathematician/statistician, who had recently escaped to Britain from Paris. Dirac, in effect, delayed publication of Moyal's first

paper, later rewritten as two papers, and published with some support from Dirac, who was not convinced by Moyal's statistical approach to formalising quantum mechanics. In recent emails, Cosmas Zachos of the Argonne National Laboratory, commented that Dirac "believed that Poisson Brackets would solve everything, and missed the breathtaking innovation of Moyal brackets." Curtright and Zachos (2012) provide a more formal summary of the development of the phase-space interpretation of quantum mechanics, including Moyal's contribution. Meanwhile, Dirac was not alone in his skepticism: Google Scholar shows that Moyal's 1949 paper, "Quantum mechanics as a statistical theory," now has 3210 citations, and rising, and very recently I received an email confirming that Moyal's phase space approach had anticipated Richard Feynman's propagator approach by a decade or more.¹

Reading Ann Moyal's paper, I thought I should try to obtain the original paper of J. Moyal's and publish it; Cosmas Zachos would love to see it. But, apparently, Moyal did not bring a copy to Australia with him in 1954; at any rate it is not amongst his surviving papers. What, I thought, about Dirac's collected papers, at Florida State University? Inquires turned up nothing. Then I read the complete letters, in Ann Moyal's 2006 book. Dirac always promised to return the draft after reading it. Then it hit me: with computers, photocopiers, printers, we are overwhelmed by copies of papers. But 70 years ago, if one had not made carbon copies of a draft when it was first typed up, there were only two ways of making further copies, short of retyping from scratch: photography, or off-prints after publication in a

journal.² (There are of course many stories of the single copy of a MS lost in a taxi, flood, or fire.) So soon we forget. So, unfortunately, no copy exists of Moyal's first paper, the one he disagreed with Dirac over.

The sixth submitted paper, by Robert Young, is a reevaluation of the scientific legacy of the Rev. W. B. Clarke, founder of the Royal Society, whose contributions in several fields have been forgotten. It is appropriate to publish this reappraisal now, 150 years after the founding of the Society.

I admit to being excited by the invited papers. With the 2017 Four Academy Forum exploring, inter alia, the undermining of scientific expertise in these times of Trump, I thought it might be timely to see what science (in this case, applied psychology) could tell us about those who deny the conclusions of climate science: the deniers. Last year I had come across *The Debunking Handbook* (Cook and Lewandowsky, 2011). I approached John Cook (now at George Mason University in Virginia) to write a review article for us, which appears below. An advance copy was sent to all presenters at the 2017 Forum.

In May 2017, a new guidebook to Australian birds (Menkhorst et al. 2017) was published; as a confirmed birder I bought a copy and was struck by a chapter on the evolution and relationships among Australian birds as revealed by recent DNA analysis. The chapter was rather lost in the guidebook, I thought, and wrote to Leo Joseph, its author, to seek permission to republish it

¹ Email from Basil Hiley, Professor Emeritus of Physics at London University, of 15 November 2017.

² My 1969 Master's thesis, "Optimisation and plastic analysis," was typed on one of the first IBM Selectric typewriters in Melbourne, with carbon copies of the text, but I had to photograph the print-outs of the computer simulations to include them in the bound thesis.

here, which was granted. An updated version appears below.³

The final invited paper is a commissioned study of the Royal Society at two dates, in 1867 and 2017, as a celebration of its sesquicentenary. It is also the second paper in this issue by the indefatigable Ann Moyal.

The issue includes 11 abstracts of recent Ph.D. dissertations, from the University of New South Wales, the University of New England, Charles Sturt University, Southern Cross University, the Australian Catholic University, and the University of Canberra. (The other universities in NSW and the A.C.T. were asked to nominate outstanding theses, but have not yet responded.)

The Society, under the two recent presidents and councils, has been moving to broaden its appeal, in particular to extend beyond the physical sciences to the social sciences, the arts and humanities. Of some interest, then, might be a new magazine, *America*, the tagline of which is (in French)⁴ “America like you’ve never read it.” It was conceived to help French readers understand the U.S.A. in the age of Trump. The motivation, according to its editor, François Busnel, is that, while political experts had dismissed the possibility of Trump’s success, some American novelists and writers had foreseen it. Its editorial mix includes long interviews with novelists, as well as essays and excerpts in translation. Although Australia is not as forlorn as the U.S. post September 11th,

our Federal politics has been topsy-turvy for almost the last ten years. Meanwhile, the recently appointed Distinguished Fellow and Booker-Prize-winning novelist, Thomas Keneally, will give the Distinguished Fellow’s Address next May, which will appear in the June 2018 issue of the *Journal*. So the Royal Society, too, is looking to novelists and writers and the humanities for insights, insights sometimes beyond the ken of scientists, of all stripes.

I thank Ed Hibbert, Rory McGuire, and Jason Antony for their assistance in the production of this issue. Remember, the *Journal* archive can be found on-line, at <https://royal.soc.org.au/links-to-papers-since-1856>.

Dargan, NSW,
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³ This paper is timely: recent work has confirmed that songbirds originated in Australia in the Oligocene, between 34 and 22 million years ago, and then spread to the rest of the world via Wallacea (Moyle et al., 2016).

⁴ Incidentally, there has been only one paper in French in the *Journal*, by Julien Bernier, in Volume 32, 1898. And two papers (in English) by Louis Pasteur’s nephew, Adrien Loir, in Volume 25, 1891.

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