Editorial

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Science is the pursuit of truth, and necessarily, scientists have to be completely honest in their research. Except for a few glaring exceptions, this was true until a couple of decades ago. Of late, a worrying trend seems to be setting in. The severity of the problem is brought out clearly in the blogs of a colleague, Abhinandan (see http://nanopolitan.blogspot.in/ and the links therein). The matter is very important and anybody considering the pursuit of science as a career should be aware of it.

Recently, scientists at the biopharmaceutical company Amgen tried to reproduce the results of 53 papers that they considered as landmarks in the area of cancer research. The attempt was made with close co-operation of the original authors, to make sure that the experimental techniques matched closely those of the original studies. They were able to reproduce the results only in six cases. A similar study carried out at Bayer HealthCare, a German pharmaceutical company was reported in the journal *Nature Reviews*: *Drug Discovery*. Their success rate was somewhat higher – but still only around 25%.

It is not uncommon to make mistakes when one is carrying out scientific research. But when an error is published as a paper, it would normally be subjected to very close scrutiny by the peers, would get pointed out and corrected, so that the search for truth goes on in the correct direction. That is, science is self-correcting. This was the way of science in the past, but this seems to have changed in the recent past. The problem seems to be more in the area of biological sciences, which is even more alarming, as the efforts and investments made in biological sciences are much more than for most other areas.

Scientists can delude themselves to believe so strongly on their hypothesis that they do not pay attention to experiments that give evidence to the contrary. Often, results that go against their hypothesis are ignored. This is not very surprising – it shows that scientists too have human shortcomings, though in principle they should not. The more worrying problem is deliberate falsification of data so that the results would appear much more important than they are, and the paper would have more impact, and hence would get more cited. Consequently the author would be able to get more funding, recognition and promotion.

Unlike in the past, these days mistakes do not get corrected quickly. The reasons are many-fold. Nobody has the time or the willingness to try and reproduce someone else's experiments. If the results agree with those of the original paper, then the investigator would not be able to publish his results and hence would affect his own funding. A major reason for this trend is academic pressure. If you do not publish more papers than your peers, or at least the same number, then you are seen as not performing. Consequently, your promotion may not go through. As a result, scientists have started publishing results from hastily carried out, poorly designed experiments. Increase in computational power and ready availability of software has made computational simulations easy. As a result, the number of papers reporting such studies is rapidly increasing. However one often wonders: have the authors paid enough attention to the limitations of the method that they are using for the study? Or, if it is a molecular dynamics simulation, have the authors taken enough care to make sure that the system has equilibrated? All these are worrying. Scientists seem to be headed towards very troubled times – for the first time in the history of science they are going to face the question of their own credibility.

Unlike the bleak scenario outlined above, the work of Leonor Michaelis and Maud Leonara Menten, both featured in this issue of *Resonance*, has stood the test of time. Published 100 years ago, their landmark paper on enzyme kinetics has become an integral part of all books on biochemistry. As *Resonance* has already published a two-part article on the kinetics of processes involving enzymes (see D N Rao, *Resonance*, Vol.3, Nos.6 and 7, 1998) we have not included a discussion of their original work. However, Dipshikha Chakravortty gives brief biographical sketches of the two scientists. Enzyme kinetics continues to fascinate scientists. Advances in technology have permitted scientists to observe a single enzyme molecule doing its duty of catalyzing chemical reactions. In a beautifully written article, Binny Cherayil describes recent work, which has led to further interesting insights into the ways of the enzymes.

This issue has details on the recently announced Nobel Prizes as well as the Israeli 2013 Eric and Sheila Samson Prime Minster's Prize given to the well-known chemists George Olah and G K Surya Prakash for their research on the use of methanol to replace fossil fuels and petroleum-based products. *Resonance* takes pleasure in that Surya Prakash is an Indian American, born in Bangalore.

Vijay Sharma continues the series on circadian rhythms. The other articles in this issue include one on the slowing down of light so that it moves at velocities comparable to that of a bullock cart, and the applications of such slowing down, written by Anita Warrier and C Vijayan. Dipanjan Ghosh writes on flowers that are edible, while S Kesavan shows how to generalize the integration of radial functions from 2 to N dimensions.