# In this issue

## Economics of electron transfers

Chemical reactions where electrons are transferred, with or without protons, are vital to life: without these reactions life cannot exist on our little blue planet. There are some specialized biomolecules that excel in these reduction–oxidation or 'redox' reactions. They can repeatedly give and take electrons/protons from other molecules that are similarly ready to transfer electrons and protons in return. Prominent among them are what biologists call NADH and NADPH: Nicotinamide adenosine dinucleotide and its phosphate, as chemists call them.

A large number of enzymes use $NAD^+$/NADH or $NADP^+$/NADPH transformations for multiple cycles of redox reactions. Hence NAD and NADP are often called cofactors of enzymes. Our body can synthesize these molecules from some amino-acids. But due to the crucial nature of the molecules, niacin of the vitamin B family, is used as the main precursor of these molecules in our body.

Chemical and biochemical engineers use these cofactors in the production of antibiotics, pharmaceutical intermediates, herbicides, fuel alcohols…. But the costs are very high – going up to a million dollars per mol of NADH! Scientists from IIT Mumbai review the various methods used so far to regenerate these cofactors.

This is the first step in the search for the most economical method of regenerating these electron transfer molecular machines and thus to reduce the bank transfers of foreign currency. And the article does come up with a clue – metabolic engineering seems to emerge as a feasible industrial solution for the future. Read on from **page 946**.

## Chinese take on steel fibre in high performance concrete

Mix cement, sand and coarse aggregates with water to erect concrete structures that are strong. Add a little fly ash or blast furnace slag or rice husk and silica fume to improve the performance of concrete if it has to remain in contact with water and chemicals. To reduce the chances of cracking of concrete under different conditions including earthquakes, use steel fibres in concrete. These are all old stories. Enter nanoparticles.

In the last few years, there have been a large number of studies on concrete with nanoparticles. And nano $SiO_2$ seems to emerge as a potential candidate to improve the mechanical properties and durability of concrete. Now, scientists from Zhengzhou University, China are rationalizing the use of steel fibre in high performance concrete with nano $SiO_2$ and fly ash. Their research article on **page 980** demonstrates that steel fibre content beyond 2% does not add much value.

Coming from a country that makes half of the world's cement and is the biggest exporter of steel, infrastructure developers world over would take note, if at least to save the costs. No two opinions on that. But it is quite evident that there is a lot more scientific research necessary to reduce under or over-engineering of concrete structures.

## Indian roadmap to knowledge economy

Scholars far and wide could give their learned opinions about the nature of knowledge and its relation to economic development. But when the scholar is responsible for setting the tone and tenor of both scientific research as well as the deployment of knowledge so created for the socio-economic development in India, it will make you want to turn the **page 936** in this issue. From brief descriptions of the present state of India as a knowledge producer for the benefit of the majority which live in rural areas, and as a contributor to International big science, R. Chidambaram, the Principal Scientific Advisor to the Government of India, moves on to the prescriptions: high quality education for the young, grooming of leaders in science, stronger ties between industry and education, improved manufacturing skills, improved energy availability for citizens and industry, strong infrastructure.... The insight? National development and national security are intricately interconnected. Ultimately, what are the measures of how fast we are moving to knowledge economy? The quality and quantity of our research papers.

## Scientometrics, bibliometrics: publish before you perish

Measuring the scientific output and its impact on further developments in science or in society is fraught with difficulties. Many of the past issues of *Current Science* have explored the problems and prospects of measuring the published output of an individual, institutions, countries… In this issue, scientists from NISCAIR explore the scientometrics of Botanical Survey of India (BSI), covering 423 publications from 1971 to 2010. See **page 964**. When examining the outputs from an organization for such time periods one can easily detect trends. Statistically, one could note, for example, that there are more than 10 papers per year from BSI. Scientists also look for explanations why during certain times the number went down or up: useful to take steps to improve performance.

Interestingly, the preferred journal for publication seems to be *Current Science*. So it is only appropriate to examine *Current Science* itself – being the preferred journal in India is not enough. In this issue, Gangan Prathap (**page 958**) gives a citation-based bibiliometric profiling of the journal. Besides quality and quantity, he uses a third dimension in his analysis: consistency. He covers only the last 25 years of this 80-year-old journal that has brought out more than 17,000 items – editorials, letters, reviews, articles…. Top contributing authors, cities and states get their due recognition.

*– Science Media Centre, IISER Pune*
*e-mail: kp.madhu2000@gmail.com*