/ COMMENTARY

by Bernard Dixon

ECOLOGY AND RATIONALITY IN FREE RELEASE

Three solid days on the ecology of biological invasions, the first two within the portals of the Royal Society and the other by courtesy of London's Ciba Foundation, sound like a formula for intensive cerebration. Contemplating this tandem of meetings, as I did recently, was enough to suggest a formidable outpouring of knowledge. No doubt we would be hearing about ways in

which centuries of organic understanding, built up through the painstaking observations of natural historians, had been complemented by the quantitative labours of modern ecologists in charting changes in the biosphere. Just as enticing was the prospect of learning how the combined efforts of ornithologists, botanists, and their peers had spawned unambiguous principles concerning invasion. These should provide invaluable guidelines for today's biotechnologists in considering the first releases of engineered organisms into the environment.

After the two meetings, I'm less confident. True, some extraordinary achievements and approaches were in evidence. At opposite poles were ingenious studies spanning 18,000 years of history and organisms as diverse as forest trees and HTLV-III virus. Dr. K. D. Bennett of Cambridge University showed how it was possible, by analysing pollen grains in sediments, to show at what rate and why particular plants had spread across continents with the retreat of ice sheets during postglacial times. And Professors Bob May from Princeton and Roy Anderson of Imperial College, London, supplemented the astonishingly rapid growth of computerized epidemiology to model and perhaps fathom the course of the pandemic.

Between these extremes, the London audiences heard many case histories accounting in detail for events ranging from the infiltration of Britain by American mink, coypu, and *Rhododendron ponticum*, to the arrival of exotic varieties of diatom in the Irish Sea. In each case retrospective explanations were highly impressive: like economics, ecology is capable of exemplary analysis after the event. But what of those broad, clear principles which distinguish a mature science from an emerging one? Here, the sole undisputed opinion was the inadequacy, indeed errancy, of the conventional wisdom concerning ecological invasion. What, for example, are the properties of a particular site that determine whether it is vulnerable to settlement by a newly arrived species? The traditional answer devolves around the adjective "disturbed"—meaning altered by agents such as fire, glaciation, or humankind. But there are so many exceptions to this rule that ecologists now consider it mediocre as a means of prediction.

Equally unreliable pointers are the competitive and other properties once thought to characterise a likely invader. Here, even the most plausible ideas turn out to be unsound. One might, for instance, imagine that migratory birds have an unreasonable advantage over non-migrants

in taking up residence in new terrain. In the real world, they fare no better. Today's ecology seems incapable of determining, on *a priori* grounds, which species will and will not become pests (itself an anthropomorphic rather than biological term). As Sir Hans Kornberg said to general agreement during the Ciba Foundation cabal, what we really require is an understanding of why many apparently promising candidates fail to penetrate or become established in new areas. Penning these lines at a time when guidelines on controlled release are about to be published both by the Organization for Economic Cooperation and Development (OECD) and by Britain's Health and Safety Executive, I may appear to be arguing that ecologists have little or nothing to offer by way of guidance to field biotechnologists. Quite the reverse. Despite the comparative immaturity of the discipline, an ecological perspective on the dawn of planned release is essential—not least because it indicates two boundary conditions. First, the insights and limitations of ecology are such that it would be feckless in the extreme for regulatory authorities not to take ecological thinking into account when assessing proposed releases. Second, there is a symmetrical caution. Just as an awareness of all possible biochemical and microbiological hazards with associated foods (including "organic" ones) might drive an over-sensitive soul to seek safety in starvation, so ecology could easily provide an endless catalogue of reasons for never interfering with the biosphere. What we should be doing is to insist on adequate ecological input into the screening of release proposals, together with a determination to extend that knowledge by case law as experience accumulates.

And here I want to refer to an argument put forward recently by Brian Wynne of Lancaster University about the European ban on steroid hormones in animal husbandry, seen by many scientists as a totally irrational response to ill-informed consumer pressures (see *Bio/Technology* 4:255, April '86). Known for his shrewd comments on nuclear policy over the years, Dr. Wynne points to important caveats in the report of Professor Eric Lammings's expert committee which studied the question. It ruled that these substances could be employed safely provided certain conditions (such as dose and route of injection) were followed. What society ought to be concerned with, according to Wynne, is whether those conditions can be enforced in practice. Failing that reassurance, farmers should not be allowed to use steroid hormones. This is the point consumer groups have a right to raise. And this is the conclusion which the regulators, acting on behalf of the community at large, ought to draw too.

For such reasons, Brian would like to see "a good social scientist with an empirical nose" on every scientific advisory committee. I am inclined to echo him. In the realm of controlled release, it seems, we need sociology as well as ecology. But the qualifier "good" is essential in each case too.

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