

Editorial*

C P Rajendran, Guest Editor

When did I start following Charles Lyell, a 19th-century British geologist—the featured scientist of this issue? The memory prompts me that my first encounter with his work started way back in the early 90s while I was a postdoc at the University of South Carolina. I was getting interested in the earthquake of 1819 in the Rann of Kutch, NW India, and Charles Lyell’s writings on the earthquake in his treatise *The Principles of Geology* had turned out to be an eye-opener. I remember the depiction of the sinking Sindri Fort amidst the sticky mudflats of the Rann—a classic case of level change due to earthquake-related faulting. Finally, when I reached the ‘scene of the crime’, the Rann of Kutch, close to India’s western border, myself, I was literally flabbergasted with Lyell’s distant vision of what that earthquake had done to the landscape of Kutch. The 1819 earthquake was a real-time demonstration of how such a single event could change an existing landscape so profoundly. Standing in that desolate landscape I understood why Lyell was excited about the 1819 event as he saw it as a geological agent of surficial changes. Like his protégé Charles Darwin, there were many who were influenced during his lifetime by his geological acumen favoring the principle of uniformitarianism—an assumption that the natural laws operative in present-day must be a continuum from the past.

When I started writing about Lyell for this issue of *Resonance*, what struck me most was his immense fecundity of imagination about earth processes that made a profound impact on the science of geology, which was just taking first baby steps towards future. This imaginative prowess was even more important at a time when the real field data was hard to come by unless one had



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the audacity and means to reach the distant geological hotspots. In the article in this issue of *Resonance*, I have made some broad-brush strokes on the social background of Lyell's early years, and how he began to develop his unique geological vision, considered heretical in those days and its far-reaching influence on the contemporary European intellectual climate. And, finally, I have touched upon his legacy and the continuing debate on his contributions to geological thoughts. As a writer of this piece, it was a personal journey of sorts that offered me an opportunity to explore how a renaissance mind operated against the then-prevailing faith-derived convictions on the origins of the Earth and had eventually succeeded in establishing an evidence-based alternative stream of thought. Charles Darwin, who finally turned the table by introducing the theory of evolution, followed that trail. The rest is history.

Aside from the article on Charles Lyell, the July issue of *Resonance* offers a forum for a group of authors from varied branches of science. As V. Rajaraman, who was associated with *Resonance* from 1995 to 2014 as an Associate Editor, Editor, and the Chief Editor recollects how this journal took shape with a unique format to include articles that were meant for higher secondary school/pre-university students who aspire for scientific careers, along with general/feature articles. It should be a matter of pride for all those who work for science literacy, as V. Rajaraman eloquently expresses in his 'Reflections' that *Resonance* has been able to evolve into a popular science education journal without ever losing its original intent and lustre, even after twenty-five years of its existence, thanks to the hard work and commitment of the people who have worked for years behind the scene.

In an article titled, 'Approximations in Physics: A Pedagogic Perspective', K.K. Mashood, Arvind Kumar, and Anwesh Mazumdar address the question of why approximations are important in physics (in fact it is an important tool in many other branches including Earth sciences). This method, generally known as modelling, has paid rich dividends in understanding complex systems containing a large number of variables. Their article discusses



some of the elementary aspects of making valid approximations in physics. Hemanth K Bilihalli in his article ‘Physics of Conductive Conjugated Polymers’ outlines the importance of electron-phonon coupling to charge transport in conductive polymers. A polymer is long accepted as an insulator. The idea that structural modifications could make such insulators highly conductive was indeed a revolutionary concept, and with possibilities of applications in the future, it is likely that these materials may replace metals in several critical areas. The usage of electricity is so common these days that the familiarity makes us unconcerned about some of the critical questions related to this field. Trilochan Bagarti and Arun M Jayannavar in their article try to remove this prevalent chimera of ignorance by taking us on a tour of electrical energy storage systems.

For non-mathematicians, the term ‘Calkin-Wilf Tree’, may appear a bit strange. A Calkin-Wilf tree is a special type of binary tree of fractions, obtained by starting with the fraction $\frac{1}{1}$ and iteratively adding $\frac{a}{(a+b)}$ and $\frac{(a+b)}{b}$ below each fraction $\frac{a}{b}$. In an expository piece, K Siddharth Choudary and A Satyanarayana Reddy present proofs of its various properties. Following the mathematical trail, under ‘Classroom’ series (a forum in *Resonance* “for raising broader issues and sharing personal experiences and viewpoints on matters related to teaching and learning science”), Kapil Hari Paranjape frames a question in his article: What is the meaning of an infinite sum?—a question that had fascinated many mathematicians including G. H. Hardy and Srinivasa Ramanujan. The use of infinite series is widely applicable in physics, computer science, statistics, and finance. That the potentially infinite summation could end up in a finite result was considered counter-intuitive, and from this article, we learn how this paradox was finally resolved. V. M. Sabarish in his article, shows how a photon that has zero rest mass, when confined in a box, can contribute to the mass of the system and help us understand the idea of mass-energy equivalence expressed in the famous Einsteinian equation $E = mc^2$.

From the rarefied pursuit of such thought experiments, an article

by Raghavendra Gadagkar takes us to the down-to earth-world of animal behaviour research—grounded in the kind of data researchers collect from cumbersome and time-consuming field experiments. In his essay, Gadagkar focusses on a question on the mimicry in the animal world. The theme is knitted around the mimicry system adopted by the harmless snakes to fool their predators by pretending to be poisonous ones. They may not be perfect in their art of mimicry and this imperfection itself may provide them an edge on survivability. Biology experiment becomes a theme again in the article by Lee Alan Dugatkin wherein he discusses a research program pursued by a team of Russian geneticists over the last sixty years. Called as the ‘Silver Fox Domestication Experiment’, the idea is to understand social cognition in the domesticated silver foxes—the most pro-social to humans among the foxes, and observe what happens to these animals at the level of genes as they become more and more social—an interesting research topic ever since Darwin wrote his 1868 book, *The Variation of Animals and Plants Under Domestication*. We now understand why dogs now have developed cute eyes and floppy ears. The ‘cuteness index’ helps the animals survive among humans.

Abhinaba Das in his essay, ‘Combatting Climate Change Denial’ raises a valid question that has implications for building a societal consensus to deal with the threat of climate change that looms large on the long-term survival of human race along with global flora and fauna. He informs that scientists must devise new strategies of climate change communication to convince the deniers and sceptics. But why just climate change, we are also faced with stringent opposition to many other types of scientific knowledge including vaccination. In another article, Oshin Gulsia takes us to the world of ‘vanilla’ in an article titled ‘Vanillin: One Drug, Many Uses’. Vanillin is an aromatic compound, which is utilized in a wide variety of applications such as food flavoring, perfumery, animal feed, pharmaceuticals, agrochemical, and industrial products. Gulsia narrates its varied uses and its applications as a drug that can arrest the growth of cancer cells.



EDITORIAL

Resonance is a journal of science education—an activity that mainly focuses on helping to prepare the students to study science at higher levels thereby assisting them to pursue careers in science. Beyond these purposes, such journals make them scientifically literate even if many of them opt out of science as an occupation. The scientific literacy helps in sustaining a culture that honors scientific enquiry. Thus, science communication is becoming ever more required and the onus falls on scientists, although busy with their research, not only to communicate their research to a wider public but also to do so innovatively and engagingly. The current contributions bear testimony to the fact that *Resonance* is wedded to its original commitment of propagating science engagingly. Charles Lyell, the featured scientist of this issue, was a science communicator par excellence, and his success as an influential scientist in 19th century England to a great extent lies in the fact that he could write science engagingly for the reading public. It is so befitting that *Resonance* has chosen to feature Lyell for this month.

