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Pushing flies... too far?

Vincent Dethier's 'To know a fly' and Ralph Greenspan's 'Fly pushing' represent two schools and two eras of *Drosophila* research. The hallmark of the first was a deep and unfailing interest in the organism, an all-encompassing attempt to describe every bit the sensory modalities and great observations. The second, a manual for technicians, albeit witty and well-written, targeted to the new genre of fly folk who uses flies but have precious little interest in flies for their own sake. They of course hope to have answers to questions from homosexuality to mosquito control, cancer to birth defects from definitive fly experiments. When it comes to those who are looking for easy ways of screening drugs and compounds in the present day ministerial moods and costs of animal up keep, it is even more attractive for them to check out *Drosophila*. Cheap, almost test-tube work and animals that rights activists may not bother to make too much noise about, make this an attractive proposition. Biological continuity demands that most compounds that affect us, particularly those which have side effects and hence likely to have a certain non-specific component to their action, should have effects on flies too. Sharma and Sushil Kumar **(page 476)** try to see a pattern in effects of anti-epileptic drugs on *Drosophila* and seek similarities in developmental and toxic effects on flies to teratogenic effects on rodents and humans. They further argue for mechanisms of action on the basis of less obvious defects to flies affected in the sodium channel function. The results presented are interesting from the point of view of developing a model system for their purpose. Having done that, the logical things to follow ought to be serious fly-pushing pursuits. While it is important to develop model systems, it is imperative that they are validated by an in depth analysis of molecular targets and identification of genetic loci which then could be utilized to search for human homologues when the genome data come through. In principle, this approach could provide valuable inputs to drug testing, in particular long-term and generational effects of drug exposure which could be reasonably extrapolated, at least as warning, to human situations. It is becoming increasingly clear that the fly could be a model system particularly for studies on chemical insults but a clearer understanding will need not only pushing flies but knowing flies.

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Photocatalysis using semiconductors

Nil Ratan Dhar (1892–1986) is one of the early colourful figures of Indian chemistry. He is often considered the founder of physico-chemical research in our country. At Allahabad University, he worked on diverse problems in catalysis, chemical kinetics, colloid chemistry, photochemistry, biochemistry, until he eventually became identified as a leading soil chemist. He guided 150 doctoral students and published over 700 papers.

It is of interest to recall a series of his papers entitled 'Photosynthesis in tropical sunlight', which appeared mainly in *J. Phys. Chem.*, during the thirties. He suggested that many compounds that are formed in the atmosphere and in the soil resulted from light-induced reactions. He systematically investigated many photooxidation processes as well as photochemical nitrogen fixation. He also recognized that the complex chain of reactions could be promoted by inorganic substances like phosphates and oxides. To quote from the discussion in one of his papers, 'Gopal Rao and Dhar have shown that the velocity of oxidation can be greatly increased by adding some photosensitizers like titanium dioxide, zinc oxide, cadmium oxide, etc.' (*J. Phys. Chem.*, 1932, **36**, 575). The motivation for the work and insights obtained are all the more remarkable considering the fact that the experiments were carried out with primitive analytical techniques, at a time when chemists had no theoretical understanding of band gaps and semiconducting properties of metal oxides.

Photocatalysis at semiconductor surfaces has blossomed into a major area of research in recent years. One can readily recognize the potential advantages. The chemical transformations attempted involve formation or breaking of bonds to oxygen or nitrogen, which offer considerable scope for further synthetic manipulations. The reagents used on the organic substrate are molecular oxygen (from air) and light (preferably from the sun). The catalyst employed is a semiconducting material with a carefully chosen band gap (usually a commonly available metal oxide). We thus have all the ingredients needed for performing *green chemistry*. Of course, there are many complicating factors which need to be sorted out, such as controlling the relative efficiencies of diverse redox processes possible at the semiconductor surface. But the prospects look promising.

The progress made in photochemical oxygenation and deoxygenation reactions involving a specific set of substrates using titanium dioxide catalyst is reviewed by C. Srinivasan on **page 534**. Taking examples mainly from his own work, he has highlighted the possibility of oxygen transfer to and from organosulphur compounds. Mechanistic details obtained from a number of studies are summarized. It is hoped that much more work will be done in this field, enabling photocatalytic methods to be used in synthesis, not only in the laboratory but also in an industrial scale.

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