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Environmental Biotechnology for Waste Treatment

Edited by

Gary S. Sayler
Center for Environmental Biotechnology
Knoxville, Tennessee

Robert Fox
International Technology Corporation
Knoxville, Tennessee

and

James W. Blackburn
Center for Environmental Biotechnology
Knoxville, Tennessee

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Preface

The use of biotechnical processes in control of environmental pollution and in hazardous waste treatment is viewed as an advantageous alternative or adduct to physical chemical treatment technologies. Yet, the development and implementation of both conventional and advanced biotechnologies in predictable and efficacious field applications suffer from numerous technical, regulatory, and societal uncertainties.

With the application of modern molecular biology and genetic engineering, there is clear potential for biotechnical developments that will lead to breakthroughs in controlled and optimized hazardous waste treatment for *in situ* and unit process use. There is, however, great concern that the development of these technologies may be needlessly hindered in their applications and that the fundamental research base may not be able to sustain continued technology development.

Some of these issues have been discussed in a fragmented fashion within the research and development community. A basic research agenda has been established to promote a sustainable cross-disciplinary technology base. This agenda includes developing new and improved strains for biodegradation, improving bioanalytical methods to measure strain and biodegradation performance, and providing an integrated environmental and reactor systems analysis approach for process control and optimization.

There remains an identified need to promote cross-disciplinary communication of technology development and application, and to identify choke points that impinge on the effective commercial application of the technology. For these reasons, industrial, federal, and academic partners joined together to sponsor this current dialogue on moving modern environmental biotechnology from the laboratory to successful field application. Unlike other efforts to communicate the technology, this symposium was planned to not only identify current practices and state-of-the-science, but also to identify perceptional and regulatory issues that affect credible applications and evaluation of the technology. In this regard, we must acknowledge the concerned foresight of the sponsors of the symposium, International Technology Corporation; the American Cyanamid Company; the U.S. Air Force, Office of Scientific Research; the University of Tennessee, Waste Management Research and Education Institute; support from the Oak Ridge Waste Management Association; the planning and steering committee and the symposium participants.

A goal of the symposium was to communicate a broad view of environmental biotechnology ranging from conventional practices in biological waste treatment to genetic engineering perspectives in *in situ* treatment technology. From the beginning it was acknowledged that the biology was intimately linked to the environmental application and the engineering design in implementing the technology. This major scale-up consideration is the critical technical hurdle in moving the technology from the lab to practical field use. In this scale up, there are major limitations in monitoring and controlling biotechnical processes, and these limitations further confound societal and regulatory perception of the credibility of the technology.

The outcome of this symposium contributes to identifying applications of fundamental research in emerging technology and to defining industrial research needs. It is also anticipated that strategies will be forthcoming to overcome concerns of the safety and efficacy of the technology. There appear to be numerous opportunities for environmental biotechnology to contribute to integrated waste management, but care must be taken to demonstrate reliable technology in order to capitalize on these opportunities.

Gary S. Sayler

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