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Biotechnology and the environment: a Birmingham perspective

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Environmental issues are arriving at the top of the political agenda in many countries in Europe and elsewhere. In fact, public awareness of these issues, and lobbying by different environmental pressure groups have led to demands for environmentally acceptable solutions to many of the problems which mankind has made for itself. In terms of environmental research, biotechnology has an important role in such solutions.

The University of Birmingham is well-placed to make a significant contribution to environmental research through biotechnology. A quick glance at the most recent edition of the brochure "Who Does What in Biotechnology" (University of Birmingham, 1988) shows that much biotechnology research related to the environment is being carried out at this institution. The research ranges, for example, from the study of carcinogen activation in isolated and cultured cells in the School of Biochemistry, the effects of biocides in relation to the fouling of surfaces by micro-organisms as well as the treatment of industrial wastes in the Schools of Chemical and Civil Engineering, to the study of genetically-transformed crops for release into the agricultural environment and the *in vitro* conservation of plant genetic resources in the School of Biological Sciences.

Current spending in the U.K. on environmentally-related biotechnology is somewhat limited compared to other areas of biotechnology. During the coming decade, however, this is likely to increase as appropriate solutions to environmental problems are sought. Much of the research will, by its very nature, be interdisciplinary. The formation of the Environmental Research and Management (ERM) Group in the University of Birmingham should strengthen capacity for interdisciplinary research. Originally founded as an initiative in the Faculty of Science, ERM now has a university-wide programme with earmarked financial support from the Uni-

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versity itself. ERM provides a forum for bringing colleagues together who have mutual interests in environmental research. In fact, since ERM was formed, several interdisciplinary research projects have been funded, including for example, a study involving colleagues in Geography and Biological Sciences on the impacts of climatic change on international agriculture, and a study of metal ion genotoxicity, between the School of Biochemistry and the Institute of Occupational Health. We hope that ERM will also enhance collaborative research in environmental sciences and biotechnology.

Besides biotechnology, considerable expertise in environmental management is found throughout the University. In broad terms, the interests of the Group cover atmospheric, water, land and biological resource management and public health. In the latter area, expertise in the Institute of Occupational Health has been strengthened with the recent establishment in the School of Biological Sciences of a Chair of Environmental Health, funded by the City of Birmingham. A Chair of Environmental Biology has been established recently in the same School, with again further prospects for extension of biotechnology research interests. Other benefits could also accrue to the undergraduate degree course in biotechnology from these two appointments.

One relevant area of particular interest (in the School of Biological Sciences) is the conservation of plant genetic resources, and it is one in which the University of Birmingham has gained an international reputation during the past 20 years, principally through its postgraduate training course. Genetic conservation is an important environmental concern, and more than 300 students from 73 countries have received training at Birmingham. Biotechnology is an important component of this course, since *in vitro* techniques are part of the conservation strategy for some crops, and is discussed in more detail in the article by Ford-Lloyd and Jackson in this special issue. Traditional crop varieties, as sources of genetic diversity, form the basis of modern plant breeding, yet many old varieties have been lost, and others are under threat of extinction. Most species are stored as seeds which have been dried to a low moisture content, and then stored at low temperature. Under these conditions seeds will remain viable for decades, if not hundreds of years. However, many crops, such as long-lived perennials and many tropical species, cannot be stored as seeds, since they either do not produce them, or their seeds will not survive drying and storage at low temperatures. Consequently, *in vitro* conservation strategies are employed aimed at maintaining genetic integrity while using different culture conditions to reduce growth rates so that sub-culturing intervals may be lengthened. This application of biotechnology is extremely important for genetic conservation strategies. Furthermore and more generally, biotechnology will become increasingly important as plant breeders aim to utilize genetic resources during the coming decades to lessen the effects of global warming on the agricultural environment by producing new strains of crops better adapted to grow under the new climatic conditions (Jackson and Ford-Lloyd, 1990).

Clearly, there is great interest in environmental issues at the University of Birmingham via the general commitment to biotechnology and via ERM. This institution will continue to stimulate in the coming years many established and

newly emerging interdisciplinary links. The six papers which follow this brief introduction represent only a small sample of the environmental research interests here. They describe current work of colleagues in the Schools of Biological Sciences, Biochemistry and of Chemical and Civil Engineering, and highlight specific aspects of biotechnology with an environmental perspective.

References

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