

us, the tragedy can recoil on others as well.

We are talking of different phases of one's scientific life and there has to be at least a loosely defined phase transition. This may be placed somewhere between the ages of 60 and 65 for administrative and economic purposes. But the real transition is when one is struggling to keep pace with younger colleagues and with

the development of the subject. It comes at different times to different people and can be postponed by energy, experience, enthusiasm, and sheer ability. Its external manifestation can also be delayed by a few years after its internal onset.

One can worry, as Balaram's editorial does, about those cases when it comes after the administrative deadline. But let us not forget that in most cases the

transition comes far earlier, and we should all think about how to handle that, in others and in ourselves.

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## A few words of appreciation for editorials

At the outset, I must put in these small words of appreciation before they get 'dissipated' again. I have been wanting to write this letter of appreciation for over a year now, but it always gets drowned in the innumerable mundane things one does (including writing research papers). These words (which come straight from the heart and are not meant to flatter) are for the editorial column in *Current Science*. Its amazing consistency (there has not been a single issue without the column) has made me pick up *Current Science* the moment it lands on my table. I can make one honest confession here. I invariably read the 'Editorial' first, the letters next and then the research papers. Over the years the quality of papers has become 'run of the mill', with the

emphasis so much on methodology, and procedures. So, my preference has not changed. The credit for that goes to the Editor. I was particularly fired at last to, put down these words of appreciation, after I read the latest one 'A profusion of academies' (*Curr. Sci.*, 1999, 77, 5-6). I remember mentioning this to several colleagues in many academic meetings and seminars. A colleague of mine who is a fellow of the Indian Academy of Sciences (IAS), once patiently explained to me how the IAS (Bangalore) was 'different' from the National Academy of Sciences (Allahabad). I asked him how it was different and he said, it was 'different' because it was 'accepted' that the IAS (Bangalore) was higher up in the 'hierarchy of professional membership'

than NAS (Allahabad), which in turn was probably 'on par', with INSA, Delhi. The personal egos of two 'larger than life' personalities (as the editor subtly put it), dictated that two separate entities be born in the mid-30s. But, C.V. Raman and Meghnad Saha are no more. Does anybody now have the audacity to suggest in the annual meeting of the academies (before or after the sumptuous lunch and the evening 'Nastha') that a merger of the two is still possible? He will probably have to insure himself first.

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## Why should the pollinators be conserved?

Flowers are the most precious and beautiful gift of nature. When they bloom in different colours, they provide a picturesque landscape to the earth's ecosystem. Can anyone imagine the earth without vividly coloured flowers? Yes, this could happen if the devastation being caused by human-engineered activities continues to eliminate the pollinators. The latter have played a great role in the evolution of different morphs and colours of the flowers<sup>1-3</sup>. The conservation of this great biodiversity, therefore, depends upon the conservation of pollinators.

During the course of evolution of angiosperms (the flowering plants), they developed a genetically strong breeding

barrier – the self-incompatibility<sup>2</sup>. Due to this barrier, a flower cannot utilize its own pollen or pollen from the same clone/ramet/genet for the fertilization of its ovules (i.e. selfing is not possible). Therefore, the conspecific pollen has to be brought from the other flower(s) or flowers of a different clone/ramet/genet. This is called cross-pollination. Entomophily (i.e. pollination by insects) was the first to evolve. It started with unspecialized pollinators like beetles (cantharophily) to end with very highly specialized pollinators like bees (melittophily). Present day self-pollination and other kinds of biotic and abiotic pollination are all manifestations of sec-

ondary derivatives of entomophily, albeit subsequently specializations did evolve in other kinds of zoophily (pollination by animals) too, for example, ornithophily (bird pollination), chiropterophily (bat pollination), psychophily (butterfly pollination), sphingophily (moth pollination), etc. Due to these specializations, strong mutualistic relations exist between the pollinators and the plants. The elimination of one class of pollinators would, therefore, curtail the reproduction of different kinds of plants and thus open a path to their extinction. Erosion of habitat of the pollinators, use of several poisonous chemicals and addition of pollutants in the environment of the

pollinators have caused their large-scale demise<sup>4</sup>. This has threatened the reproductive success of a wide array of plant species over the globe. As per the latest survey, over one thousand species of bees are on the verge of extinction. If this continues, there is every likelihood that this is going to markedly reduce not only the melittofaunal diversity, but also the coloured floral diversity of the biosphere. Therefore, conservation of pollinators would mean conservation of angiosperm diversity of the earth. This is not the only reason for the conservation of the pollinators. Their loss also affects the yield of several cross-pollinated crop

plants<sup>5</sup>. In the absence of managed pollination, at several places the world over, seed growers have to rely on wild pollinators for the pollination of their crops. Therefore, there is an urgent need to conserve the pollinators through the conservation of their habitats and ensured safety against pollutants and hazardous chemicals.

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4. Kevan, P. G. and Laberge, W. E., Proceedings of the IV International Symposium on Pollination, Maryland, 1979, pp. 489-508.
5. Kevan, P. G., *J. Agric. Econ.*, 1977, 25, 61-64.

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## Healing plants – Do they heal?

With herbal medicines gaining popularity, the profusion of articles and comments about them<sup>1,2</sup> seldom address the crux of the matter – Do herbal medicines work? In our country, the use of medicinal plants is well entrenched and is a part of our culture and heritage. There are extensive works on the description of these plants, their supposed medicinal qualities and detailed pharmacopoeias of herbal remedies. All this still does not detract from the fundamental question that authors of this subject rarely ask: How do we know that they work?

Modern medicine has its origins in traditional medical knowledge, from which it evolved to such an extent that they are now divorced from and often in conflict with each other. This is because modern scientific medicine is underpinned by a sound base in the relatively new fields (historically speaking) of anatomy and physiology, and the rigorous pursuit of truth using logical deduction and experimental proof. Traditional systems of medicine, where herbal treatments are used, have failed to do either, perhaps because they will wither and die if exposed to the harsh light of truth. For purposes of this discussion, all systems of medicine, whether traditional or relatively modern, that fall outside scientific medicine, can be taken as constituting a group that does not follow scientific principles or are actually opposed to it. Thus, the criticism of herbal medicine pertaining to its lack of rational basis

applies to its fellow travellers equally. That some of the remedies that they use contain pharmacologically active substances does not diminish their irrationality.

For a remedy to be deemed effective, it has to be compared to a placebo to see whether it is more effective than the placebo treatment. In practice, these clinical studies are underpinned by careful statistical design and analysis, epitomized by the randomized double blind placebo-controlled study. Patients are randomly allocated to either treatment or placebo groups, treated with the drug under investigation or placebo, respectively, and the outcome compared. Neither the investigator nor the patient knows who is on the effective drug or placebo. Randomization avoids bias in patient selection and ensures that the two groups are comparable, and blinding prevents the manipulation of outcome and foils the many prejudices that may sway the result. Without such methodological rigour, even treatments, which we assume to be beneficial based on good physiological or biochemical reasons may turn out to be ineffective or harmful, a consequence of the complexity of biological systems and the myriad interaction between the drug, labyrinthine biochemical pathways and organ systems that we cannot currently predict. The double blind placebo-controlled study is a sort of baptism by fire, and a new drug or any other form of treatment that survives it is deemed

effective. How many herbal medicines have been subject to such studies? Indeed, how many forms of treatment with herbal medicines have a sound base in modern biology? Let us, therefore, talk not of the lack of side effect of these drugs but the lack of effect. If it is without any effect, it will not have side effects either! Indeed, even the lack of side effects cannot be taken for granted without a placebo-controlled study.

The fact that herbal medicines are rooted in history, bolstered by mythology and nostalgia, are cheap, popular and widely available are immaterial if their efficacy is not known. Of course, most diseases (especially minor infections) are self limiting and any form of treatment, including placebos will appear effective. In this way, the use of herbal medicines can be justified. Indeed, the same can be said of scientific medicine, where most minor ailments are treated with drugs to control symptoms and by non-specific placebos. However, the efficacy of many forms of treatment (for acute life threatening and chronic debilitating or life threatening conditions) are well established by clinical trials, though many are still based on logical deduction without sufficient evidence of efficacy established by clinical trials. This weakness is well recognized but these treatments are at least based on scientific knowledge of biological systems, which cannot be said of the traditional systems of medicine. Hence, herbal treatments,