Super plants

John R. S. Fincham

Risk Assessment in Genetic Engineering: Environmental Release of Organisms. Edited by M. Levin and H. S. Strauss. *McGraw-Hill: 1991. Pp. 403. $39.95, £37.95.*

AT the heart of the debate about the hazards of genetic manipulation is a fundamental question about evolution, namely the extent to which the potentialities of organisms are restricted by their own genetic systems. To put the question in teleological terms, are organisms divided into mutually isolated species for their own good, to avoid disruption of their selected blends of mutually adapted genes, or are interspecific barriers restraining the emergence of new and highly competitive life forms? Or are both propositions true, the first as the general case and the second as the rare but important exception?

Risk Assessment in Genetic Engineering hardly addresses these basic issues, but it does give a good picture of the state of the risk-assessment industry in the United States, where environmentalists, government agencies, firms of private consultants, lawyers and academics, not to mention the companies attempting to test and market their products, are locked in expensive (or lucrative) controversy and negotiation. Levin and Strauss's compendium consists of 17 chapters by different authors, writing from a variety of different standpoints — scientific, technological, administrative and social/political. The subject matter is confined to plants and the control of plant pests, presumably because it is only in this area that environmental release of manipulated organisms is in prospect.

The earlier chapters review the conceivable hazards from different applications of genetic engineering — engineered organisms and toxins for pest control, safety of transgenic plants as food, use of viruses to mitigate viral infections, horizontal gene transfer, the cultivation in open fields of transgenic plants. Several of the authors make recommendations on precautions, either during preliminary tests to assess hazards or after full-scale release.

Different authors manifest different levels of excitement. Kathleen Keeler and Charles Turner, in their long chapter on 'Management of Transgenic Plants', foresee both great benefits and great dangers. "We may expect to find transgenic plants growing as crops, in forests, in pastureland, in urban settings as ornamentals, on roadsides to combat erosion"; the transgenes will "run the gamut", they say. At the same time they see "immense potential for problems from human dispersal of transgenic plants in the next century". The most serious are to do with transfer of invigorating genes to weeds, but the authors do not rule out the possibility that the engineered crops themselves may have increased invasiveness and recommend careful monitoring of the countryside adjacent to the new crops and the preparation in advance of measures for wiping out naturalized colonies. They are also worried that desirable wild species will lose biological diversity as the result of invasion by highly selectable transgenes. One cannot help thinking that the expense of dealing with this degree of worry is likely to price most transgenic plants out of the market.

James Fuxa, in his chapter on the use of engineered organisms (viruses, bacteria, fungi) for biological control of insects, also identifies a range of hypothetical risks, but seems somewhat more relaxed about them. "How many data are sufficient before an environmental release?", he asks, adding, with admirable frankness, "There is no good answer". He thinks, nevertheless, that limited release without disaster of organisms designed for low persistence in the environment will build confidence to the point where selective pathogens intended for persistence will become acceptable. "Zero risk will not be possible", he says, "nor should this impossibility prevent releases."

The trouble is that the concerned layman, not to mention the militant environmentalist, may be disinclined to accept that genetic engineering is worth any risk at all. Robert Wachbroit ('Explaining Risk') emphasizes the difficulty that laymen often have in understanding probability estimates; indeed, he seems not to understand them very well himself. A later chapter, by Joseph Fiksel, deals with the use of computerized knowledge systems in risk assessment. Useful as these may be for calling to mind relevant considerations, their usefulness must depend on the quality of the expert knowledge fed into them.

The problem of reaching agreement on what is relevant and realistic is well illustrated by Jonathan Naimon's chapter on the role of 'expert panels' with special reference to the furore in California concerning 'ice-minus' *Pseudomonas*, designed to protect fruit crops against frost damage. This product of genetic engineering has no transgene at all but only a controlled deletion of the gene coding for an ice-nucleation protein. It must have been quite a challenge to those trying to identify risks. One of the experts rose to the occasion by suggesting that wild-type 'ice-plus' bacteria in the atmosphere might be catalysts of rain, and that their replacement by ice-minus cells on the leaves of fruit trees could jeopardize the Central Californian rainfall. Presumably the next challenge is to devise a test of that hypothesis.

"One can only hope that reasonable attitudes will prevail", writes Fuxa. Everyone can say "Amen" to that. □

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Dated effort?

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Principles of Stratigraphic Analysis. By Harvey Blatt, William B. N. Berry and Scott Brande. *Blackwell: 1991. Pp.512. £39.50, $49.95.*

STRATIGRAPHY has long been regarded as one of the less interesting, very traditional topics of an Earth science degree, lots of formation names and fossil zones to learn with little obvious significance. To call a geologist a stratigrapher was once something of an insult, a person with little specialization who mapped a bit and stamp-collected rocks and fossils but had no real feel for the palaeontology, sedimentology or geochemistry of the rocks he/she was studying. But that has changed in the last decade or so, with the subject now very diverse and technical, requiring a jack-of-all-trades or a team of people to tackle stratigraphic problems. Stratigraphy has also had a great boost in the last few years with the development of sequence stratigraphy, a new way of looking at the larger-scale geometries of sedimentary rock packages. Sequence stratigraphy is an approach used extensively by the oil companies to predict the distribution of potential reservoirs and source rocks. Against this background then, any new textbook on stratigraphy will be looked at with great interest by college lecturers and students alike, as well as professional geologists.

Principles of Stratigraphic Analysis by American university professors Harvey Blatt, William Berry and Scott Brande briefly reviews the techniques used (fieldwork, fossils, seismic, wireline logs), describes sedimentary rocks and their depositional environments, outlines the tectonic controls and basin formation, and discusses economic resources (oil, coal, salt, sand). Chapters are also provided on geological time and correlation, distribution of organisms, evolution and biostratigraphy. The book does bring together a lot of useful information, enabling the student easily to get a feel for the breadth of the subject. There are several more comprehensive texts available on sedimentary rocks and depositional environments, at less than half the price, but the sections on the palaeo/biostratigraphy side do include material not readily accessible. But in spite of this, the book does have a lot of drawbacks.

Surprisingly, there is no presentation of the concepts of sequence stratigraphy even though these important ideas have been at the forefront of geological research for at least five years. The omission drastically reduces the value of the book to students. There is no excuse for the lack of sequence stratigraphy. Although the main book on the subject was published in 1988 (*Soc. Econ. Paleont. Miner. Spec. Publ. 42*) and ideas are still developing, there has been ample