In this issue

Insect pests – the continuing battle

We wish to maintain much higher population densities of humans than is ecologically reasonable. One of the many tricks we have to employ to make this possible, is to grow food plants at ecologically unreasonable densities. This in turn generates many problems, not the least of which, is the outbreak of insect pests. With characteristic arrogance we unleashed a chemical warfare on insect pests, the disastrous consequence of which is only too well known to the layman and specialist alike. Sobered by the health hazards caused by synthetic chemical insecticides and by the development of resistance by the intended target organisms, we embarked on a less arrogant technology – we began to engineer plants so that they carried genes for resistance that were present in other organisms such as the bacterium *Bacillus thuringensis*, for example. Even this seems to have met with no great success. With this further blow to our confidence in controlling nature, a new, much more modest approach is in sight. Attempts are now being made to understand how plants naturally respond to and evade (to the extent they can) pest attack. Once this is understood, the idea is to help plants enhance their own ability to do so. Intuitively, one feels that such an approach, based as it is on learning from nature and improving upon her methods (rather than on unleashing an independent warfare), is more likely to be successful. Whether or not we will be more successful this time around, the facts about plant responses to insect attack that we are learning in the bargain, are turning out to be especially fascinating. A number of cases have now been documented where plants express resistance to insects only after an initial attack rather than carry around resistance all the time. What is more, information about an attack and hence a message to prepare for it, seems to travel from the damaged part to unaffected parts and prepare the plant for future attacks. As you might expect, all this is mediated through chemical messengers which are appropriately dubbed 'Sentinels of plant defense'. On **page 576** of this issue, T. N. Ananthakrishnan provides an overview of this fascinating chapter in Chemical Ecology.

Raghavendra Gadagkar

Pollination by deceit ?

Who is not fascinated by insectivorous plants like the Indian pitcher plant, *Nepenthes khasiana*, which produces a chemical to attract midges, mosquitoes and other small flies for its nitrogen needs. There are certain plants belonging to families Araceae and Asclepiadaceae that attract and trap insects for an altogether different purpose – pollination. Sumesh Dakwale and S. Bhatnagar report in this issue (**page 606**) a case of an aroid, *Theriophonum crenatum*, pollinated by blood-sucking midges! Interestingly, these midges are crepiscular or nocturnal in their activity and *T. crenatum* flowers produce, as the authors claim, a *stench*, probably resembling a strong odour of an animal, in the evening hours. No doubt, midges come to the flowers in hundreds. The inflorescence structure is such that, midges that enter get trapped. There are other interesting things as well. The inflorescence has both male and female flowers. The female flowers become receptive first, when the midges enter the inflorescence and the male flowers dehisce pollen only the following day. Thus it is inevitable that the midges have to be retained inside the inflorescence for almost 24 hours, at the end of which there will be a rain of pollen grains on the midges; the gates then open allowing the poor captives to flee, but only to be trapped in another inflorescence. Well, the plant is actually fooling the midges, without paying anything for the service. We do not know when these midges get a blood meal, and how they reproduce, because for many species of midges and mosquitoes a blood meal is a must for egg production.

The questions of a larger interest that remains to be answered are, which are the hosts of these midges? Do the plant species and the animal hosts share a common habitat? And what is the chemical involved? It of course would be very interesting to ponder how the system evolved.

V. V. Belavadi

On symmetry

Symmetry means different things to different people. The widespread importance of symmetry in all the sciences and in the arts is emphasized by Rajaraman on **page 570**. Symmetry, like beauty, often lies in the eyes of the beholder. Symmetry and beauty are of course not synonymous, with many surveys concluding that the most beautiful faces (a majority perception) are often unsymmetrical. The role of symmetry in science is all pervasive, permeating fields as disparate as organic chemistry and particle physics. The enormous excitement that pervaded chemistry in the years following the discovery of buckminsterfullerene (C_{60}) may in part be attributed to the remarkable symmetry of its structure. To a bystandar, the shared symmetries of an inanimate carbon form and an icosahedral virus are spectacular; evidence of the importance of shape and form in nature. The importance of symmetry is most often underscored not only by its presence, but also its absence. Rajaraman concludes that 'the role of symmetry in the arts is often secondary' although he tempers this judgement by invoking 'a reflection symmetry between what is present in the work of art and what lies in the psyche of the viewer/listener'.

P. Balaram