Editorial*

N Sathyamurthy, Chief Editor

About a year ago, it was felt that there were not enough articles on biology related topics published in *Resonance*, reflecting the importance of biology in the 21st century.

Mathematics, in some sense, is a language. It helps enormously in articulating ideas and provides unexpected insights into the physical world. Physics deals with the physical world around us. In a larger sense, it tries to provide quantitative explanations for the observations made. Dogged pursuit of the reasons for the discrepancy between the predictions and observations of real-world phenomena leads to theoretical refinements and sometimes, leads to breakthroughs in our scientific understanding. Although one can say, by extension, that chemistry deals with the chemical world, it is often difficult to distinguish between the physical and chemical worlds. After all, it is chemistry that underlies all the physical phenomena. Despite this understanding of disciplinary overlap, the difference between the living and non-living continues to evade our understanding. Although biology is all about understanding the 'living' systems, there is a lot of physics and chemistry that lies underneath. An integrated approach to studying complex biological systems led to the emergence of 'systems biology'. However, we are far from a complete understanding of biological systems. Classification of the living systems (including the birds, beasts, plants and other entities) helps us in our endeavour.

Among the many ancillaries that help us understand life, developmental and molecular biology are fascinating subjects. How life arises from a collection of chemicals remains a mystery. While DNA has the genetic code, life existed before the arrival of the

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DNA, and what led to different forms of life is still the subject of intense research. The chemical basis of morphogenesis proposed by Turing seems to be the basis of all our understanding so far.

While it is not easy to modify living forms, biologists have managed to do so by modifying the genetic code and in the process have learned some of the underpinnings of life. Simultaneously, systematization of existing/newly generated knowledge aids in taking stock and tracing out the existing gaps and often points out future directions. Formulation of the periodic table in chemistry is a classic example of this approach.

In this context, Hermann Joseph Muller achieved both the feats. Muller received the Nobel Prize for explaining mutations arising from exposure to radiation. But he is remembered for much more than that. He helped in systematizing our knowledge of biological inheritance and how it could be understood by rigorous experimentation using model organisms. We are grateful to Bodhisatta Nandy for writing about the man and the science that he led from the front.

This issue of *Resonance* also contains articles spanning various disciplines. While Priya Hasan elaborates on GAIA, the 3D Milky Way mapper, Samiul Islam and S S Z Ashraf explore the point and space groups of graphene. The electron pushing and electron pulling inductive effect of alkyl groups is a fascinating subject, and Asim K Das explains the same in his article. Mohammad Yasir Feroz Khan in his article investigates some discontinuous derivatives which prompted the development of the fundamental theorem of calculus and discusses the Henstock–Kurzweil integral as an attempt to modify the Riemann integral. The issue also carries an interesting trial experience by R R Tena *et al.* that highlights the advantages of using ICTs in teaching and learning science.

We hope you enjoy reading the articles in this issue.