women? How about Charles Darwin, who was a basic biologist and chosen as 'man of modern science' ahead of Einstein by an Internet poll survey recently?

Some people think and believe that biology is a different kind of and very easy science. But in reality it is not. This doubt arises because of there being no laws in biology (as there are in physics), and the differences between typological thinking (characteristics of the physical sciences) and the population thinking that marks modern biology. In his last book[3], the famous biologist Ernst Mayr attempts to tackle this important, albeit not exactly novel, question: is biology a different kind of science? Mayr, in this book, points out the limited usefulness of mathematical formalism in partially historic disciplines such as biology. Through a largely historical and informative approach, Mayr then goes on to argue that biology is sufficiently autonomous from physical sciences that no useful 'reduction' can be carried out beyond a fairly limited scope.

Sanal notes that biologists have not been able to 'create' a new organism and are still exploring the existing biological systems. Perhaps the author is totally unaware of transgenic plants, cloned animals (e.g. Dolly!), a unique frog species discovered recently in Western Ghats of India (which was considered as 'discovery of the century') and many more path-breaking recent research publications in biology. Any scientist would agree that any biological system is extremely complex and we are still far from understanding fully how certain systems work. No one expects biologists to create a new plant or animal and it is not the principal objective of biologists. Basic scientific research (including biology) is driven by academic curiosity and there is not simple route from science to new technology. According to Wolpert, who delivered the famous 'Medawar Lecture in 1998, entitled 'Is science dangerous' (for detailed script of the lecture see ref. 4), science is not the same as technology. Basic science researchers are not directly responsible for technological applications of science; the very nature of science is that it is not possible to predict what will be discovered or how these discoveries could be applied. The distinction between science and technology, between knowledge and understanding on the one hand, and the application of that knowledge to making something, or using it in some practical way, is fundamental. Science produces ideas about how the world works, whereas ideas in technology result in usable objects.

It is unfortunate that Sanal has ignored the above facts, basic philosophy of biology (or science) and has made hostile comments regarding a fascinating subject, biology, which is considered as 'mother' of all basic science disciplines, perhaps due to his unrealistic expectations and misunderstanding. If biology is so simple and not important why have other branches of basic science been associated with it and resulted in new branches like biochemistry, biophysics, bio-statistics, biomechanics, etc. in late 20th century? These are some of the reasons why biology (and all its sub-branches) is attracting more funds as well as students rather than for its simplicity. If biology appears simple and attractive to students then kudos to biology teachers and biologists who make it simple to understand and attractive to students. No one in India can force students to opt for biology and it is their choice. Unlike Sanal, all science professionals and teachers treat all branches of basic science with equal importance. There is no such think as one branch being easier or important than another.

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Photorespiration and mitochondrial respiration are not just evolutionary leftovers

Photorespiration, a process that diminishes net photosynthesis by ≈25% in most plants, has been viewed as the unfavourable consequence of plants having evolved when the atmosphere contained much higher levels of carbon dioxide than at present. This biological process was considered to be a wasteful process under the present situation. The deleterious impact of photorespiration apparently led to the evolution of C_4 plants. In order to improve the photosynthetic efficiency of crop plants, modification in the O_2 binding site of Rubisco by site-directed mutagenesis was proposed. However, the outcome of the research over the recent past clearly indicates the significance of this process as a protective and supportive mechanism against photoinhibition and an array of environmental stresses[1]. Plants exposed to elevated CO_2 show diminished growth and the results with both *Arabidopsis* and wheat plants when exposed to elevated levels of CO_2 and low levels of O_2 (a condition that inhibits photorespiration) slowed down nitrate assimilation in their shoots[2]. This process enables the plants to take inorganic nitrogen in the form of nitrate and convert it into a form that is useful for plant growth[3]. In the absence of photorespiration, concentration of O_2 free radicals may reach high levels and can attain a destructive level in the chloroplasts. As we anticipate a doubling of atmospheric carbon dioxide associated with global climate change by the end of this century, the research outcome suggests that it would not be wise to modify/eliminate this biological process by molecular tools. The intricate biochemical, physiological and structural relationships that make up photosynthesis suggest that photorespiration may not be overcome by genetic manipulations. Genetic engineering of Rubisco cannot accomplish what several billion years of selection pressure have not.

Similarly, the existence of a non-phosphorylating bypasses, viz. rotenone-insensitive NADH dehydrogenase and alternative oxidase in an organelle that functions primarily in energy conservation was also considered to be energetically wasteful. However, persistence of these processes in plants despite million years of divergent evolution was indicative of their significance in plant metabolism. The mitochondrial alternative oxidase kinetics and regulation during plant development over the recent past signifies its metabolic importance. Induction by increased expression, activation and engagement of alternative oxidase under unfavourable environmental circumstances and during plant development also support changing priorities of plant mitochondria. Induction of mitochondrial alternative oxidase by nitrate in *Chlamydomonas reinhardtii* is indicative of its significance in the process of nitrate assimilation[4]. Analysis of mitochondrial mutants with impaired mitochondrial function has clearly indicated the significance of alternate oxidase in regulating the cellular redox homeostasis and protecting plants from varieties of biological stresses[5]. Moreover, transgenic plants with reduced alternate oxidase expression using antisense approach showed increased susceptibility to biological stresses[6].

It appears that Nature is the best judge to decide what to retain and what to eliminate and what appears to be energetically wasteful in the present time is future necessity looking to the global climate change and environmental uncertainty to which plants will be exposed.

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Linking Indian rivers

With reference to the meeting report[1] on linking Indian rivers, the total transfer of water in both Himalayan rivers component and peninsular rivers component is envisaged to be in the vicinity of 200 km^3 per year. Thus, it may be seen that this figure is insignificant in comparison to the total discharge available to flow down to Bay of Bengal. Moreover, the use of about 200 km^3 of transferred water will also generate considerable return flows to the natural drainage systems which will further contribute to the river discharge into the Bay of Bengal. Therefore, the apprehensions raised by the group of scientists on adverse impacts on monsoon activity due to diversion of waters through various links seem to be misplaced and misinformed.

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Ayurveda will survive till *Bharat* breathes

It is a cause for some conceit that four thousand years ago Ayurveda was already ancient[1]. Some date it more than 2000 years old[2], and some conjecture the interval of 600 BC to 800 AD as ‘Ayurvedic period’ and find Ayurveda the cradle of not only medicine but also of chemistry and science of plants and animals in India (P. C. Ray as quoted in ref. 2). Now, concern is raised as to how long Ayurveda will survive[3].

Ayurveda was discovered, nurtured and perfected in India (*Bharat*). This science of longevity was not just a collection of therapeutic recipes, but a framework, which defined conditions of sickness and connected them with healing practices. This science not only thrived in *Bharat* (India) but also influenced healing practices of many other countries. Strong interactions existed between Greeks and Hindus around 4th century BC, when the great Greek sage Appollonius of Tyana, came to India and carried back Ayurvedic knowledge from here. Buddhists took this knowledge to many countries and thus influenced the healing traditions of Tibet, Sri Lanka, Burma (Myanmar) and to some extent China[1].

Ayurveda was born along with *Bharateeya* civilization. In the course of time this country known as *Bharat*, became *Hindustan* and later transformed into *India* under colonial reign. Now, globally it is recognized as India. We proudly articulate ourselves as Indian and have blissfully adopted cultures, customs, practices, law, and the modern lifestyle under their influence and therefore, the modern medicine. But, there still exists *Bharat* in India and that is called rural India. It is this *Bharat* where *Bharateeya Chikitsa Paddhati* (Indian System of Medicine), Ayurveda still continues to provide healthcare to a large percentage – 70% according to some estimates[2]. Dhakal[3] asks, who opts for Ayurveda? And (s)he replies herself/himself that mostly chronic patients usu-