

Preface

Chemistry and chemicals play vital roles in providing food, clothing, shelter, medication as well as luxury goods for an ever-increasing world population. While the benefits from industrial chemistry have remained uncontested for a long time and have been accepted without remorse, the environmental costs have been recognized by the general public only during the past 10–15 years. Since chemical production relies on non-renewable resources for raw materials, from which up to 50% may be left as waste, these costs are high. They have been, and sometimes still are, paid for by human exposure to a variety of potentially harmful chemicals, by the contamination of water resources and by the endangerment of wildlife. In the future, however, they will have to be met by efficient recycling and waste treatment technologies.

Besides chemistry and chemical engineering, microbiology and biotechnology will play a major role in developing the technologies required for an environmentally safe production of chemicals. Contributions of biotechnology to be envisaged are twofold:

a) It may lead to the replacement of 'hard' chemical technologies by 'soft' biological technologies utilizing renewable raw materials and energy sources. The substitution of pesticides by biological pest control, efforts to understand the biological nitrogen fixation process as a future alternative to nitrogen fertilizers and the production of raw materials for the chemical industry from biomass are examples of the substitution approach. The present state of research and the potential of biological energy conversion have recently been presented in a multi-author review published in this journal (*Experientia* 38 (1982) Nos 1 and 2).

b) A different approach of biotechnology to the environmental problems of chemical industry consists of developing biological techniques for recycling, detoxification or mineralization of waste compounds and pollutants. While this strategy is less innovative and does not involve radical changes in the management of resources, it is probably closer to being realized than the substitution approach. The present multi-author review thus examines the potential use of microorganisms in solving environmental problems of densely populated and highly industrialized areas. It tries to identify questions to be answered and research to be accomplished if microbes, in the framework of biotechnology, are going to contribute even more to the health of our environment than they have thus far.

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