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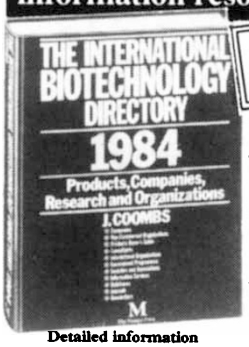


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# U.K. PUSHES DOWNSTREAM PROCESSING RESEARCH

LONDON, England—The government is putting the finishing touches on a massive research program to entice British firms into investing in downstream processing. The program is part of the government's strategy to fill notable gaps in downstream processing skills in British industry. The strategy led last year to the formation of BIOSEP, a cooperative R&D effort between government research institutes and industry aimed at developing industrial techniques for separating fermentor products.

BIOSEP involves three departments and between £2 and £3 million of the British taxpayer's money, to be spent over several years on research, consultants, and reports on new technologies. The aim of the program is to attract industrial subscribers, who, for a fee, will receive state-of-the-art designs on new processes. Phillip Hawtin, BIOSEP's project manager, says details of the proposed research program will not be made public until after the interested companies have approved it, but that it is likely to focus heavily on chromatography and membrane processing.

The government's Warren Spring and Harwell laboratories (the latter part of Britain's Atomic Energy Authority) are managing BIOSEP jointly. But they depend heavily on the fermentation expertise and genetic engineering skills of another government organization, the Center for Applied Microbiology Research at Porton Down. All three may soon be candidates for "privatization"—being sold to private interests.

BIOSEP's services have been free so far, but beginning October 1 subscribers must pay, with rates depending on their location. British companies will be charged between £1000 and £4000 a year, while overseas companies will have to pay between £4000 and £11,000. Multinationals with a strong British manufacturing base will pay something in between. Hawtin says that while the program does not discourage foreign participation, its main purpose is to boost British industry. A similar Harwell "club" for the chemical industry attracted more than 60 subscribers, half of them foreign, among them Rhone Poulenc, Exxon, Shell, and Unilever. Together they contribute to a turnover of more than £1 million a year. So far, between 10 and 20 companies are interested in joining BIOSEP's club.

Harwell already has several processes waiting to be taken up by industry. The laboratory's marketing men are negotiating a licensing deal with a multinational corporation for a unique adsorption column, which can purify tens of thousands of liters of the soupy fermentor mixture. The column depends on Harwell's patented techniques for manufacturing rigid particles with large pores out of a range of substances, including kieselghur, titanium, and cellulose. The skeleton consists of these particles, densely packed, which support conventional separation gels, and which trap a product. The column is well suited to separating fine chemicals or large quantities of monoclonal antibodies, but it could also be scaled up to handle water purification, effluent treatment, or the filtration of beverages.

Alternatively, such columns could be turned into bioreactors. As an immobilized support for enzymes, the column could reduce the cost of manufacturing antibodies considerably by permitting the rapid processing of labile compounds such as penicillin and cephalosporin. Together with Tate and Lyle, the British sugar manufacturer, Harwell developed a system of immobilized amyloglucosidase for the production of high quality glucose syrups from thinned starch. In the pilot plant the process operated continuously at 55°C with a half life of more than 50 days for the enzyme activity.

Harwell's second invention, Biostream, which is marketed by CJB Developments Ltd., an offshoot of John Brown, the contractor, is an adaptation of electrophoresis for industrial processing. In principle, it consists of one tube within another, the inner being negatively charged and the outer positively charged. The mix is pumped gently down the inner tube, out through the bottom, and up the outer tube. The positively charged particles collect on the inside tube, while negatively charged particles collect on the outer tube, forming concentric bands at the top. Each band represents a single type of molecule or cell.

The first applications will be for purifying factor VIII. Hawtin says machines have also been sold to American and Japanese companies for evaluating other uses, which could embrace enzyme manufacturing and clinical applications, such as the separation of abnormal blood cells from healthy ones.

**—Stephanie Yanchinski**