Letters

Recombinant DNA Release: European Regulation

The first two sentences of David Dickson's News & Comment article, "Europe splits over gene regulation" (2 Oct., p. 18), illustrate some of the confusion that reigns over the question of the "newness" of genetically manipulated organisms. In the first sentence, Dickson cites the recent "*first* publicly approved release of a genetically altered organism in Europe" (emphasis added), a small-scale field trial of baculovirus containing a cloned genetic marker. Assuming that he is taking into account the vast experience and monumental successes with pre–recombinant-DNA genetic manipulation of human and veterinary vaccines (*1*) and with gene transfer in crop plants (*2*), Dickson seems to imply that only recombinant DNA manipulations cause organisms to be "genetically altered." However, the definition of genetic manipulation mutates in the very next sentence, which refers to a "field test of a genetically manipulated *Rhizobium* bacterium," manipulated not by recombinant DNA techniques but by using conventional in vivo methods.

The article mirrors the confusion that plagues attempts in Europe to devise political solutions to scientific questions about planned introductions into the environment. Perhaps European regulators should look to the *scientific* answers to the questions provided by a recent U.S. National Academy of Sciences (NAS) report (*3*) that is clear and authoritative; its conclusions and recommendations include the following.

- Recombinant DNA techniques constitute a powerful and safe new means for the modification of organisms.
- Genetically modified organisms will contribute substantially to improved health care, agricultural efficiency, and the amelioration of many pressing environmental problems that have resulted from the extensive reliance on chemicals in both agriculture and industry.
- There is no evidence that unique hazards exist either in the use of recombinant DNA techniques or in the movement of genes between unrelated organisms.
- The risks associated with the introduction of recombinant DNA–engineered organisms are the same in kind as those associated with the introduction of unmodified organisms and organisms modified by other methods.
- The assessment of risks associated with introducing recombinant DNA organisms into the environment should be based on the nature of the organism and on the environment into which the organism is to be introduced. It should be independent of the method of engineering per se.

We can summarize the current situation regarding the regulation of new genetic engineering products in a syllogism. There exists substantial experience with the testing—including field trials—and use of products genetically engineered with older, more crude techniques. Protection of public health and the environment have been compatible with the stimulation of academic and industrial innovation under existing societal regulatory schemes. As noted, there is no evidence that unique hazards exist either in the use of recombinant DNA techniques or in the movement of genes between unrelated organisms. Therefore, there is no need for additional regulatory mechanisms *specific for the new techniques* to be superimposed on existing adequate regulatory mechanisms.

The simple, unassailably logical precepts of the NAS report provide clear perspectives on field trials of recombinant DNA–manipulated organisms. If put into practice by the European Economic Community and others, they could introduce a high level of rationality and enlightenment into societal oversight of the field testing of genetically engineered organisms.

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REFERENCES

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2. R. M. Goodman *et al.*, *Science* **236**, 48 (1987).
3. *Introduction of Recombinant DNA–Engineered Organisms into the Environment* (National Academy Press, Washington, DC, 1987).

Response: My article described the variety of approaches in European countries to regulating the environmental release of these organisms. Some countries have adopted a line close to that proposed in the NAS report; others, at least provisionally, have assessed the situation differently and have chosen not to. Young and Miller clearly disagree—as many in Europe's biotechnology industry do—with those who have adopted the second strategy. The purpose of the article was merely to demonstrate that it is a debate with several points of view.

—DAVID DICKSON

China's Population Program

The article "Fertility policy in China: Future options" by Susan Greenhalgh and John Bongaarts (6 Mar., p. 1167) seems to announce that China's present population policy has broken down and that to retain it is "the least desirable strategy." China has advocated later marriage and later childbearing since the early 1970s. Yet, the authors say, delayed childbearing is neglected in China. They list a variety of timing options for minimum age at first birth and minimum spacing intervals between births and conclude that one of the two most advantageous policies is for China to adopt a 27-4 option (that is, to have the first birth at the age of 27 with a 4-year spacing before the second birth). The reason for such a recommendation appears to be that "introduction of a 27-4 policy in 1985 would produce total fertility rates of 0.44, 1.34, and 1.68, respectively, for the periods 1985 to 1990, 1990 to 1995, and 1995 to 2000," thus keeping "the total population from ever reaching 1.2 billion" by the end of the century. The authors' statistics and projections appear to be accurate as mathematical exercises. One wonders, however, if they have taken into consideration the realities of cultural conditioning and the drives of human nature, especially as they relate to wishes concerning the time of marriage and childbearing in China's vast rural areas. As far as I know, there is not likely to be a single woman in the rural area who would wish to delay having her first child until the age of 27! Generally speaking, the majority of rural people marry as soon as they reach the legal age of marriage (20 for women and 22 for men), or perhaps 1 or 2 years earlier, at the nominal age reckoned by the traditional method (that is, considering a person 1 year old at birth and adding a year each lunar new year). The conventional practice is to have a child right after marriage. Nowadays, many people would follow the government's advocacy of delaying childbearing for a few years, but not until the age of 27.

With regard to the author's other suggested alternative, "a stop-at-two-and-space policy that sets no restrictions on the timing of the first birth but sets a minimum age at second birth of 30 years," even people in developed countries like the United States would be unlikely to follow this practice, not to mention the people in rural China.

The nucleus of China's present population program is its family planning policy. Its aim is to control population quantity and to improve its quality (in terms of health and education) so that population growth may be in keeping with socioeconomic development and commensurate with the utilization of natural resources and environmental protection. Its main points are (i) to promote late marriage and later, fewer, but healthier births with prevention of genetic and birth defects; (ii) to advocate the practice of "one

couple, one child"; (iii) to persuade couples wishing for a second child to have planned spacing; and (iv) to avoid second or multibirths outside planning (with proper flexibilities for national minorities).

Advocacy of "one couple, one child" does not mean that every couple must have only one child. The 1985 statistics show that only about 20% of China's 190 million married couples of childbearing age have expressed a wish for one-child families; nearly 20% of eligible couples currently have third and subsequent births.

Three points should be clarified.

1) Some Chinese regulations do stipulate certain conditions under which couples may have two children, with the implication that other couples, if having a second child, will have to pay certain fees to the public welfare fund to lighten the burden on society. This is not meant to stop a second or third birth entirely, since even children born out of wedlock are protected by law.

2) Psychologically speaking, if couples were encouraged to have one child each, a portion of them would tend to have two. If they were encouraged to have two children each, then there would be more cases of third and high-order births. That is the general phenomenon in rural areas of China.

3) The important thing is that people's wishes are respected. China has carried out public education in various forms to encourage the practice of the one-child family norm, but has not used coercion to force it upon the people. In China, human responsibilities are stressed as well as human rights. All policies, no matter how good, must be adopted on the condition that the majority of the people will accept them.

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NOTE

1. This letter is condensed from a longer manuscript available from the author.

Response: In writing our article, we hoped to stimulate research and debate on alternatives to the one-child-per-family policy, a policy of obvious high cost both to the Chinese population and, in political terms, to the Chinese government.

Zhao does not address the nature of the analysis presented in the article. The article was not about China's current fertility policy and whether or not it has "broken down." (In fact, as we point out, it has been extraordinarily successful in meeting its demographic objectives.) Rather, the piece addressed the issue of policy criteria—the number and kinds of factors that should be considered in the formulation of a demographically effective, socially and economically desirable, and culturally acceptable population policy.

Between the late 1970s and the mid-1980s the number of factors considered in the formulation of China's population policy appears to have widened. In our article we further expanded the range of factors that, arguably, should guide policy choice to include the policy's macrodemographic impact on population size and aging; its microdemographic effects on the family's ability to support the elderly, its economic capabilities, and the position of women; and the cultural acceptability to the Han Chinese population. Most of the article consisted of an evalution of the present policy and five hypothetical policy alternatives with regard to these criteria. Our conclusion suggested that when the policy options are weighed with all these criteria, the present policy ranks below the other options. We argued that the 27-4 option is appealing not so much because it meets China's specified demographic objectives—although it does so—but because it succeeds in achieving a wide range of desirable social, economic, and demographic goals.

With regard to the timing of childbearing, we maintain that the demographic impact of delayed childbearing has consistently been underestimated in China. Even though, as Zhao indicates, current policy continues to advocate late marriage and long spacing, in fact these policy elements have been given less emphasis than the reduction in the number of children. As a result, in some parts of the country the age at marriage and childbearing has recently been falling, with obvious consequences for population growth rates.

Zhao's comments on "cultural conditioning" as expressed in peasants' marriage and childbearing desires are very much to the point. Where we differ from Zhao is in the policy implications of these cultural preferences. He implies that because "there is not likely to be a single woman in the rural area who would wish to delay having her first child until the age of 27," a policy stipulating such a delay is not worth considering. Our view is that all options should be open for discussion. On the issue of delayed childbearing, we would point out that demographic preferences of individuals do not exist in a vacuum, but are subject to constraints—most particularly, in the case of China, constraints imposed by the needs of society as determined by its leaders. With regard to delaying childbearing until age 27, our argument is not that peasants would wish to do so, but that, given a societally dictated choice between having one child any time or two children beginning at age 27, a rural Chinese couple might well prefer two children at a later age. Our general aim here was not to advocate any specific policy, but to expand the range of options available to policy-makers, offering policy alternatives that may be more in line with individual preferences and more effective in achieving national demographic targets than the current policy.

A trip to China in the fall of 1987 indicated that scholarly interest in population policy alternatives is growing. We welcome further dialogue on the desirability of different options and the criteria underlying policy choice.

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Newton Gravitational Constant

A controversial topic of late is the possible variation with distance of the Newtonian gravitational constant, G. One explanation for this phenomenon is a possible fifth force in nature. Because the ramifications of such an important new effect would be far reaching, there is considerable enthusiasm among scientists to perform experiments that might shed light on the issue. The strongest evidence for non-Newtonian behavior is the difference between the value of G measured in an Australian mine shaft, where the length scale of the experiment was hundreds of meters (*1*), and the value of G determined very accurately in the laboratory over a length scale of tens of centimeters (*2*).

In his report "Borehole measurement of the Newtonian gravitational constant" (21 Aug., p. 881), A. T. Hsui correctly concludes that his results for G are "generally consistent with those of the Australian experiment." Although it is difficult to compare the uncertainties of the various results because the geophysical error bars contain a subjective element, Hsui's results are also consistent with the value of G found by Luther and Towler in the laboratory and, indeed, with the value surmised by Isaac Newton some 300 years ago (*3*). The unavoidably large uncertainty in Hsui's measurement that comes about from inadequate density information does not allow a conclusion to be drawn about the discrepancy between the value determined by Stacey's group in Australia and the laboratory value. Contrary to the statement in This Week in