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Although Lederberg is Scientist in Residence for POSTS, he is principally committed to the Stanford University Medical School where he receives most of his support. Included among his many interests is a concern for the social and political effects of advances in the field of biology. Two of his published articles deal with this subject, (9) and (12).

Advances in molecular biology promise to enlarge our technical capacity to intervene in genetic problems. Social and ethical factors are likely to play an increasingly important role in determining the application of new scientific advances to humans. Lederberg believes that the evolution of wise policies for the use of genetic advances requires a widely disseminated understanding of the probable potentialities of various types of genetic intervention and their technical as well as ethical limitations. In addition, the costs of enforcing constraints against such interventions must be weighed against the social motives for possible sanctions against them. Currently, such intervention generally takes the form of prenatal diagnosis coupled with elective abortion of the threatened fetus. However, cell and organ transplantation and virogenic therapy are being developed. The re-nucleation of eggs (cloning) is a theoretical possibility, likely in the near future to be of more metaphorical than pragmatic interest. The discussion of cloning may help to illuminate the ethical problem of parenthood, i.e. what is the responsibility of each generation for the biological and educational predetermination of its successors?

To answer such questions, it is important not only to disseminate information on genetic possibilities but also to integrate biology with the social sciences, such as psychology, philosophy and history. Such an interdisciplinary field is called "human biology." It includes many questions presently not understood, such as: When does life begin? To what extent do biological factors determine temperament, language skills, intelligence and other behavioral traits? When more intricate methods of intervention in human development are found, they must

*Includes 1971 - 1973.

be given the most careful scrutiny with respect to the social utility of their adoption. The study of "human biology" is needed to do this.

Lederberg also wrote an article on chemical and biological weapons (10). In it he outlines the history of national and international policies directing the production and use of these weapons. For example, he describes the Biological Draft Treaty (BW-71) which states that each party promises to "never . . . develop, produce, stockpile . . ." biological weapons. There are two main problems with this: the treaty does not mention actual *use* of such weapons; and the peaceful uses of potential biological weapons make verification of adherence to the treaty extremely difficult. Despite these difficulties, BW-71 and other international agreements involving chemical and biological weapons have been practical forces to deflate the pressures for such a weapons race by the superpowers. Lederberg states, "Insofar as the superpowers place some utility on the pattern of stability achieved by BW-71, they may discourage violations even in the face of local advantages to one of their allies."

In another article (11), Lederberg outlines several approaches for better directing scientific research toward improving the human condition:

- a) Liberate the universities from some of the programmatic restraints of centrally administered governmental funding.
- b) Promote a flourishing, well-informed and effectively critical scientific community.
- c) Subject the scientist turned consultant to public scientific skepticism.
- d) Provide Congress with greater access to good technical advice.
- e) Assess not only individual projects, but also their aggregate impact.

New laws will be necessary to resolve conflicts of rights along new lines in the areas of: privacy, including computer dossiers on individuals; public education for over-specialized professionals; and environmental concerns, including the deprivation of individual rights for the general welfare. The registered non-profit advocate of consumer and environmental interests, already exemplified by public interest law firms, is a new institutional form needed to deal with these problems.