# In this issue

## Growth hormones and transgenic animals

The recombinant DNA revolution has changed the way we think about biotechnology and basic biology. Experimental methods for which Nobel prizes were awarded just over a decade ago are now used in undergraduate and even high school laboratories. The study of genes used to be restricted to organisms where classical genetics is feasible: some plants (such as maize), some animals (such as flies and mice) and bacteria and fungi. Those who used genetics for a practical purpose were, and still are, called breeders. Breeding is thought to be an art, in large part, and genetics is a science and the members of the two tribes rarely communicated intelligibly with each other. Results from basic research promises to change the face of agriculture and farming. One aspect of this potential is addressed in the review by Palanivelu and Dharmalingam in this issue (**page 169**). It is possible to isolate a gene encoding an important molecule such as a growth hormone from one species and to then integrate this gene, so that it is stably inherited, into another species. The integrated gene can also be put under defined control elements so that its place and time of expression can be regulated at will. Such transgenic animals or plants could then solve all our problems: Cows could be milked for insulin, banyan trees could make almonds and the plants that clog our lakes and rivers could make tomatoes. Correct? Wrong. There are two kinds of problems. The first is technical. The present technology allows only the expression of one or few gene products in a given transgenic organism and the expression levels and control are not always as one would want. We know too little about plant and animal development to undertake all of the dramatic transformations mentioned above. But some impressive results on the use of farm animals for making drugs have been published and industrial use of such methods is only a matter of time. The second problem is ethical. With the increasing potential of transformation of an organism with foreign DNA, question related to the impact on the environment and other ethical matters continue to surface. To deal with these in a correct manner, that is to balance the growth of science and technology against the possible impact on the environment, is not easy. Scientists must communicate to social, political and environmental activists the details of their work and develop a framework for functioning. The development in transgenic animal research is impressive and will definitely have economic and social impact. An awareness of the issues by all sections of a society is essential both to develop an appreciation of ethical issues amongst scientists and to avoid an unreasonable Luddite reaction by others.

## Jet engines

The Draper Prize of the National Academy of Sciences, USA — the largest one for engineering (375,000 US dollars) to recognize living individuals for outstanding engineering achievements — has been awarded (for the year 1991) to Frank Whittle (84) and Hans von Ohain (80) who independently invented the jet engine (**page 195**).

B. R. Pai tells us of the exciting story of the origins of the jet concept and the invention of the jet engine by Whittle and Ohain (**page 191**). It is also interesting that Herbert Wagner who introduced the revolutionary idea of using 'monocoque' structures with load-bearing aluminium alloy skins (which really permitted the inclusion of jet engines in aircraft) also conceived of the turbojet. There was one more, Schelp, who too contributed greatly to the idea of jet engines. It seems strange that the four contemporaries — Frank Whittle, Hans von Ohain, Herbert Wagner and Helmut Schelp — independently and in ignorance of each others work hit upon virtually identical solutions almost at the same time. It is not at all surprising when one studies the history of science and technology.

Whittle said, 'Invention requires a return to first principles and simplicity, in which one looks to the basics and natural logic for inspiration'.

Nature has in the process of natural selection explored many possibilities for locomotion. In the case of fish, their prowess for swimming is attributable to their having rigid skeletons. However, squids and octopuses, which do not have rigid skeletons, too swim, but they do so by jet propulsion. They suck water into their cylindrical mantle cavity on each side of the head and expel it under high pressure through a funnel. This technique has been well adapted for endurance, acceleration and speed. Squids are known to migrate thousands of kilometres swimming continuously for almost 100 days. Some squids can accelerate exceptionally fast to avoid predators. While others can attain speeds of 25 to 30 kmph.

Aerodynamicists have been studying fishes and are attempting to adopt the change of shape for boundary layer control which these denizen of the oceans have long used. One wonders whether engineers and scientists can get new ideas by studying the fascinating yet complex movements of these jet-propelled soft-bodied creatures?