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Editorial

The appearance of volume 10 of the series "Advances in Biochemical Engineering" is a good reason to state that this rapidly developing speciality has overcome its struggle against traditional boundaries and has established itself as a discipline in its own right. As in other such developments, the dynamics of specialization and reintegration of sciences follow their own laws. This joint venture, essentially based on convergent developments in microbiology and biochemistry on the one hand and technology and engineering on the other, has proved to be very successful in theory and rewarding in practice. The topics treated and evaluated in the review articles of this series show convincingly that Biochemical Engineering can significantly contribute to the analysis and solution of a considerable variety of relevant problems.

There are many possibilities and opportunities for Biochemical Engineering to make further contribut ions to material progress and to stimulate significant developments. Just a few of them, which may serve as examples, will be mentioned here.

First, the improvement of methods enabling the continuous growth of any kind of microorganism under optimal conditions will require safe and simple ways of regulation. The use of such procedures in large scale production largely depends on energy input, yield and quality of the product, but no less on their reproducibility.

Second, the search for new microbes and for mutants with novel features also falls within the scope of Biochemical Engineering. Taking into consideration that bacteria and molds are experienced masters in biological warfare, it is not unreasonable to assume that there exists a number of metabolic products still awaiting detection and chemical and biological characterization. Third, it will be of considerable practical interest to widen the scope of available tools in Biochemical Engineering, e.g. by further investigating the use of purified enzymes and enzyme combinations, whether free or carrier-bound, for any kind of synthetic or degradative procedures.

Obviously the most important problem of our time is to provide enough food for mankind. Since the danger persists that the world population will continue to grow more rapidly than food production, more efficient ways of production are urgently needed. If there still is some hope that science can significantly contribute to the solution of this problem, then it is expected to come in the first place from genetics and biochemical engineering.

It has happened twice in the history of mankind that fundamental achievements drastically changed the living conditions and the food production capacity on this planet: first, when animals were domesticated and dairying was started; second when systematic agriculture with its increasing monocultures permitted harvesting of huge crops. Is it unreasonable to propose that taming of suitable microbes with all the consequences regarding production capacity may ultimately lead to an analogous improvement in man's food supply?

Even if one is more modest and does not anticipate a real scaling up in productivity of basic foodstuff such protein, there remain many other possible developments which may help to improve the nutritional situation. It is an established fact that the large scale synthesis of nucleotides, amino-acids (notably glutamate), certain polysaccharides, vitamins and other food components or additives is more readily accomplished by microbial processes today than by the classical chemical methods used in the past. In this context it is of interest to note that those countries with a leading position in the world market are also those who first became aware of the great impact of the astonishingly high and versatile synthetic capacity of microbes in low cost mass production.

An analogous situation may apply with regard to measures aimed at the protection of our environment. Microbes have always played an important role in biodegradation. The more frequent the accidents leading to drastic water pollution and the heavier the load of substances resistant to recycling, the more microbial strains and techniques which can efficiently counteract pollution are needed. Selective binding of toxic heavy metals such as lead, mercury or cadmium, oxidative degradation of hydrocarbons, detergents and pesticides are just some examples showing what might be achieved in this respect.

Knowledge in Biochemical Engineering is advancing rapidly. In view of its considerable prospective significance this newly formed discipline deserves a high degree of priority. This not only means that scientists active in this field should be supported and encouraged; it also means that the exchange of views should be promoted, as by this series of progress reports.

However, it also implies that those young biochemists, microbiologists and engineers who feel responsible and concerned should get an opportunity to collaborate. Finally, although Biochemical Engineering has become an independent discipline, it should never be forgotten that a close interdisciplinary collaboration and a special effort to understand and to integrate the partner's point of view have greatly contributed to the rapid progress made in this field.

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