

Editorial*

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This issue of *Resonance* features the immensely versatile Freeman Dyson who contributed extensively to both physics and mathematics. He was prolific, writing diversely—apart from his scientific work—on the world at large. He has talked and written on ‘Bombs and Poetry’, ‘Imagined Worlds’, ‘Origins of Life’ and ‘Birds and Frogs’. Dyson was at the Institute for Advanced Study, Princeton almost throughout his career. An intriguing aspect of his facility with scientific work and other purely mathematical work is revealed in one of his lectures ‘Missed Opportunities’. He says there, “I missed the opportunity of discovering a deeper connection between modular forms and Lie algebras, just because the number theorist Dyson and the physicist Dyson were not speaking to each other.” Among many original ideas, Dyson thought of a genetically modified tree that could grow on comets which could be engineered to have hollow spaces of atmosphere to breathe, so that humanity could have a self-sustaining habitat outside the solar system also. A sample of the rather prodigious spectrum of Dyson’s contributions to science and mathematics is described in two separate articles in this issue. Dyson received several scientific awards but did not win a Nobel Prize. Dyson himself spoke about it and said “I think it’s almost true without exception if you want to win a Nobel Prize, you should have a long attention span, get hold of some deep and important problem and stay with it for ten years. That wasn’t my style.”

In this issue, we also have personal reflections by a well known physicist R Rajaraman who was invited to visit the IAS, Princeton by Dyson in the 1960s. V Rajaraman, a celebrated computer scientist from our country, known also for his textbooks that gen-



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erations of students have learnt from, has recently written a book outlining ground-breaking inventions in information and communication technology. It has just been released and a review of it by N Sathyamurthy appears here. Shobha Bagai from the Cluster Innovation Centre at the University of Delhi has been actively engaging with high school and college students for several years; in this issue, she and a student have a beautiful narrative on tiling the plane using pentagons. *Resonance* encourages students also to write, and an article by Sharv Laad on prime numbers outline his own variation of a proof of infinitude. Yet another note by a student Gurbir Arora and his project supervisor Ramadevi studies mathematically the ‘chiming’ of a Schwarzschild black-hole disturbed from its initial stable state—it is known that black holes perturbed from their initial state return to a stable state by emitting waves in some characteristic frequencies. Vishakha Patel describes the Ziegler–Nichols tuning method for a PID controller used in the study of speed control of a DC motor. There is a fascinating discussion on ‘Teaching Scientific Temper’ which is specially relevant today when fake science ‘news’ without any evidence is ubiquitous. The author of this article Abhijeet Badrapurkar says, “When science students fail to confront falsehood with the courage and temperance of tentative but known truths, the teacher knows that something is amiss in their science education. Teaching scientific temper is teaching the values in science for personal-ethical and consequently social betterment. A scientifically tempered citizenry values truth over rhetoric in a culture capable of honoring ethical and aesthetic excellence.”

Many readers of *Resonance* look forward to reading Raghavendra Gadagkar’s captivating series article in each issue. The present episode talks about the landmark scientific study by Nick Davies and Michael Brooke of the fact known from ancient times that a cuckoo does not build a nest or raise its offspring but lays its eggs in the nests of birds from other species. As this series deals with designing experiments to study animal behavior, Gadagkar keeps up a compelling running commentary relating the present experiment with the general theme. At the end, he reflects on the



study of animal behavior vis-a-vis the prevalent system of natural science education. He recalls that just as Davies's tutor told him in the 1980s that "The days when you can go out into the countryside with binoculars and notebook and discover something interesting are long gone", there will be plenty of tutors saying the same thing today with renewed conviction, but that nothing could be further from the truth.

Talking of current science news, behavioral ecologist Liz Derryberry seized the opportunity to study how the white-crowned sparrow responded when human noises disappeared. In a study published in *Science*, it is observed that songbirds in San Francisco sang at lower volumes during the time people stayed at home because of COVID-19. Their calls also had higher quality as they did not have to struggle to be heard. Derryberry mentions, "it highlights just how big an effect noise pollution has". In other science news, Regina Barzilay, from the MIT has been awarded a million-dollar prize—the Squirrel AI Award for Artificial Intelligence for the Benefit of Humanity. Her work focuses on machine-learning algorithms for detecting cancer. Martin Hairer, already a Fields medalist, has won the three million dollar Breakthrough Prize for mathematics 2021. Hairer worked on stochastic analysis, and his amazing work has been described by one colleague as "must have been done by aliens". Among the eight winners of the Breakthrough Prizes for 2021, we just mention the two awardees—Dennis Lo and Catherine Dulac. Lo developed a test for genetic mutations in DNA shed by unborn babies; he is supposed to have got inspired from the Harry Potter story of Voldemort giving Harry a scar. Dulac's research showed the enthralling fact that neural circuits for maternal and paternal behaviour are found in both men and women, quashing the idea of gender-specific roles in child care.

