

Letters

Dangers of Reprogramming Cells

In an editorial, "Will society be prepared?" (11 Aug., p. 633), Nirenberg wrote about the prospects of molecular genetics:

Cells will be programmed with synthetic messages within 25 years . . . and when man becomes capable of programming his own cells, he must refrain from doing so until he has sufficient wisdom to use this knowledge for the benefit of mankind.

No subject of policy is more important than this, and it deserves the most critical debate. There is some danger that, whether so intended or not, Nirenberg's language could generate public misunderstandings that might undercut the very research needed to reach sufficient wisdom. His underlying concern, which I share, is that biological control might be used by a malevolent government to the peril of individual freedom. As Hitler's racial policy illustrated only too well, the State's access to forcible compulsion already gives it the power of genocide.

Presumably we have to be even more concerned about subtler mistakes. A well-intentioned government might impose rash commitments for the sake of short-term advantages. Plainly we must be very sensitive about innovations that, once introduced, constitute irreversible evolutionary deviations.

However, we should emphasize the distinction between eugenics, that is, programmed evolution, and euphenics, that is, the reprogramming of somatic cells and the modification of development. "Message" does carry a strong connotation of RNA messengers with somatic effects. To interdict such personal uses of messages would be hard to justify without a prohibition on all new medicine, especially such interventions as the use of hormones. If only germinal messages are meant, we have other prospects to worry about too. The manipulation of germ cells for genetic

surgery would almost certainly be preceded by techniques for clonal propagation and for chromosome manipulations in human beings, which would already have the most cogent evolutionary implications.

Human culture, as the late H. J. Muller has pointed out, is already a major commitment of individual development to formative influences decided by the community. Our educational systems are certainly a form of psychological engineering scarcely different in fundamental principle from the biological interventions that our knowledge of nucleic acids is likely to bring about.

Our main concern must be to maximize the role of individual decision. This could be defeated by overenthusiastic policing of personal initiative and experimentation as well as by premature positive measures imposed by the State.

In point of fact, we already practice biological engineering on a rather large scale by use of live viruses in mass immunization campaigns. While these are of indubitable value for preventing serious diseases, their global impact on the development of human beings of a wide range of genotypes is hard to assess at our present stage of wisdom. Crude virus preparations, such as some in common use at the present time, are also vulnerable to frightful mishaps of contamination and misidentification.

Live viruses are themselves genetic messages used for the purpose of programming human cells for the synthesis of immunogenic virus antigens. Nirenberg's cautions are just as relevant to considerations of contemporary policy as they are for the ever-widening applications of molecular biology in the near future.

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Samuelson's article on the SST (8 Sept., p. 1146) emphasizes the future problems of the sonic boom, but certain parts of the country already are in the supersonic age. While camping deep in the Teton wilderness area of Wyoming this summer, our family experienced almost daily this menacing noise. Presumably these shattering onslaughts arose from planes based at nearby military centers.

The temptation to use unpopulated regions of the country for SST overflights must be great and will increase shortly. However, the Wilderness Act set aside a small percentage of our nation to be left unspoiled, and I am convinced that the SST must be excluded from such areas now and in the future.

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. . . No mention is made by Samuelson of the bias evidenced in the sonic boom tests which are conducted by the Federal Aviation Administration and other agencies. Again and again, the investigators seem to strive to remove the main thrust of the sonic boom: its startle effect. It is well known that the boom, striking with no warning whatsoever, is highly startling; often it produces muscular spasm and marked increase in rate of heartbeat (1). But in the most recent sonic boom tests (2), the investigators actually warned the human subjects just before each sonic boom that the loud noise in question would occur "...in one or two minutes." In certain other tests (1) each subject knew *within five seconds* when the boom would occur. Also, in these two series of tests the subjects were adults, in good health, wide awake, and in a relaxed state of mind; they were participating in the tests voluntarily, were paid for doing so, were persuaded that the tests had scientific value, and knew that the tests would soon be over.

Consider, then, the temerity of the FAA officials and other SST proponents in implying that the results of the tests have *general* relevance! How different might the outcome be if the subjects were of nervous disposition or already under strain, were responsible for children and infants, and had already had their homes damaged by booms; how different would be their response if the booms came at irregular times, night and day, with no warning, if the sub-