

ETHICAL ISSUES IN BIOLOGICAL ENGINEERING

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The same doctor that can keep us from disease would also be clever at producing it by stealth.

Plato, *Republic*, I, 333.

In this article I shall discuss some of the ethical issues that arise in connection with social programs of biological engineering.¹ My treatment falls, roughly, into two parts. After presenting some preliminary background and discussing the limitations of this paper, I turn to certain general questions about social programs and our obligations to the future in sections II through IV. I then pass on to a specific consideration of programs of biological engineering in sections V through VII, although there are allusions to them in earlier sections. In both parts, some issues are gone into in detail, while others are merely brought to the attention of the reader. I have no pretensions that any of them is conclusively settled here.

I. THE PROBLEMATIC SETTING OF PROGRAMS OF BIOLOGICAL ENGINEERING

It will be useful to begin with a general statement of the problems that motivate the subsequent discussions. These problems are engendered by the population explosion and the genic composition of mankind. It seems that man's cultural successes are frequently the sources of his most intractable problems. Among the factors accounting for the enormous rise in world population are the advanced technologies that have the cumulative effect of lowering the rate of infant mortality and prolonging the span of life. It is probable that in some parts of the globe there has not been much change in these respects, but the picture in these places,

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¹ I am not here concerned with the solution of specific ethicolegal problems arising out of the use of biological technology: such as, whether the A.I.D. child is (should be regarded as) the legal heir of the donor or of the mother's husband. We shall soon need to have legislative solutions to such problems, solutions that will (or should) reflect broad policy decisions on whether to encourage, discourage, permit, or prohibit various social tendencies and practices. My discussion, hopefully, bears upon these larger questions.

other things being equal, is likely to alter toward what one might call the "Western pattern."

On the other side, the birth rate in the developed countries has tended to go down. This development is parallel on the whole with urbanization. Any prediction of future population statistics must take into consideration that urbanization, which is growing apace in the developed countries, is a world phenomenon. It would be a mistake, of course, to associate the downward trend in the birth rate solely with urbanization. The "urbanized" nations have scientific technologies, and thus an availability of birth control devices.² Yet even if a general drop in the birth rate is in the offing, its advantages, insofar as the control of man's numbers is concerned, are likely to be offset by a further lowering of the rate of mortality at any given age. And while it is now generally the case that the elderly do not father or mother, advances in biological technology may very well allow every man to be an Abraham and every woman to be a Sarah. The technology may increase human fecundity as well as decrease it. In any event we may look forward to a fantastic increase in our numbers whatever the accuracy of specific projections of the United Nations report of 1958, *The Future Growth of World Population*.³

But what about the genetic quality of this world population?⁴ Any change in the size of a population may be either advantageous or disadvantageous depending on the environment, just as the "deleterious" chromosome may be useful in other surroundings. Our biological technology, present and future, is not the only technology. The environment of the future may well be able to sustain more people than even optimists predict. Nevertheless, there are a number of phenotypic variations that have a genetic basis. Some are of little concern, for instance, hair and eye color. Hemophilia, certain bodily deformities, predisposition to various diseases, and certain forms of mental deficiency are another matter. Our culture has been successful in prolonging the lives of many carriers of deleterious genes to enable them to transmit these propensities to future generations. An increased population is likely to have large numbers of individ-

² Birth control is older than Onan, but it may require "urban attitudes" before it is widely practiced. I do not know whether the birth rate of the ancient or mediaeval city was lower than that of the rural areas. I suspect that city dwellers tend to be more continent than their country fellows.

³ The recent DEMOGRAPHIC YEARBOOK (1967), published by the United Nations, puts the world's population at 3,356,000,000 as of June, 1966. It predicts that if the present rate of increase is maintained, the figure will double by the year 2005. But these figures are challenged by some demographers. See N.Y. Times, Nov. 12, 1967, at 113, col. 1.

⁴ See Gorney, p. 291 *supra*.

uals subject to them. Secondly, genic mutations are almost always "disserviceable"; and it has been argued that the "load of mutations" in the crowded world of the future will pose serious problems,⁵ even though advances in medicine will permit the treatment of many suffering individuals.

There is a further aspect to the topic of genetic quality. The crowded world of the future is likely to require mental and social skills of a high order. It has also been argued that just as various physical traits have a genetic basis so do these skills. There is a danger, therefore, that they too are subject to gradual debasement, a circumstance that poses as serious a threat to mankind as those referred to above. Aside from eliminating negative physical traits, it also seems that positive human traits will need to be accentuated.

How should our biological technology be deployed to deal with the intertwined problems of genetic integrity and population control? I shall shortly take up some of the general ethical issues raised by this question. Before doing so, I think it important to set out its wider problematic context, although only a bare itemization is possible here. First, any discussion of the above question that pretends to be complete would have to reckon with the complexity and inter-relatedness of problems that currently threaten the existence of man and the character of human life, including problems engendered by (a) the production of nuclear devices for military and industrial purposes, (b) the depletion of natural resources, (c) the alteration of our living-environment, (d) the population explosion, and (e) the genetic composition of mankind. I have deliberately not employed any neat principle of division in formulating this list, for I wish to point out that whatever is done in regard to any one element is sure to have repercussions for the others, although in some cases it may be indirect and tenuous. There is no suggestion intended that the list is by any means exhaustive. In this paper the focus is upon (e), with occasional reference to (d).

Second, a complete discussion of the above question would have to consider the inter-relatedness of the various facets of human engineering,⁶ including (a) genetic control, (b) behavior control, (c) personality control, (d) cultural control, and (e) environmental control. The term "control" ranges from total control to the introduction of important changes through minor manipulations. Here again it is obvious that there are interconnections, although it is

⁵ See Muller, *The Guidance of Human Evolution*, 2 EVOLUTION AFTER DARWIN 423, 430-34 (S. Tax ed. 1960), [hereinafter cited as EVOLUTION AFTER DARWIN].

⁶ See *Toward the Year 2000: Work in Progress*, DAEDALUS (1967).

not always apparent what these interconnections are. Biological control implicates all five sub-items. Biological engineering is only one facet of human engineering.

I think there is no need for me to expatiate on the limitations of this inquiry into the ethical aspects of biological engineering insofar as they derive from an inability to reckon with the total problematic context. However, I must say a few words about the personal limitations of the writer.

Is Saul also among the prophets? Ideally this inquiry should be undertaken by someone who has both a thorough understanding of the technological possibilities (including an understanding of specific techniques) and a fully worked-out moral philosophy that would be acceptable to all concerned parties. I possess neither. On the second, I frankly make no apologies. The lack of a perfected moral philosophy need not prevent one from exposing ethical issues. On the first I would maintain that it is ultimately the layman who will, and moreover should, decide what social policies are to be initiated with regard to the technological possibilities. The layman is therefore justified in putting forward a tentative view on various policy proposals. Clearly, he needs the advice of the scientific expert. There may, therefore, also be some advantage in having laymen express themselves on these matters, for the expert will then be able to indicate the respects in which such views rest upon misunderstandings of the potentials of the technologies, both in their intended outcomes and in their side-effects. The need for mutual confidence between layman and scientist is essential in the area of biological control.⁷ The motto prefixed to this paper was chosen in order to underscore this point; in fact it covers all forms of social doctoring and not only biological engineering. A further possible advantage of a layman's treatment is that, by not getting caught up in discussion of techniques, it can focus more steadily upon the moral assessment of ends and means.

II. NORMATIVE ASPECTS OF SOCIAL PROGRAMS

In a discussion on the topic of how means condition the ends that we pursue, Morris Raphael Cohen points out that the mere availability of a means sometimes impels us to seek for an end that it can accomplish. His example is a humorous one: Give a boy an axe and see what happens. On the serious side, it does seem that we do not give enough thought to the ways in which the potentialities

⁷ This is discussed more fully in section VII, *infra*.

of our various technologies may be realized. In so doing we should, however, be sensitive to the danger of supposing that all the goal-potentials of our wonderful scientific technologies are necessarily good. And in the case of biological technology we ought to be particularly sensitive to this danger. There are, in fact, a number of normative issues—some ethical, some non-ethical—that arise in the formulation of social programs. I shall present in brief a catalog of these issues. What I say applies to social doctoring, generally, of which a program of biological engineering is a special case.

A social program has three components: (1) a goal, or set of goals, (2) means to effectuate the goal, and (3) an institutional framework for the implementation of the means. Although the second and third may be collapsed, here it will be useful to keep them separated. There is also the communal context of a social program. Normative issues obtain with respect to each of the components and the communal context.

A. *The Goal*

It is difficult to conceive of circumstances in which the bare fact that nothing can be said *against* the adoption of a given goal would be regarded as an adequate justification for its pursuit. Perhaps the case of a hyperactive individual most nearly qualifies. He needs to work off his restless energy, and would be helped if supplied with a goal. Any number of goals, so long as there is nothing in their disfavor, would do. The selection of the particular goal, however, would be an arbitrary matter. This kind of “justification” has no force when the adoption of social programs is at stake. Here the goal must appeal to some sense of *obligation* or *desirability*. The distinction between the two is a problem for ethical theory, and we need not go into it. It is enough to suggest that the mere fact that the end-product of a social program would be a good one to have is not always enough to arouse in us the sense that we have an obligation to realize the end. But the question “Is it ethically mandatory that we pursue this goal?” is always an appropriate one. The source(s) of obligation is, of course, another problem for ethical theory which, though it is not my principal concern in this paper, I shall touch upon in the next section.

The desirability of a goal refers us to the values that it represents. It is customary to distinguish between moral and other kinds of value, but this is not an easy distinction to make. Is the enrichment of life through art the achievement of a non-moral value? Is the enrichment of life by raising the standard of living a non-moral achievement? It is sometimes said that moral values are those

that are ultimately overriding. This is plausible; but it seems to hold that the good attendant upon the realization of a value is inversely proportional to its violation.⁸ Fidelity is, in one sense, a higher value than mere preservation of life; yet a violation of the latter is a more serious crime than a violation of the former. I shall advert to this matter in the sequel. Non-moral values are traditionally identified with the maximization of self-interest. Some go so far to condemn self-interest as immoral. But, given a distinction between moral and non-moral values, the pursuit of self-interest is immoral only when it conflicts with the realization of a moral value or with a goal whose pursuit is ethically mandatory. In any case, it is hard to conceive that self-interest would be accepted as sufficient justification for the adoption of a social program, unless we have in mind a larger notion of the "self." I should add that these remarks are not predicated on the assumption that there are "objective" standards of desirability. In concrete instances of the adoption of a social program the operative standards will be those that the adopters maintain. Nevertheless, when we contemplate a social program of biological engineering we must seriously stop to consider whether it conforms to our standards of moral desirability. Mankind's recent experience with *Rassenhygiene* should always serve as a warning.

It is important to recognize that a goal might be desirable but yet not be one that we ought to pursue. As Hobbes says of the laws of nature, some goals

oblige *in foro interno*; that is to say, they bind to a desire that they should take place: but *in foro externo*; that is, to the putting them in act, not always. For he that should be modest and tractable, and perform all he promises, in such time, and place, where no man else should do so, should but make himself a prey to others, and procure his own certain ruin⁹

The control of man's numbers may be just such a goal; it would be desirable if it were achieved. But it may be disadvantageous for the United States to engage in a program of population control, since—as seems likely—other countries will have little success with it. Thus, we, perhaps, should engage in such a program only if all other countries do. Some social policies must be based on the likelihood of their being widely adopted. This is no reflection on the urgency of world population control, but it is surely sometimes the

⁸ See the fascinating discussion in 2 N. HARTMANN, *ETHICS*, 451-59 (S. Coit transl. 1932), an undeservedly neglected book.

⁹ T. HOBBS, *LEVIATHAN* 121 (5th ed. 1952).

case that "in the struggle for life a refusal to limit numbers gives a positive advantage."¹⁰

Lastly, and related to the point just made, a goal may be desirable when viewed in isolation from our other ends, but ethically problematic when seen in a wider context of desires.¹¹ This is not to confuse the desired with the desirable, although it is plain that the goals that we regard as desirable cannot, in practice, be entirely separated from what we desire. But just as there is no reason to suppose that our desires form an harmonious structure, there may be no reason to suppose that the goals we judge as desirable constitute an harmonious structure. This is, in fact, one of the sources of moral perplexity.

B. *The Means*

The considerations of the last paragraph become apparent as we turn to the *means* aspect of a social program. To be sure, one of the primary questions in the adoption of a social program is the purely factual one of whether any currently available means will achieve the goal. Granted the desirability of the goal, it may still not be one for a social program because there is no way in which the goal can be accomplished. Secondly, given the availability of alternative means—all of which would effectuate the goal—we should naturally want to select the most efficient one. "What is the best means?" is a normative question, although perhaps not an ethical question.¹² It presupposes a criterion of efficiency, which in turn involves some method for calculating costs. But when these costs include the intangibles of so-called social costs, it becomes less plain that the question is not an ethical one. Social programs not only hopefully achieve a desirable goal, but are also *lived through*. The old chestnut "Does the end justify the means?" perhaps deserves the flip reply "If the end doesn't, what else could?" But the important point here is that a means may not only be successful in effectuating the goal, but may also disadvantageously affect other of our ends. We must, therefore, evaluate the means-goal complex within the wider context of desires, rather than in isolation. "It is willful folly to fasten upon some single end or consequence which is liked, and permit the view of that to blot from perception all other undesired and undesirable consequences . . .

¹⁰ Darwin, *Can Man Control His Numbers?*, in 2 *EVOLUTION AFTER DARWIN* 463, 470.

¹¹ See the critique of the "method of isolation" in A. MACBEATH, *EXPERIMENTS IN LIVING* 387-90 (1952).

¹² Cf. H. SIMON, *ADMINISTRATIVE BEHAVIOR*, ch. III (2d ed. 1957).

Not *the* end—in the singular—justifies the means”¹³ In justifying the adoption of a social program, therefore, we must inquire into the desirability of its side-effects as well as the desirability of its intended goal. (Unforeseeable consequences add further complications.) Obviously, the case for a social program of biological engineering cannot rest solely upon its potential as regards the maintenance of genetic integrity.

C. *The Institutional Framework*

A social program requires an institutional framework, a legal structure, for its implementation. This may take many forms and here I can give only an abstract characterization. Such a framework is comprised of decision-makers, personnel to carry out decisions, enforcers of decisions, and a system of sanctions covering perhaps rewards as well as penalties. Many normative questions arise in the construction of this framework, some of a practical sort and some of an ethical sort. I shall merely indicate the points at which such questions arise. There must be standards for the selection of decision-makers and personnel, guidelines for decision-making, and guidelines for the determination of appropriate sanctions and methods of enforcement. Again, in the light of mankind's experience with the *Rassenhygiene* of the Nazi regime, it would be difficult to exaggerate the importance of the ethical angles inherent in the formulation of standards and guidelines for a program of biological engineering.

The moral quality of the required institutional framework will much affect our judgment on the desirability of a social program. To the extent that its administration must be in the hands of “experts” who have esoteric knowledge it becomes less amenable to democratic controls. The dangers need not be spelled out. On the other side, a scientific technology which is a component of a social program will tend to become bureaucratized. Inevitably, in our case, there would be “control of biological control.” I shall offer a suggestion on this near the end of this paper.

I come, lastly, to the communal context. The formulation, adoption, and initiation of a social program occurs within a given communal context which is determinative of the feasibility of the program. This itself is not a normative issue, but it is in such a context that a program is lived through and in which the program is institutionalized. When we speak of the desirability of the goal, plainly, it is in relation to some community for which the goal is

¹³ J. DEWEY, HUMAN NATURE AND CONDUCT 229 (1930).

desirable. One of the hardest problems in justifying a social program arises when the community that is to reap the alleged benefits of the program is other than the community that must pay its costs. This seems to be the situation of biological engineering, and I shall shortly take up one aspect of this problem.

Before I do so, it would be appropriate to say a few words about the means element of a social program for the maintenance of genetic quality, that is, biological engineering. In a broad sense "means" refers to a set of activities and instruments which are jointly sufficient in order to actualize some goal. "Engineering" may be thought of as combining a theoretical component and this set of techniques, a "knowing that" and a "knowing how." Biological engineering has as its theoretical component the results of the biological sciences, which results determine the utilization of techniques for the production of genetic and phenotypic change. It is clear that some of these techniques may be "scientific" in a narrow sense and some "non-scientific." Artificial insemination is an old-hat example of the former; and undoubtedly more sophisticated and more fantastic techniques for monkeying-around (pun intended) with the human organism are available or soon to be discovered. The term "biological technology," when used strictly, refers to this aspect of the methods of biological engineering. The use of "non-scientific" techniques would also be based upon biological science. It is fairly obvious that the composition of the gene pool may be affected by changes in the law. (Changes in the gene pool would result from raising the salaries of college teachers, since they would tend to have more children.) Juridical laws that affect mating and reproduction we may call "genic laws." Some income-tax laws are undoubtedly of this kind. Such genic laws as are enacted because of considerations drawn from biological science would be part of a program of biological engineering. In this paper, I am concerned with social programs of biological engineering in the broad sense, which includes both types of technique.

III. OBLIGATIONS TO THE FUTURE

In the popular literature on biology and genetics—and undoubtedly in the technical literature, too—a frequent topic of discussion is whether man can consciously control the future of human evolution. It is pointed out that civilization has, in a sense, suspended the normal processes of natural selection, or at least that the form that the struggle for existence takes has been materially affected by human culture.¹⁴ The interpretation of the current stage

¹⁴ See G. HARDIN, *NATURE AND MAN'S FATE* 219 (1961).

is not entirely clear. Is it a "new kind of biological evolution" or is it a "new state of evolution" in which the "psychosocial" aspects are paramount?¹⁵ The topic is a heady one, full of deep philosophical significance. The issue that I shall now consider seems easy by comparison—what are our obligations toward the future?

The occasion for this question is plain. One ground on which a social program of biological engineering might be justified is that its goal is ethically mandatory, an obligation. The goal is that of maintaining (or enhancing) genetic quality. We must still consider what this goal (or set of goals) consists of. At this point, however, there is no need to go into the details. I am now concerned, rather, with a general question about social doctoring, of which biological engineering is only a kind, albeit an important kind. Put more precisely, though in quite general terms, the above question may be formulated as a complex of three questions: (i) is there now an obligation to bring about any given situation in the future?; (ii) if there is such an obligation, on whom does it fall?; and, (iii) if there is such an obligation, what ought be done now to fulfill it? I shall concentrate on the first of these three. It is clearly the most important, although I would hardly go so far as to say that social programs of biological engineering are completely foreclosed if it is answered in the negative.

But even as now formulated, question (i) is unsatisfactory. "Future" is a vague term, and no headway can be made until we settle on the "future" that is the subject of concern. Purposive conduct is future-oriented; one does something now in order to bring about some condition at a later date. But this later date may vary from the next second on into eternity. I move towards the switch in order momentarily to turn on the light. A nation goes to war in order to make the world safe for democracy twenty years later. It would be easy to multiply examples. On the other hand, we accuse someone of short-sightedness. He acts in the present for the present, so to speak. And the "present" for which he acts might be a point five years from now, when that point should be—we think—ten or twenty or fifty years hence. What relevantly counts as the future in one context, counts as the present in another.

How do we fix the future for the problem-area that constitutes the topic of this paper? In order to get a foothold I must advert to the problem of genetic quality, although the following discussion has application, I believe, to any social program for which the

¹⁵ See Huxley, *The Emergence of Darwinism*, in 1 *EVOLUTION AFTER DARWIN* 1, 19-21.

dimensions of the future are the same. The outer boundary of this future is not easy to establish. It is that point at which a critical situation will obtain unless steps are taken in order to prevent it. The nearest I have come to a definite statement on this is contained in the following remarks of Sir Julian Huxley:

[I]f we don't do something about controlling our genetic inheritance, we are going to degenerate. Without selection, bad mutations inevitably tend to accumulate; *in the long run, perhaps 5,000 to 10,000 years from now*, we [sic] shall certainly have to do something about it. . . . Most mutations are deleterious, but we now keep many of them going that would otherwise have died out. If this continues indefinitely . . . then the whole genetic capacity of man will be much weakened.¹⁶

I hasten to add that my reading of the literature suggests that the situation is somewhat more urgent. The inner boundary of this future would be set, I suppose, at that point at which a society begins seriously to suffer from the failure to maintain genetic integrity. I am, frankly, at loss to supply a date for this, especially since "seriously to suffer" is both vague and ambiguous (suffer in what respects?). In any case, it would seem that the "future" with which we are concerned is—in relation to programs of social action—what we ordinarily think of as the *remote* future. A social program of biological engineering would be planning for this remote future. We may therefore reformulate our original question as follows: Is there now an obligation to bring about any given situation in the remote future? Unfortunately, I cannot be more precise. (Obviously, I am not concerned with eugenic programs that might be aimed at our immediate descendants, but I shall say a few words about them later.)

This reformulation takes us back to an item mentioned in the previous section, namely, the communal context of social programs. I remarked there that sometimes a social program is initiated in one communal context in order to bring about an allegedly desirable situation in another communal context. We are thus raising a question about our moral relations to the community of the remote future. I submit that this relationship is far from clear, certainly less clear than our moral obligations to communities of the present.

I think it worthwhile to dwell a bit on this point. It appears that a social program may be justified on three grounds (singly or in combination): (1) self-interest, (2) an obligation to prevent an

¹⁶ Taken from a television broadcast and printed in 3 *EVOLUTION AFTER DARWIN* 61 (emphasis added.)

undesirable situation or promote a desirable one, and (3) humanitarian considerations. Frequently, these tend to converge.

To justify a policy on grounds of self-interest is not necessarily to condemn it to the realm of the immoral. Considerations of self-interest are always legitimate, even if they are not always overriding. Now when a social program is justified in this manner, the "self" which is involved is an extended self, so to speak. In the United States we are currently engaged in a number of programs of social welfare, and it is in our interest to be so engaged. The "self" encompasses a community of individuals. But as the "self" is thus extended, it becomes less plausible to view our concern with the communal welfare as "self-interested." This would be true whenever the "self" is extended so as to transcend spatial and temporal boundaries, where the "self" is enlarged to encompass wider and wider communities. If the individuals whose welfare is the object of the program are included in the "self" whose interest is being maximized, then the ground of the programs would be virtually indistinguishable from an obligation to promote the good of humanitarianism.

A social program may be justified by appeal to an obligation to promote a desirable situation or prevent an undesirable one—but, I take it, not a desirable or undesirable situation *simpliciter*. It must be desirable or undesirable *for some community*. I have elsewhere elaborated upon the importance of the notion of community in the development of a theory of human rights.¹⁷ For our purposes we may note that the extension of rights is historically conditioned by two factors. Individuals and groups put forward *claims* to the goods of life, demand them as their right. In this way the content of a system of rights is increasingly expanded towards the inclusion of more of these goods. That a college education should be available as a matter of right would have hardly been thought of one hundred years ago, but many people now talk in this way. Secondly, there is an increasing expansion of the "moral community," namely, those individuals and groups whose claims to the goods of life are entitled to recognition. The altruistic impulse breaks out of narrow confines towards a concern for the well-being of larger segments of mankind. Of course, not every claim is recognized as conferring a right; not every claim is recognized as a claim upon me or a claim upon society, imposing an *obligation*. Some claims may be frivolous. Here a third factor enters the picture: *the social ideal*, a conception of the good life for man, which serves

¹⁷ Golding, *Towards a Theory of Human Rights*, forthcoming in the *MONIST*.

as the yardstick by which such claims are measured. In speaking of the good life I do not have in mind the ideal life of saints, which may be a personal ideal, but that kind of good life which is feasible for society at large. It must surely contain a material or economic component. (This is one of the greatest points of pressure in considerations of population and environmental control. For, as has been often said, what the few demand today the many will demand tomorrow.) I am far from maintaining that a social ideal is subject to easy formulation; it is certainly not static. In any case, it is in reference to claims, the scope of the community, and the ideal that our social obligations are determined.

These three also play a role in humanitarianism, for there is surely a distinction between genuine humanitarianism and mindless do-goodism. At its heart humanitarianism is concern for the well-being of others. Viewed from the inside, humanitarianism is the desire that others should have the goods of life, or at least not suffer its pains. Men do have genuine other-regarding affections, which are not disguised forms of self-love—although this does not exclude the possibility that even altruists are sometimes capable of crass selfishness. There are, of course, significant differences among those “others” whose well-being motivates us, as will be evident to anyone who compares his concern for the well-being of his own child with his concern for the starving child in a far-off land. These differences derive from the kind of obligation one has for the other’s welfare and the strength of the altruistic impulse. It would be just as much a mistake to conclude that humanitarianism involves no degree of obligation to the stranger, as it would be to conclude that the normal father-child relationship involves no altruistic impulse. To be sure, we hardly think of the father’s concern for the welfare of his child as humanitarian. But this is not because other-regarding affections are absent—in fact they are of the strongest sort. Rather it is, first, that the very term “humanitarian” implies a relationship different from that obtaining among members of the nuclear family. And, secondly, the father has a special kind of obligation towards his child, namely, he is assigned the immediate responsibility of seeing to the child’s welfare. There is, so to speak, a moral division of labor (or a division of moral labor) operating, whereby the obligation of a father towards his child is (normally) quite different from that of a man to a stranger’s child. Nevertheless, we do have an “obligation of benevolence, or humanity,” as Bishop Butler called it, an obligation that extends out from the family to increasingly wider communities. The character of this obligation is determined by the kinds of moral relationships one has to these communities, or to put it in other terms, by one’s mem-

bership in different kinds of community. The concept of community is, admittedly, obscure. The analysis of it is beyond the scope of this paper. Here I would point out that it is not a biological notion. It is ethical and metaphysical, if you will, a spiritual idea.

In considering the social programs that this country has undertaken in order to promote the welfare of other societies and nations, one can hardly deny that a good share of our motivation is self-interest in a narrow sense, *i.e.*, our national interest. But this is not the whole story, for we do also acknowledge an obligation toward other peoples. This obligation, of course, is not of the same order as the special obligation we have to promote the welfare of various individuals and groups in our own society, who are entitled to be recognized as part of our moral community. A crucial factor in the home situation—to the extent that these social programs are based upon an obligation towards indigenous individuals and groups—is an awareness of the *relevance* to them of our social ideal, and therefore a receptiveness to their claims to what we regard as the goods of life. Now the notion of “the relevance to X of a social ideal” is extremely complicated, and I am unable to give a full explication of it. (I suspect that it has both normative and descriptive components.) Undoubtedly, the condition of someone’s life is an important, and perhaps the important, element in determining this relevance. And it would seem, in turn, that composition of a moral community is a partial function of the degree to which a social ideal has relevance for a set of individuals, given their conditions of life.

We may conclude, I think, that our obligation to engage in social programs for the peoples of distant lands has a problematical status. The more remote the conditions of their life from ours and the stranger they are, the less relevant does our social ideal become for them and the farther they get pushed towards the fringes of our moral community. It requires a great effort of mind to see in them the same humanity that we share with our next-door neighbors. I do not say this in order to justify the kinds of vicious colonialism that so-called advanced nations practice against the unadvanced. Rather, the issue is the justification of social policies for the betterment of life of the less advanced. The more remote the conditions of their life from ours and the stranger they are, the less do we know what to desire for them.¹⁸ Of course, it does not follow that we have no obligations in respect of strange peoples in remote

¹⁸ Sometimes, the better we get to know these peoples, the clearer we are on the irrelevance of our social ideal for them. Few of us today—and probably the fewer the better—feel an obligation to export Western culture to the corners of the earth.

lands. What is exceedingly questionable, however, is the extent to which we should think of them as having claims to the goods of life as we conceive these goods. If I may be permitted to indulge in a bit of science fiction, the point I am making will, perhaps, become clearer. Suppose there are rational beings on other planets. They are bound to be very different from us and the conditions of their life would be very different from ours. Since they are rational I assume that we would have an obligation of truth-telling in respect of them, if we could communicate with them. But we would be at a loss to say whether we have any social obligation to secure for them what we consider the goods of life. I readily concede that the strange peoples of the earth are in a better case than Martians or Venusians.

In this respect our immediate descendants, though yet unborn, are better off than strange peoples. After all, we do know—or at least think we know—what to hope for our children. The conditions of their life will probably be much like ours and they will be much like us. Our social ideal has relevance for them and they—though unborn—are part of our moral community. They have claims upon us. If someone finds it difficult to think of having an obligation towards his unborn child, then he should find it difficult to think of having an obligation toward a community of humans (humanoids?) fifty generations hence. (I must confess to finding it odd when the same people who put biological engineering for the future on ethical grounds also defend abortion of a foetus on the ground that we have no obligation in respect of an unborn child.)

The conclusion to be drawn from the above discussion should be apparent. It is highly doubtful that we have an obligation to establish social programs that would secure a “good life” (prevent the undesirable, promote the desirable) for the community of the *remote* future. The conditions of life then are likely to be so different from anything we can now imagine that we do not know what to desire for them. Now this does not *prove* that we have no such obligation; but it does put a heavy burden of argument on anyone who comes forward with proposals regarding the remote future. We shall have to inquire further into whether a case can be made for biological engineering. In so doing we need to be sensitive to the probability that any effective program of biological engineering will itself alter the conditions of life. Which leads me to the next topic.

IV. BETWEEN THE PRESENT AND THE FUTURE

But, surely, it may be said, we do know something about the future, or are at least entitled to think so. (But do we know

enough?) Are we at such complete loss as to what we should desire for the community of the future, namely, the enhancement of certain "positive" human traits and the elimination of "negative" ones? (See the following two sections.) And if man has learned anything from the past, isn't it that he must plan for the future?

Agreed; we must plan. But for *whose* future shall we plan? There are many generations between the present and the remote future. Aside from the question "What shall we plan for?" we must consider whom we shall plan for. Is any generation, or set of generations, more entitled to our humanitarian concern than any other? There is no easy answer to this question, but I would lay it down as a general (though not necessarily unexceptionable) rule that the amelioration of current evils has higher priority than the production of future goods. (Note that "current" may refer to a long stretch of time.)

This "rule" appears to be short-sighted, but I think it reasonable to adopt it as a way of overcoming certain tensions inherent in humanitarianism. We are all familiar with the fact that planning for the future frequently requires that gratification be postponed. This is the essence of prudence. More strongly, in order to achieve the desirable we must sometimes live through, even cause, what is undesirable when taken by itself. Anyone who has had major surgery can confirm this from his own experience. Now, is it not conceivable and moreover highly probable that in order to promote a desirable life for a future community we will have to allow an anterior community to suffer through an undesirable life? We, today, could easily be faced with a morally similar circumstance. Many people argue that the number of births of unwanted illegitimate children could be drastically reduced if the state were to cease welfare allotments to their mothers. (One is reminded of the political programs of some of the "Social Darwinists.") Suppose this *could* be shown. Few would deny that the reduction of the number of such children would be a blessing for society. But it is doubtful that this would be done, and not merely for political reasons. Shall those unwanted children who are born be thrown to the wind? Can we accept Spartanism? A tension arises within our humanitarian impulse, a struggle between a desire to promote the welfare of the unwanted child and a desire to eliminate the production of unwanted children. Assuming that these were the only alternatives, I think we would do better by fastening on the former and hope to find some humane way of dealing with the latter situation in the future. The difficulty with any other "rule" of procedure is that it has nowhere to stop. If the amelioration of current evils is to give way in favor of betterment in the remote future, it is hard to see what

social programs cannot be justified on this basis. (Why not postpone gratification forever?) Humanitarianism could not survive the strains of continually favoring the future. Certainly we must plan for the future, but in so doing we must deal humanely with the present.

Proponents of biological engineering maintain that medicine sometimes has a "dysgenic" effect. Not, of course, on the individual whose affliction is relieved, but on society, because carriers of deleterious genes are enabled to pass them on to later generations. No one, however, proposes that this be dealt with by withholding the benefits of medicine from these suffering individuals, and for a number of reasons. First, they claim to have a better method of treating the problem, and the proposal would not be politically feasible anyway. Secondly, it goes against their sense of obligation to promote well-being, their humanitarian impulse, in the present. The importance of the second factor should not be underestimated. There is a deep awareness, I think, that to adopt such a proposal would be the death of humanitarianism, and perhaps of humanity too.

When we contemplate a social program aimed at the future, not the least of our problems has to do with local interests. Consider the population explosion. Whether a portion of the earth is to be regarded as over-populated depends on the environment of the population, its "ecological niche," whether the environment can sustain the population. This standard is, of course, incomplete; one needs to specify the "sustainment." It plausibly may be argued that by any reasonable measure of sustainment there now exist portions of the earth that are over-populated, portions that are under-populated, and portions that are neither. We may further specify respects relative to which over-population, under-population, and neither could be estimated. Rumania currently regards itself as under-populated from the viewpoint of developing an industrialized economy, and has in consequence banned contraceptive devices and abortion.¹⁹ The State of Israel maintains that from a security point

¹⁹ See N.Y. Times, Nov. 13, 1967, at 19, col. 3. Rent and taxes for single persons and childless couples also have been increased. In unmarxist fashion Communist party guidelines have let it be known that worker and peasant families should have three children while intellectual families should have four. The French are also concerned with a drop in the birth rate, which has gone from 18.1 births per 1,000 three years ago to an expected figure of 16.7 for this year. According to some French demographers, the main reason for the decline is the emancipation and greater freedom of women. The fall is also inversely proportional to a rise in living standards. Jean-Marcel Jeanneney, Minister for Social Affairs, has nevertheless said: "All economic progress is based on demographic expansion. An increase in living standards presupposes a growing active population capable of insuring the expense of the

of view it needs a greater number of Jews, and has therefore called for their migration from the West. Such interests, though local, may be presumed to be real, but their promotion could conceivably conflict with an attempt to contain the population explosion.²⁰ Now, population control is directly related to the problem of genetic integrity. "Quality" control must work through population control. It is unnecessary for me to spell out, through this or other examples, how the protection of a genuine local interest might be in opposition to any effective program of biological engineering. In particular, the institutional framework required for such a program may have damaging effects on the quality of life in some locale. Again, we must ask: For whom shall we plan?

The natural reaction to the above is that it is parochial and short-sighted, for what is at stake is the very survival of mankind. The part must give way to the interest of the whole, and the present must give way to the future. We need the larger, long-run perspective. This, it may be said, is the perspective of the evolutionary biologist. Only what happens to populations and not to individuals, and only long-term and not short-term adaptation are of evolutionary significance. (The pathological specimen is of interest for its general implications.) Unfortunately, however, it would be wrong blithely to assume that a perspective which is appropriate for one context, in this case evolutionary biology, is benign in every other context. The dangers of the long-run view have already been expressed, and here it is enough to add that the common good—which in this connection may turn out to be the good of Mankind in the abstract—does not justify any and every action.²¹ The larger,

upkeep of the nation as well as the cost of looking after the young and the old." N.Y. Post, Nov. 30, 1967, at 19, col. 1.

²⁰ Note the following interesting exchange (from a television interview, printed in 3 EVOLUTION AFTER DARWIN 52):

"DARWIN: But we have to face the appalling difficulties involved. If the Chinese, or any other people, are really ready to tolerate a lower standard of living than we are and if both know how to control our populations (which we don't yet), what is the consequence? In a hundred years there will be three times as many Chinese as now. Any group that believes in not limiting its population automatically scores.

"HUXLEY: We shall have to establish an international global policy.

"DARWIN: Under whose control?

"HUXLEY: Some central organization; not the United Nations in its present form, because it has no mechanism for dealing practically with the population problem.

"DARWIN: World government is the obvious answer. But now supposing a world government limits populations, but one part of the world says: We don't like your limitations. We are going to have more children because we are more important than anyone else, and you can't have too many pigmies in Central Africa—or whatever race it may be. What is the world government going to do—kill them?

"HUXLEY: That is a highly hypothetical situation."

²¹ See Stumpf, *Some Moral Dimensions of Medicine*, 64 ANNALS OF INTERNAL MED. 460-70 (1966).

long-run perspective can be, and has been, pushed to its limits. Examples are many, but one chilling one will do. I shall merely quote a few sentences by Alfredo Rocco, who as Minister of Justice under Mussolini guided the revision of the Italian Penal Code from 1925 to 1930. After presenting an analysis of the origins of modern political doctrines, Rocco goes on to say:

For Liberalism, society has no life distinct from the life of the individuals . . . For Fascism, the life of society overlaps the existence of individuals and projects itself into the succeeding generations through centuries and millennia. Individuals come into being, grow, and die, followed by others unceasingly; social unity remains always identical to itself.

For Fascism, society has historical and immanent ends of preservation, expansion, improvement, quite distinct from those of the individuals which at a given moment compose it; so distinct in fact that they may even be in opposition. Hence the necessity, for which the older doctrines make little allowance, of sacrifice, even up to the total immolation of individuals, in behalf of society . . .²²

The chill remains even after substituting "Mankind" or "The Human Race" for "society." To be sure this quotation represents a "pathological specimen," but "in ethics as in biology, we may learn from pathological specimens."²³

But it would be nothing less than obscene to foist this extreme of the larger, long-run perspective on exponents of biological engineering.²⁴ Nor would those who question this position enjoy the counter-charge of parochialism and short-sightedness. The parochial, short-run perspective has its immoralities and irrationalities, too. The *desideratum* and the difficulty, of course, is to strike a balance between these perspectives.

It is plain that no meaningful discussion on this issue is possible unless the two sides have some common ground upon which to stand. There must be some measure of agreement that life is better than death, and that the continued survival of mankind is desirable.²⁵ However, dispute breaks out once we begin to characterize the kind of survival we have in mind and what it allows us to do in terms of its alleged ethical status. For example:

[A] person was asked in the course of a public discussion whether or not he would regard with complacency an evolutionary development

²² Rocco, *The Political Doctrine of Fascism*, in 2 *MAN IN CONTEMPORARY SOCIETY* 649, 658-59 (1955).

²³ Freund, *Ethical Problems in Human Experimentation*, 273 *N. ENG. J. MED.* 687, 692 (1965).

²⁴ But we should not forget the recent past. As L.C. Dunn points out, German geneticists were already well-prepared before 1933. Dunn, *Cross Currents in the History of Human Genetics*, 54 *EUGENICS REV.* 69 (1962).

²⁵ See generally G. HARDIN, *supra* note 14.

in the course of which man himself learned how to be, like the ant, so mechanically and unchangingly efficient that all his intelligence and even his consciousness would fade away. He replied that he did not anticipate such a development but that if it should occur he saw no reason for being disturbed. Such a creature would be all the surer of "being here tomorrow" and that was, after all, the only criterion which could be applied.²⁶

But this view is not likely to take us very far, and it is doubtful that it would find favor with very many exponents of the long-view of things. The plausibility of this criterion derives from the fact, mentioned earlier, that a violation against the preservation of life is the most serious of crimes. Mere life, however, is at the bottom end of the scale of values, and its importance consists in its being a necessary condition for the realization of all other values. It loses this importance when life is such that no other values can be realized.

There is another tack which most exponents of the long-view are not likely to follow. It deserves a brief mention, at least, for it was once popular among eugenic planners. I have in mind the belief in evolutionary progress. It was once believed—and perhaps still is in some quarters—that evolution is a progression from "lower" to "higher" states, using these terms in an evaluative sense. Somehow certain human institutions intervened in this process and set things awry; these institutions have had a "dysgenic" effect. The damage needs to be repaired through certain political and genetic programs, so that evolution may proceed on its natural course towards ethically higher and higher states. We are, therefore, by the nature of the case justified in doing whatever is necessary in order to bring these higher states about.

The idea that evolution *is* progress is no longer widely accepted, and most biologists regard it as conclusively refuted.²⁷ Similarly, the misleading parallel suggested by the unhappy term "cultural evolution" is increasingly being called into question.²⁸ (I have a lurking suspicion that both Julian Huxley and Hermann J. Muller have not rid themselves of these overtones.) The difficulties in the notion of progress in culture or history are laid bare in Collingwood's *Idea of History*.²⁹ Aside from the troubles one has in

²⁶ J. KRUTCH, *THE GREAT CHAIN OF LIFE* 184 (1956).

²⁷ See G. HARDIN, *supra* note 14, at 64-95. For a more technical discussion see G. WILLIAMS, *ADAPTATION AND NATURAL SELECTION* 20-55 (1966).

²⁸ "The term 'evolution' is applied to both socially transmitted culture and gene transmitted biology. . . . However, there is no identity between the two usages. The cultural processes of continuity and change are different." Tax, *The Celebration*, in 3 *EVOLUTION AFTER DARWIN* 280.

²⁹ R. COLLINGWOOD, *IDEA OF HISTORY* 321-34 (1945).

defining "culture," it is fairly obvious that a culture which is "simple" or "less advanced" by our standards may be better able to grapple with the problems posed by its conditions of life than our own culture is able to deal with its problems.

Putting aside, then, these who would plan for "mere" survival and those who would plan so as to allow evolution to take its natural progressive course, the issue turns upon the *kind* of life for which we would plan (the elusive "quality of life") and what must be done to achieve the goal. In this section I have been concerned to stress that even if one grants the desirability of *some* biological condition in the remote future, severe moral problems are likely to arise in connection with any program of biological engineering that effectively could achieve that condition. I must confess, however, that I am not able conclusively to show this. But the fault, I believe, lies with exponents of biological engineering. Were they as clear as Plato, their spiritual grandfather, on the required institutional framework, I think a fairer evaluation would be possible. Unfortunately, though they stress the urgency of the problem, they tell us little about this, nor do they make clear how intervening generations would be affected by their programs. And it is essential to have the latter point made clear. For just as there can be no meaningful debate unless it is mutually agreed that in general life is better than death, so also discussion cannot proceed unless it is agreed that not everything is permissible in order to bring about a desirable remote future. The tragedy of the situation may be that we will have to reckon with the fact that the amelioration of short-term evils (and the short-term may last a number of generations) and the promotion of good for the remote future are mutually exclusive alternatives.

V. POSITIVE EUGENICS

In the next three sections I shall consider aspects of some possible programs of biological engineering. My discussion is confined, in the main, to their goal-component. Except for a few instances I pass no judgment on their desirability. I am concerned, rather, to bring to light issues that have to be settled in order for such judgments to be made. It goes without saying that I approach the topic with trepidation, as any layman must.

I begin with positive eugenics³⁰ because I find it simpler for me to handle. This type of biological engineering, according to Julian Huxley who is one of its leading exponents, "has a far larger scope

³⁰ See Batt, p. 529 *infra*; Gorney, p. 294 *supra*; Grad, pp. 486, 491 *infra*.

and importance than negative [eugenics]. It is not concerned merely to prevent genetic deterioration, but aims to raise human capacity and performance to a new level." Moreover, according to Huxley, "negative eugenics is of minor evolutionary importance and the need for it will gradually be superseded by efficient measures of positive eugenics."³¹

Except for *Rassenhygiene*, I am not aware of any attempt to carry out a program of positive eugenics on a wide scale excluding animal stock-breeding. One of the reasons for this is the lack of clearly defined aims.³² The clarification of these aims would necessarily have two facets. One involves specification of the traits that are to be enhanced, and the other would be a showing that their enhancement would truly be advantageous for the community for which they are to be enhanced. As far as I can tell, there is paltry attention given to the second. There is a tendency readily to assume that characteristics which we all take to be desirable, and whose absence we deplore, would not only be valuable under all conditions but also would be universally more valuable if they could be improved on. This may be true, but it needs to be supported by argument. Mere reference to the fact that culture can survive only if human beings possess the genetic equipment which is favorable for culture is not sufficient. To know only that culture has a genetic basis is not much more useful than knowing it has a solar basis. Perhaps it is asking for what no one could possibly supply, but it seems to me that what is required is the establishment of connections between genetic constitution and specifically characterized features of culture. However, it is generally accepted that "genes determine the possibility of culture but not its content."³³

The first of the facets mentioned above has been more widely discussed. It is interesting to take note of the shift from the talk of races or strains, found in earlier eugenic literature, to talk of mental or social characteristics. Thus, Francis Galton, the coiner of the term "eugenics," states that the aim of eugenics is "to give to the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable than they otherwise would have had."³⁴ Behind this way of speaking were, first, Galton's conviction "that the English propertied and governing classes were a repository of virtually all that is biologically precious in the English

³¹ Huxley, *Eugenics in Evolutionary Perspective*, 54 *EUGENICS REV.* 123, 135 (1962).

³² See C. AUERBACH, *THE SCIENCE OF GENETICS* 97-99 (1961).

³³ Dobzhansky, *Evolution at Work*, 127 *SCIENCE* 1091, 1097 (1958).

³⁴ Quoted in L. DUNN & T. DOBZHANSKY, *HEREDITY, RACE AND SOCIETY* 9 (1946).

nation and possibly in mankind,"³⁵ and, second, an incorrect theory of heredity (blending inheritance). Even such a liberal-minded follower of Galton as the English philosopher F.C.S. Schiller lapses into this way of speaking. Consider, for example, his statement that "the reason why the symptoms of racial decay are not more pronounced is probably that European civilization is still living on its biological capital, on the qualities bred into the Nordic stock by the severest natural selection, while it was still barbarian, only 1500 years ago."³⁶

With the rise and development of genetics such talk tends to disappear and is replaced with the notion of the production of the "ideal genotype." A strong elitist tone remains, however, with ideological overtones. This is illustrated in Hermann J. Muller's removing of Marx and Sun Yat Sen from his 1935 list of eminent men and his adding of Einstein and Lincoln.³⁷ If Muller is now sanguine about the prospects of positive eugenics, it seems that in 1932 he was prepared to jettison the whole affair. In a speech given before the Eugenics Society in New York, he said:

Only the impending revolution in our economic system will bring us into a position where we can properly judge, from a truly social point of view, what characteristics are most worthy of a man. . . .

Thus [he concluded] it is up to us, if we want eugenics that functions, to work for it in the only way now practicable, by first turning our hand to help throw over the incubus of the old, outworn society.³⁸

The ideological overtone is also to be found in a 1962 article by Julian Huxley, who would stress:

. . . . the need for planning the environment in such a way as will promote our eugenic aims. By 1936, it was already clear that the net effect of present-day social policies could not be eugenic, and was in all probability dysgenic. But, as Muller has demonstrated, this was not always so. In that long period of human history during which our evolving and expanding hominid ancestors lived in small and tightly knit groups competing for territorial and technological success, the social organization promoted selection for intelligent exploration of possibilities, devotion and co-operative altruism: the cultural and genetic systems reinforced each other. It was only much later, with the growth of bigger social units of highly organized civilization based on status and class differentials, that the two became antagonistic. . . .³⁹

I do not wish to suggest that ideological perspectives are irrelevant to the choice of an ideal genotype; obviously they are not. But this

³⁵ *Id.* at 8.

³⁶ F. SCHILLER, *EUGENICS AND POLITICS* 92 (1926).

³⁷ See Muller, *supra* note 5, at 454; noted by Dunn, *supra* note 25, at 75.

³⁸ Quoted in G. HARDIN, *supra* note 14, at 230.

³⁹ Huxley, *supra* note 31, at 133.

is one reason why there is likely to be much disagreement over the choice. Furthermore, the moral to be drawn from Muller's changing of his list is that—assuming we could produce our ideal genotype of today—we might regret our choice in 25 years. And we still need assurance that the kind of culture we regard as desirable could in fact be maintained by our ideal genotype.⁴⁰

In any case, if I correctly understand the exponents of positive eugenics, it is not an ideal genotype that they wish to produce, but an ideal phenotype. This would be in line with their insistence on planning the proper environment for the development of certain human capacities. Huxley explicitly maintains that eugenics needs a phenotypic approach, and goes so far as to criticize the "geneticism" of Medawar and Penrose in their purely scientific work.⁴¹ While the phenotypic approach makes more sense to me, it is clear that it poses serious difficulties for biological engineering. It seems that there are few normal human characters that are governed by allelomorphs of a single gene (*e.g.*, ability or inability to taste PTC). Most characteristics are brought about through the interplay of many different genes. Matters are complicated by the fact that so-called graded characters (*e.g.*, stature), and certainly mental and social traits, depend on many genes and on *environmental* influences. Therefore, "any simple genetical analysis is ruled out."⁴² I have the distinct impression that although many of the more enthusiastic exponents of biological engineering always say that a sharp heredity-environment dichotomy must be rejected, this amounts to lip-service.⁴³ The production of definite phenotypes by means of genic selection seems impossible. "Few of us would have advocated preferential multiplication of Hitler's genes through germinal selection. Yet who can say that in a different cultural context

⁴⁰ See Dunn, *supra* note 24, at 75.

⁴¹ Huxley, *supra* note 31, at 132, 137.

⁴² C. AUERBACH, *supra* note 32, at 60.

⁴³ I shall not list examples. The following comment is of interest: "Statements such as the 'Jukes-Kallikaks, "bad heredity" concept may have been too enthusiastically rejected by perfectionists,' and meaningless pronouncements such as 'Heredity controls intelligence more than twice as much as does environment in families that adopt one of a pair of white identical twins' add nothing but noise to our available information.

"These statements, derived from a paper presented by an American Nobel laureate, William Shockley, must be disturbing to any serious scientist, not because they reflect an uncongenial set of social attitudes, but because they revive an out-moded but ever recurring dichotomy between nature and nurture. Any contemporary mode of thought concerning behavior and genetics which continuously fails to appreciate the functional inseparability of gene complex and environment in the development of phenotype is scientifically worthless." Birch, *Bright Rats and Dull Rats*, 10 COLUM. U.F. 30 (1967).

Hitler might not have been one of the truly great leaders of men, or that Einstein might not have been a diabolical villain.”⁴⁴

It would be very misleading and unfair to Huxley and Muller, at least, to imply that they propose as a goal the production of an ideal phenotype. Judging from the criticisms frequently made of them, they do give this impression. But they are now quite explicit that there is no single type that they have in mind. What they seek is an increase in the relative number of individuals who possess such human excellences as altruism, a spirit of cooperativeness, fellow-feeling, imagination, a sense of discipline and duty, and intelligence.⁴⁵ Whether they intend that these should be produced only in combination, and not singly, is unclear to me; but if I am not mistaken they would support a relative increase in the number of persons who have any of these traits. Moreover, they would support an increase in the strength of any of these traits. The method they propose is artificial insemination by deliberately preferred donors. Muller goes on to add that the sperm of the chosen ones be stored for later use.⁴⁶

This program raises a number of questions. (1) Are these characteristics hereditary? (2) If they are, and if it were technologically feasible to produce them, would it be desirable to do so? (3) What should be the institutional framework of such a program? I shall briefly take up each.

A detailed discussion of the first question would take me way out of my competence, so I shall only raise a few issues that seem to me to call for attention. With respect to all of the traits except intelligence, I know of no experimental studies that are designed to establish whether or not they are inherited. (It would be fascinating to have an experiment for testing the inheritability of vanity, to take something out of the scope of the above list). Of course, one is always in a position to say that there *must* be a genetic basis for them. This would be to make the term “genetic basis” a panchreston that explains everything in general, but nothing in particular. In any case, it is not easy to see how such experiments are to be designed. One of the problems is conceptual. Consider altruism. What does the term refer to: a feeling? a motive? or a set of behavior patterns? Is it not the case that the social meaning of altruism (as well as the other “social virtues”) depends on the kinds

⁴⁴ Beadle, *Genes Culture, and Man*, 8 COLUM. U.F. 12, 15-16 (1965).

⁴⁵ See Huxley, *supra* note 31, at 133; Muller, *supra* note 5, at 440-45.

⁴⁶ “Moreover, those who repeatedly proved their worth would surely be called upon to reappear age after age until the population in general had caught up with them.” Muller, *supra* note 5, at 454.

of context that elicit altruistic feelings, motives, and behavior? The problem here is very much like one that besets those who argued that criminal tendencies are heritable. What constitutes a crime may vary from society to society and from legal system to legal system. Whatever it is that the altruistic donor might transmit to his progeny, it is hardly necessary that it should be exhibited as anything that would be recognized as altruism (or any of the other social virtues that would be involved).⁴⁷ The following remark hits the nail on the head:

Our distinguished geneticist [Muller] has suggested that fellowship, co-operation, moral courage and integrity, appreciation of nature and art, and aptness of expression and communication are desirable human traits. One must agree. But, since each of these qualities has meanings peculiar to its particular evolutionary stage and social type, he surely cannot mean they are genetically determined.⁴⁸

The heritability of intelligence is a complicated topic. There have been numerous studies on it. Identical and non-identical twins have been researched, and there have been longitudinal family studies on mental retardation. Generations of school children have been I.Q.'d. I am quite prepared to admit that intelligence has a genetic basis: I take my own children as evidence. In a more serious vein, however, what seems to be established is that certain tendencies that fall within a wide range are inherited.⁴⁹ Studies of long-lasting eminent families do not permit the strengthening of this conclusion, for the unsuccessful branches are lost to history.⁵⁰ On the question of I.Q., the following seem to me to be words of wisdom:

[T]here are two questions the geneticist may be asked. The first is: if for example individuals with higher I.Q.s breed more than those with lower (or vice versa) will the I.Q. of the population change, and at what rate? The second question is, if we were effectively to encourage such differential reproduction in favor of I.Q., what would be the consequent changes in characteristics other than I.Q.? The first of these is of course difficult enough to answer, witness the problem

⁴⁷ I am unsure as to what generalizations are permissible from the study of animal ethology. (Lorenz, Tinbergen, etc.) Neither side of the dispute over the heritability of aggression convinces me, anyway. And when these arguments are extended to deal with the question whether "war is in our genes," I am even less convinced. One of the problems, as above, is the social meaning of aggression. If a layman may be allowed to express agreement with an expert, I would also endorse the following statement: "Perhaps the most ubiquitous difficulty in interpreting the data of behavioral genetics is that the genetics is sometimes sound but almost always the behavioral analysis is terribly poor." Birch, *supra* note 43, at 31.

⁴⁸ Steward, in 3 *EVOLUTION AFTER DARWIN* 241.

⁴⁹ Cf. Burt, *The Inheritance of Mental Ability*, 13 *AM. PSYCHOLOGIST* 1 (1958), who seems both properly cautious and over-enthusiastic in generalizing from his data.

⁵⁰ See, e.g., A WAGNER, *ENGLISH ANCESTRY* (1961).

of interpreting the facts concerning correlations of I.Q. and family size. The second is at present impossible to answer for even if we were to suspect negative correlations between other attributes we deem desirable and I.Q., establishment of the facts concerning the degree to which the correlations had genetic causes would be a difficult task indeed.⁵¹

It is sometimes suggested that mankind as a whole or at least a considerable segment of it may be evolving in the direction of less intelligence.⁵² If true, this would be a reason for undertaking a particular kind of program of biological engineering. Although it may readily be conceded that heredity is a strong factor in intelligence (as is shown by studies on twins and foster children), a comparison of results of intelligence tests given to Scottish school children in 1932 and 1947 seems to indicate that this is not true.⁵³ In conclusion we may say that considerably more research needs to be done on the genetic basis of intelligence before we give the go-ahead to Professors Muller and Huxley. (It is not necessary for me to compound the problem by here taking up the questions of the definition of "intelligence" and the role of environmental influences.)

But suppose the heritability of the various mental and social characters could be established. Would it be desirable to enhance their occurrence if it could be accomplished? I need not repeat my previous points that turn upon the issue of whether this would be desirable *for* the community of the future. Here I wish to bring out other issues. Consider, for example, the sense of discipline and duty to which Huxley refers. Now, I would not go so far as David Hume who maintains that the various social virtues are approved of solely on grounds of their tendency to maximize utility (happiness).⁵⁴ Nevertheless, I strongly doubt that anyone would endorse the enhancement of a sense of discipline and duty under what he regards as an evil social system and in the presence of immoral values. Admittedly, we may have a kind of morbid admiration for the Nazi's sense of discipline and duty, but we would have gladly preferred its *dis*-enhancement. A similar line of argument applies to

⁵¹ Thoday, *Causes and Functions of Genetic Variety*, 54 *EUGENICS REV.* 195 (1963).

⁵² See G. SIMPSON, *THIS VIEW OF LIFE* 277 (1964). I do not present the considerations that support this suggestion. Simpson implies that they are not conclusive, and the matter is in need of study. I fully agree that we should approach it with an unbiased mind.

⁵³ See C. AUERBACH, *supra* note 32, at 149-52. Perhaps I am only betraying my own ignorance, but if intelligence *is* declining, we may ask when this decline began. It seems to me ludicrous that there should be a significantly higher proportion of stupid individuals in the world today than there was in the time of Caesar.

⁵⁴ *AN INQUIRY CONCERNING THE PRINCIPALS OF MORALS* §§ II-III (Hendel ed. 1957).

other of the social virtues. It would seem that their promotion would be undesirable unless we could also determine the conditions of life of the community of the future, including also its values. Secondly, it is doubtful that we would welcome an increase in the relative numbers of intelligent men unless altruists could be increased in the same proportions, otherwise the result may be a disadvantageously large number of clever and crafty mean men. But what guarantee is there that selective eugenic insemination—if that is the method adopted—would work itself out in the desired manner? Finally, I submit that no one knows what would be the effects of an enhancement of the social virtues, although we all imagine that the world would be a happier place. It is quite conceivable, however, that the survival of culture is dependent upon a certain blend of altruism and self-interest for example, and that this would be upset by the program of biological engineering.

Assuming that these matters could be laid to rest, we still have the institutional framework of the social program to consider. This is an important matter, for institutional frameworks are not morally neutral. The construction of such frameworks is, as indicated previously, a complicated task; moreover frameworks must be adjusted to the techniques that are to be employed. Therefore, only a brief general discussion of a few points is possible here. One of these techniques, A.I.D. with preferred donors, has already been mentioned. Others include controlled mating and controlled breeding (by devices other than A.I.D.). It may some day be possible chemically to modify the phenotype by improving the genetic material, as is suggested by discoveries about the structure of D.N.A. Other possibilities that cannot now be foreseen may be in the offing.

The ethical issues relative to the institutional framework turn on: (a) the degree to which the use of these techniques would be dependent on voluntary adoption or coercive measures; and (b) the degree to which their utilization would be subject to democratic control, with safeguards against abuse. Obviously, no ethical assessment of any social program of biological engineering can be made until these points are straightened out.

Two of the leading exponents of the A.I.D. method of positive eugenics, Huxley and Muller, insist that adoption should be completely voluntary. In answering the objection that effective selection needs authoritarian methods, Huxley writes:

For one thing, dogmatic tyranny in the modern world is becoming increasingly self-defeating: partly because it is dogmatic and therefore essentially unscientific, partly because it is tyrannical and therefore in the long run intolerable. But the chief point is that human

improvement never works solely or even mainly by such methods and is doing so less and less as man commits himself more thoroughly to the process of general self-education.⁵⁵

This, I think, misses the point. The objector could perfectly well agree with everything just said. And he would stress that human improvement would not result from a program of positive eugenics because it needs authoritarian methods: rather than making better men, it would make men worse. It is no reply for Huxley to say that authoritarian methods wouldn't work.

Muller, if I understand him rightly, adds another point in support of voluntary adoption:

If we are to preserve that self-determination which is an essential feature of human intelligence, success and happiness, our individual actions in the realm of genetics must be steps based upon our own personal judgments and inclinations. Although these decisions are all conditioned by the mores about us, these mores can be specifically shaped and channelized by our own distinctive personalities.⁵⁶

This I interpret to imply that authoritarian methods would counteract the goal of the program, namely, the maximization of intelligence and the social virtues. If true, this is tantamount to the admission of the *environmental* factor in these characters, and raises again the question as to the degree to which they are genetically transmitted, if at all.

In the last analysis, the question of whether positive eugenics can be effective without authoritarian methods remains open. It is a straightforward question of fact, once the standard of effectiveness is specified. My personal opinion—for what it is worth—is that authoritarian methods would be required. Plato and the Spartans, who respectively supported controlled mating and breeding, were more realistic than their modern counterparts. (Plato supposed that married couples could be made to believe that their unions were based on voluntary choice.) I am not convinced by the instancing of the spread of voluntary birth control. But if authoritarian methods are required it is doubtful that the game is worth the candle. The argument that since assortive mating occurs anyway there can be nothing wrong with the complete coercive control of mating is hardly deserving of a reply.

In the absence of a detailed proposal for an institutional framework it is difficult to discuss the question of democratic control and safeguards against abuse. Suffice it to say that the benevolence of

⁵⁵ Huxley, *supra* note 31, at 138.

⁵⁶ Muller, *supra* note 5, at 460.

Professors Huxley and Muller is no guarantee against abuse by a state subject to changing ideals and tastes.⁵⁷

In closing this section it is appropriate to call attention to the profound social consequences that programs of positive eugenics (by a currently contemplated technique) would have. It would be bound, for example, to alter the institution of the family. Now this institution is already undergoing change, but it is hardly clear what these changes are or whether they are changes for the better. Plainly, selection by "delegated parenthood runs counter to a deep-rooted sense of proprietary parenthood."⁵⁸ The adoption of this method is certain to have a profound impact on the conditions of life in the community of the future. I do not share Huxley's confidence that these changes are bound to be beneficent.⁵⁹

I should add that my strong doubts about the desirability of a social program of positive eugenics do not necessarily bear upon the use of A.I.D. in individual cases. My general outlook is that we should maintain strict principles (against its use), but be flexible in practice. However, this is another matter.

VI. NEGATIVE EUGENICS⁶⁰

Negative eugenics is a subject that the layman approaches with even greater trepidation. In addition to lacking a proper grounding in the technicalities of genetics, he faces the problem of "what to do when doctors disagree." For we do not find complete unanimity among experts on the necessity for certain types of social programs of negative eugenics or their effectiveness. The following discussion is guided by what seem to me the most persuasive arguments. I refer the reader to my remarks in the opening section on the advantage of the layman's speaking out. Most of the topics I shall discuss in this section are not in themselves ethical issues, but nevertheless bear upon the question of whether we ought to engage in programs of biological engineering that aim at the reduction of genetically caused defects. A number of the points that I have tried to make in the preceding sections are relevant here. But I shall not review them. They should be fairly obvious to the reader who has made it this far.

It is well known that various defects (both psychic and physi-

⁵⁷ See Dunn, *supra* note 24, at 75.

⁵⁸ Huxley, *supra* note 31, at 139.

⁵⁹ Cf. Matthews, *Eugenics and the Family*, 53 *EUGENICS REV.* 193 (1962). Matthews is a moderate proponent of eugenics.

⁶⁰ See Gorney, p. 293 *supra*; Grad, p. 487 *infra*.

cal) are heritable. Indeed, for certain defects, the probability that a child born of a "defective" parent will also have such a defect can be calculated. The genetics of abnormality, in fact, is better known than the genetics of normality. The agents of transmission of these heritable defects are the genes. Some harmful genes are, of course, eliminated in each generation before their carriers have a chance to reproduce. War, famine, disease, etc., make a contribution in this regard, although they also eliminate "good" genes. In addition, a deleterious gene may be eliminated by virtue of its killing off its carrier. New defective genes, however, enter the gene pool by a process of mutation. Some of these are transmitted to future generations. The maintenance of biological efficiency for a species is dependent upon the operation of selective survival, the winnowing out of a large number of carriers of harmful genes before they have a chance to reproduce. The natural processes of selection are no longer operating with the degree that is required for the human species to maintain its efficiency in the long run (Huxley's 5,000 to 10,000 years). Medical technology, by prolonging the lives of defect carriers, enables the transmission of harmful genes; it has a "dysgenic" effect. The "load of mutations" thus increases in every generation. Some type of artificial selection for survival is needed, lest man commit biological suicide.⁶¹

The above paragraph is a condensed statement of the justification for a social program of biological engineering aimed at reducing the "unfit." I do not find it convincing, nor do many experts in the field. First, it is not clear that medicine *is* dysgenic in its effects. Secondly, it is not clear that any program of negative eugenics would be much help in dealing with the problem in any way that would be significant for the species. And thirdly, it is not clear that any such a program wouldn't do more harm than good. I shall present a condensed statement of the counter-considerations.

Whether medicine has dysgenic effects is a normative question, though not necessarily an ethical one. It is true that medicine protects certain genes from natural selection. But the harmfulness of a gene (or of any trait) is partially dependent, at the very least, on its environment.⁶² We do not have the genetic capacity to synthesize certain vitamins. This cannot be thought of as a defect so long as we can get an adequate supply of vitamins in our food or in chemical compounds. Some genes which are "bad" in one environment are "good" in another (as is the case with certain genes that determine susceptibility to malaria and sickle-cell anemia). More-

⁶¹ See Gorney, p. 306 *supra*.

⁶² See Thoday, *supra* note 51, at 198.

over, and especially, if the harmful effects of a gene can be overcome by medical technology it is not clear that the situation can be described as dysgenic. "If, for instance, diabetes mellitus (known to involve a strong genetic predisposition) can be fully controlled by simple and universally available medication, then the predisposing genes do no harm and their spread in a population would do no harm."⁶³ We can expect further advances in medicine that not only will protect deleterious genes from natural selection, but also provide an environmental adjustment to the genetic system. Medical science might not be able to handle completely the effects of the harmful gene, but then neither would negative eugenics.

For many hereditary defects there are no known treatments. The negative eugenicist proposes that these be reduced by eliminating as far as possible the harmful genes. The methods suggested are, usually, sterilization or controlled mating. No one seems prepared to opt for Spartanism, for reasons discussed in Section IV. Of the other two, sterilization would be the more efficient, and I shall confine myself to its prospects.

Even if a thoroughgoing program of sterilization of carriers of defective genes were adopted (and one of the difficulties here is that all of us probably carry a few harmful genes), its success would depend upon the type of gene involved. Dominant genes with complete penetration show up in every carrier, so that even if new ones arose by mutation, a program of sterilization would readily eliminate them. Huntington's chorea (a highly debilitating nervous disease) is due to such a gene. However, it usually appears too late for action to take place before reproduction. In any case such genes are rare. Moreover, for many of the most harmful dominant genes sterilization is not necessary, as they are self-eliminating. They kill or sterilize their carriers. Most new occurrences of such genes are due to mutation rather than inheritance, so that the complete elimination of such genes is impossible.

In the case of deleterious recessive genes, the prospects of sterilization are decidedly poor. The rarer the gene the more slowly does the elimination take place. It has been calculated that it would take sterilization about two hundred generations to reduce the proportion of albinos in the population to half the present frequency.⁶⁴ Most recessive harmful genes are rare, and they are carried more often in heterozygotes than in homozygotes. The elimination of these genes by sterilizing the visibly affected rare homo-

⁶³ G. SIMPSON, *supra* note 52, at 279. See also C. AUERBACH, *supra* note 32, at 95.

⁶⁴ L. DUNN & T. DOBZHANSKY, *supra* note 34, at 87-92.

zygotes would have a low rate of success.⁶⁵ Here we are supposing that sterilization would be employed against all persons visibly affected by a harmful gene. The success rate would be even lower if many such persons escape sterilization. I need not go into the ethical issues that a program of coercive sterilization occasions.⁶⁶

Nothing that I have said above negates the desirability of a program of genetic counselling. Such a program is designed to aid the individual family in reducing the risks of personal tragedy. Nor does anything I have said necessarily rule out sterilization when these risks are high and the defect serious (*e.g.*, in the case of amaurotic idiocy). Undoubtedly, as genetics learns how to identify harmful genes in phenotypically normal persons, genetic counselling and education should be expanded. We do desire a full and satisfactory life for our children, and ought to avail ourselves of all the resources of biological science to realize it. But, as I have argued, this is quite different from programs that aim at promoting a desirable life for the community of the remote future. "It is, perhaps, not too selfish to say that posterity should be allowed to tackle its own problems and to hope that it may have better means for doing so than we have."⁶⁷

Finally, it is not clear that a social program of negative eugenics wouldn't do more harm than good. This, of course, might depend upon the kind of defects that it would aim to eliminate. Nevertheless it is plain that "good" genes would be reduced in the process. A conflict could arise between the aims of positive and negative eugenics. Sweden has had a ban on the marriage of endogenous epileptics since 1757. This has been attacked by a Swedish geneticist not only on the grounds that the chances for an epileptic to have epileptic children are not very high, but also on the grounds "that many epileptics are highly intelligent and socially valuable members of their community, well fitted to bring up children, and that they may carry valuable genes whose transmission will be prevented by the existing law."⁶⁸

I do not suppose that anyone will go so far as to maintain that society should insure itself a supply of defectives so as to provide occasions for altruism and self-sacrifice, which are classified among

⁶⁵ See C. AUERBACH, *supra* note 32, at 86-91.

⁶⁶ Huxley, if I understand him correctly, supports a program of *voluntary* sterilization. See Huxley, *supra* note 31, at 135. I think it utopian to suppose that such a program would be very effective.

⁶⁷ L. DUNN & T. DOBZHANSKY, *supra* note 34, at 93-94.

⁶⁸ C. AUERBACH, *supra* note 32, at 94; see Gorney, p. 308 *supra*; Grad, p. 492 *infra*.

the highest virtues. Nevertheless, eugenics is certain to find itself in a dilemma in the cases of "a blind poet, a deaf musician, a consumptive novelist, and a hunchback physicist [who] have contributed so much to our intellectual heritage as to be classified as geniuses."⁶⁹ Secondly, and here I repeat myself, we do not know what the conditions of life in the remote future will be. It is difficult to imagine that certain severe defects will ever have a good side to them, yet we may be doing a great favor for the future if we preserve genetic diversity even on pain of allowing various defectives to transmit their genes to the future. There is something to be said for "genetic waste."⁷⁰

VII. THE CONTROL OF BIOLOGICAL CONTROL⁷¹

In this section I wish to stress the need for mutual confidence between layman and biological scientist. A breakdown in confidence can only be detrimental to both parties. To secure this trust the layman, on his part, must keep himself informed as far as possible on scientific advance thereby to acquire an intelligent appreciation of the requirements of the developing discipline; and the scientist, on his part, must act with a sense of responsibility towards the community. Our technological civilization is dependent upon science, and this is a fact which the layman knows. He can never hope to master the specialized sciences; he can get a "feel" for them, at best. Inevitably, the layman, if he wishes to preserve this civilization, must have some measure of faith in the moral integrity of the scientist. And this faith will be impaired whenever the scientist fails to act responsibly in the layman's judgment. Plainly, this judgment ought to be grounded upon the intelligent appreciation of the science, and not on ignorance or caprice. The scientist on his side must both act and appear to act in a manner that justifies the layman's faith. He must therefore not only show a concern for the advancement of his discipline, but also for its bearing upon the communal good. Among other things this means that the scientist must allow for the possibility that the communal good might at times over-ride scientific advance. In order to act responsibly towards the community, the scientist must be conscientious. That is to say, he must attempt to judge his prospective conduct from an impartial perspective, and not merely as a scientist interested in advancing his discipline. He must pass moral judgments upon him-

⁶⁹ Steward, *Evolutionary Principles and Social Types*, in 2 *EVOLUTION AFTER DARWIN* 169.

⁷⁰ See G. HARDIN, *supra* note 14, ch. 13. See also Thoday, *supra* note 51, at 199.

⁷¹ See generally Burger, p. 436 *supra*.

self, and be willing to let such judgments influence his conduct as a scientist. In this way the layman's trust in the scientist can be maintained.

It is in the field of biological engineering that we are likely to have a crisis of confidence. Control over the direction of mutation, which is possible now in a limited area, is bound to be extended. If it has not already been done, babies will be grown in test-tubes. The imagination is staggered by the possibilities—for evil as well as good. Both positive and negative eugenics, which are the products of benevolent if often misguided men (in my opinion), will be overtaken by *atopogenics*, the creation of the abnormal, the weird, and the bizarre. It is generally true that any new technique which is discovered is put to use. The strange world of the science fiction writer will become a reality.

There is much concern today over moral problems raised by experimental medicine.⁷² These problems are occasioned by a shift in the traditional orientation of medicine, which is therapeutic and patient-centered. Rather than aiming at doing good for the patient, curing not merely the disease but the whole man, there is a trend towards viewing the patient as a subject or specimen for study and research. These problems, however, are likely to pale in the light of atopogenics, which *ab novo* will be able to create its subjects for research.

At this point a crisis in confidence could become real. There is a certain casuistry of the mind whereby men convince themselves that everything is permitted. This is a special danger when one has in view an apparently good end, such as the expansion of human knowledge. But even knowledge doesn't justify any and every act. If we should ever come to believe this we shall be in the death-throes of the struggle between man's creations and himself. This is the moral of the story of Dr. Frankenstein, a piece of fiction that will soon become fact.

Perhaps I am exaggerating. Nevertheless it does seem to me that some recent statements by a leading geneticist are hardly calculated to inspire the layman's confidence in the biological engineer. Professor Joshua Lederberg can "see nothing fundamentally different between vaccinating with a live virus and introducing new

⁷² See Beecher, *Ethics and Clinical Research*, 274 N. ENG. J. MED. 1354 (1966); Freund, *Ethical Problems in Human Experimentation*, 273 N. ENG. J. MED. 687 (1965); Stumpf, *Some Moral Dimensions of Medicine*, 64 ANNALS INTERNAL MED. 460 (1966); *Informed Consent in Drug Research*, Columbia Journal of Law and Social Problems, Oct. 24, 1966, at 4-8.

genetic information into an individual." Now presumably this need not frighten us so long as we understand that this might be old-fashioned negative eugenics using new techniques. But Professor Lederberg is also reported as saying that "an overzealous policing to keep people from doing seemingly bizarre genetic experiments would be as dangerous as forcing their use on society."⁷⁸ These remarks sound like a threat, a threat which is not likely to be well-taken by the layman. It is important, to say the least, that Professor Lederberg should clarify his position. Furthermore, it is important that geneticists at large should make their views explicit.

With all due respect for Professor Lederberg, I suggest that we are heading towards the day when policing of atopogenics will become necessary. Naturally, we should wish to avoid "overzealous" policing, and it can be avoided only if the geneticist maintains the confidence of the lay public. This he can do by showing his conscientiousness.

I would propose that control of atopogenics, and of genetic experimentation in general, be initially exercised by the discipline itself. Geneticists at large must become the conscience that passes judgment on the conduct of the individual researcher. This requires full *publicity* regarding prospective experiments and their results. Discussion should then take place over whether or how the work should proceed, a judgment on its permissibility should be rendered. *Primum non nocere*—first, do no harm—may serve as a guiding principle. Individuals who violate either the requirement of publicity or the sense of the discipline on permissibility, should be censured, and perhaps be subject to some kind of penalty. I do not know how to construct the institutional framework for the control of biological control, but I think we are approaching the day when its construction will become necessary. It is possible that the discipline of genetics will be unable to police itself and that legal sanctions will be necessary to deter what the public (in its ignorance, perhaps) regards as abuses. This, of course, is not a happy prospect. The legal control of biological engineering is itself liable to abuse in ways that are easily imagined, especially after our imagination has been stretched by the thought of atopogenics.

VIII. CONCLUDING REMARKS

As control is extended over the direction of mutation, the subjects of positive and negative eugenics will need re-thinking. In

⁷⁸ Report of a symposium on genetics and development held at Columbia University. N.Y. TIMES, Oct. 22, 1967, at 67, col. 1.

this paper I have argued, on the whole, against lending our assent to programs of these types. It may turn out, however, that we shall not have to make a choice between positive or negative eugenics, on the one hand, and the amelioration of failings and ills by more standard methods, on the other. The choice may be between eugenics and atopogenics. In any case, it would be sad if we had no choice in the matter at all. Many experts in the field assure us that atopogenics lies far in the future. Let us hope so. Meanwhile, we would do well to bear in mind the words of Benjamin Jowett, one of the Victorian commentators on Plato: "We know how human nature may be degraded; we do not know how by artificial means any improvement in the breed can be effected."⁷⁴

⁷⁴ I WORKS OF PLATO 246 (B. Jowett transl. 1937).