In this issue

Fermentation – Science & technology

With increasing emphasis on biotechnology, fermentation technology is acquiring a new dimension. The demand for enriched food products, high value drugs, and other consumer products has created opportunities for expansion of fermentation technology using a multi-disciplinary approach. For a developing country like India, with its increasing man power and increasing pressure on natural resources, food production and utilization of renewable resources are important for sustainable economic growth and development. From technological point of view, microbial fermentation seems to be the best suited and most relevant to meet this requirement. Thus, it is necessary to provide a platform for the scientists and industrial biotechnologists to plan, discuss, and develop on commercial scale the various microbiological processes employing microorganisms, recovery of their products, and development of potential strains using modern genetic engineering approach.

In fermentation technology, the key areas are for the production of industrial enzymes, antibiotics, vitamins, and biofuels. There is an increasing market for industrial enzymes showing an annual growth rate of 8%. This special section deals with the classical methods deployed for the production of some of the industrial enzymes such as lipases, proteases, and xylanases, having potential applications in leather, detergent, dairy, pharmaceutical and paper industries. An overall view of several other hydrolases produced by solid state fermentation, or submerged fermentation is presented as well. An account of biogas and biosurfactant production, and biotransformation of amino acids is also discussed in detail.

Immobilized cells, being more stable and economical than free cells, could have application in biotransformation reactions. The operational stability and high product concentration are the main reasons for employing immobilized cells and enzymes in fermentation reactors. Due to improved stability, the immobilized enzymes are gaining increasing importance in biocatalysis, waste disposal, medical diagnosis, chemical analysis, and in food and pharmaceutical industries. Immobilized bio-catalyst can work in a column reactor with the substrate being fed continuously at one end and the products being recovered from the other end. Two reviews describe the significance of the achievements in the area of immobilized cells and enzymes in bio-processes.

Classical and modern approaches can be used to enrich and select strains that rapidly grow on appropriate substrates. These strains can be further mutagenized to block at various points in the degradative pathway to accumulate required intermediates and other useful biotransformation products. Molecular genetic techniques and recombinant DNA techniques are being used to create strains that produce the desired enzymes as major fraction of cell proteins. Genes for specific enzymes can be isolated, mutagenised *in vitro* and ligated to efficient promoters within a multicopy vector to obtain large amount of enzyme or other desirable products. Some of the reviews here describe these approaches for the construction of novel strains for production of established industrial products such as ethanol and bulk enzymes.

P. Gunasekaran

Chemicals in agriculture

The use of chemicals in agricultur has led to many unanticipate problems. When the first pesticide were introduced, there was a dramati reduction in the loss of crops b attack from pests. DDT, of course i the first name that springs to mind i the battle against insect pests Indiscriminate spraying of pesti cides became the norm, until the first warning appeared in Rache Carson's book, *Silent Spring* in the early 1960s. In recent years, concerns over environmental and public health issues related to chemical pesticides have forced policy planners to look for alternative strategies in the war against pests. Ecological problems are also created by the use of chemicals in agriculture, as fertilizers. While essential components like phosphate, nitrogen and potassium in soil need to be constantly replenished for good crop yields, the use of both synthetic and 'natural' fertilizers contributes significantly to atmospheric and groundwater pollution. The inexorable demands of an ever-growing population dictate that agricultural production must keep increasing. The battle to save crops from pests and to increase crop yields will occupy much of the coming century. Two articles in this issue by A. Sankaram on 'Integrated pest management: Looking back and forward' (**page 26**) and Rajendra Prasad on 'Sustainable agriculture and fertilizer use' (**page 38**) highlight the key issues in these two important areas of national concern.

P. Balaram