ETHICAL IMPLICATIONS OF DEVELOPMENTS IN GENETICS

I. INTRODUCTION

(A) Purpose

The overall purpose of this paper is to describe contemporary developments in genetics that have raised a variety of ethical problems. To do this, I will describe several of these developments, raise some of the thematic ethical issues to which they point, and describe some of the responses that have been made to them. Therefore, I wish to look at two broad problem areas related to the application of specific knowledge and to the implications of gaining such knowledge in the field of genetics. My intent in discussing the ethical dimension of these problems is to provide an overview of the debates that are occurring with respect to these problem areas. Thus, I am more interested in presenting the contours of the debate rather than argue specific points, although that will also occur. I think it is also important to note that several of the specific problems I discuss are linked together. I want to separate several of these primarily for purposes of discussion and analysis.

(B) Definitions

Genetics is the division of the life sciences that focuses exclusively on the genes or the units that determine one's inheritance. Occasionally in bio-ethical discussions, genetics is used as a shorthand way of referring to many of the disciplines and developments within the life sciences. Although I will occasionally use the word in this broad sense, I will primarily be using it in the technical sense of the study of the genes and the application of that knowledge in a variety of settings. The genes are the basic blueprint or plan for heredity, the program which helps specify how an organism will develop. The genes are made up of segments of DNA, deoxyribonucleic acid, in which four chemical subunits are united in a variety of ways. These four chemicals, abbreviated as A, G, C, T, are the alphabet which carries to the cell the instructions for making proteins. Within recent years, geneticists have learned more and more about the composition of this alphabet, the processes by which the message is originally written and communicated, and the ways in which the messages can be read. Such growing understanding of the genetic code has occasioned many discussions of the problems of both application and implication that find their way into this paper.

The term genetic engineering has a similar narrow and broad meaning. Strictly speaking, it refers to specific technical interventions into the structure of a gene for a variety of purposes including, but not limited to, removing a deleterious gene, changing the genetic structure of a particu-

lar organism, or enhancing a particular genetic capacity. Genetic engineering is a specific intervention into the actual genetic structure itself. In a broader sense, and in the sense most often used, genetic engineering refers to the possibility of designing not only our descendants, but also of manipulating the entire ecosystem in specific directions. More specifically, though, genetic engineering in the broad sense refers to technologies such as in vitro fertilization, cloning, recombinant DNA research, and a variety of other applications of the knowledge of genetics that has a social or policy dimension.

(C) Method

To accomplish the end of presenting several developments in genetics and genetic engineering that have ethical implications, I am going to describe two general problematic issues in genetics—application and implication, present the elements in the ethical debate, and provide both a framework for discussion and a bibliographical essay.

II. PROBLEMS OF APPLICATION

(A) The Technologies

Recombinant DNA research is basically a technique by which a segment of DNA can be removed from its original strand and joined to another segment of DNA from a different organism, thus forming the recombinant molecule. The new DNA that is placed into the host begins to replicate itself there. Thus, for example, a molecule can be made to produce insulin, a new species or organism could be devised or a new pathogenetic agent could be made for use in insect control or biological-chemical warfare.

Amniocentesis is a technique in which fetal cells are withdrawn from the amniotic fluid in the uterus by means of a needle inserted through the pregnant woman's abdomen. These fetal cells are then cultured, and the chromosomes are screened to determine whether or not the developing embryo has a genetic anomaly. Several hundred genetic diseases can be diagnosed in utero and the sex of the fetus can be determined. This technique is almost risk-free for both the mother and the fetus and, given reasonable standards of quality control in the laboratory, is a highly reliable diagnostic technique.

In vitro fertilization and embryo transplant, or external human fertilization, received a great deal of attention last year when the first baby conceived, transplanted and delivered by such a process was born in England. This technology involves the removal of an egg from the ovary, external fertilization and then implantation into a prepared uterus. While a fairly straightforward procedure, the success of this technique involves the interlocking of a variety of developments in an understanding of the hormonal processes that control the female reproductive cycle, the development of a proper culture in which to have the fertilization occur as well as the development of safe and reliable techniques for the removal of the egg and the transfer of the blastocyte.

(B) Ethical Issues

1. Science and Society. One of the critical issues in this area is that of how science is perceived. Two important viewpoints are provided by contemporary commentators. Pope John Paul II, in his first encyclical letter *Redemptor hominis*,[1] suggested that humans are becoming afraid of what they produce because of the perception that these products could radically turn against themselves. He emphasizes the growing fear that our products can become the means and instruments for self-destruction. Pope John Paul then asks why it is that this power has turned against humans and produced a state of disquiet, of fear and meance. Part of the answer that he suggests comes from a shift in persons perceiving themselves not as masters or guardians of the world but as its exploiters and destroyers. Coupled with this is the issue of determining whether or not those things which are produced make life more human and, therefore, more worthy of persons.

Another perspective is presented by Daniel Callahan[2] who reports that current developments in genetic engineering, broadly speaking, suggest that both the scientific community and the general public are more prepared than ever to go ahead with new developments. Callahan indicates that there has been a typical reaction of wonder and excitement in both the scientific and public media whenever a major breakthrough has been discovered. He concludes that society continues to be attracted to scientific progress and technological applications of new insights into the processes of nature. Callahan suggests that such a posture continues because no generally persuasive argument against continued research and development in genetics has been developed. By this he means that there has been no argument that goes beyond logic to an emotional attractiveness that could impel people to act or not act. That is, none of the arguments against genetic engineering have been able to touch any of our cultural, ethical or religious values in a way that is relevant to a critical evaluation of genetic engineering. Because of this, business has continued fairly much as usual and appears likely to do so for the foreseeable future.

Another problem in the relation of science and society is a change in the way of doing science or in the model of scientific research.[3] Traditionally the purpose of science and a variety of other related disciplines has been to discover the truth of nature. The scientific quest was to understand what made things and organisms work. Research focused on discovering structures and stating general laws. Once this was done, the primary task of science was finished.

This model is changing, primarily because of discoveries in genetics as well as the application of a variety of other scientific principles, especially that of nuclear power. The new perception is that not only can

[1] Pope John Paul II, *Redemptor hominis*, 15.

[2] D. Callahan, "The Moral Career of Genetic Engineering," *The Hastings Center Report* (April, 1979), 9 and 21.

[3] J. Goodfield, *Playing God: Genetic Engineering and The Manipulation of Life* (New York: Random House, 1977).

we know the truths of nature but we can also change nature. The discovery of the structure of DNA by Watson and Crick in the early 1950's set in motion a chain of events that has led to the technique of recombinant DNA. It is now possible, as mentioned previously, to reconstruct various molecules and to make them perform in new ways. It is equally possible to build a new species out of previously existing species and in this way directly intervene in the evolutionary process. In addition to being able to state the basic scientific laws that regulate the workings of nature, it is also possible to intervene into the very heart of the genetic code to change the information and produce a new product.

Such powers, of course, raise a variety of issues related to social implications of such a shift in model. One of the major areas in impact will be on the self-understanding of the scientist. Although the caricature of the scientist sitting in the research laboratory, unencumbered by any of the cares of the workaday world is manifestly inaccurate, nonetheless many scientists direct their primary efforts to basic research with little worry of potential applications or of long-term implications of what they were doing. It was assumed that they were apolitical and primarily providing a service which society would determine how to use.

In the light of the new possibilities within science, however, such a posture may no longer be adequate. At least, a scientist must re-examine what is the nature of the profession of science and what its relation to society might be. Callahan has suggested four general propositions which are helpful in such an initial re-evaluation.

> 1. Individuals and groups are ordinarily responsible only for the consequences of those actions if, through negligence, they fail to take into account such consequences.
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> 2. Individuals and groups cannot be held responsible for those actions the consequences of which are totally unknown. However, if they voluntarily undertake such acts, they may be held responsible for the consequences unless there were serious reasons for undertaking the action in the first place. One cannot, without serious reason, just "play around" in the unknown while simultaneously disclaiming responsibility for the results.
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> 3. When others may be affected by our actions, they ordinarily have a right to demand that their wishes and values be respected. This is particularly the case when those actions may result in harm to them.
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> 4. Individual scientists and scientific groups are subject to the same norms of ethical responsibility as those of all other individuals in groups in society. They have neither more responsibility for their actions nor less; there is no special ethic of responsibility applying to scientists that does not apply to others.[4]

Callahan then supplements these general propositions with two principles that he derives from the basis of our past experience. The first of these is what he calls the historical principle. This principle suggests that we know, in ways that earlier generations did not, that the search for knowledge can bring about harmful consequences and that it is possible to trace back the causal sequence. Because we know this is possible from past experience, Callahan argues that we should evaluate more carefully

[4]D. Callahan, "Ethical Responsibility in Science in the Face of Uncertain Consequences," *Annals of the New York Academy of Sciences*, 265: 2-4.

research that can set in motion causal chains, of which some outcomes might conceivably be harmful. This historical principle is supplemented with the imagination principle which suggests that a scientist might well assume that since unintended harmful consequences have happened with other forms of research, he or she might assume that the same thing could happen with this particular project. Therefore, it is incumbent on the scientist to try to imagine ahead or to envision possibilities that may arise in the outcomes of the particular project so that they can be evaluated personally and socially. Such a framework, while not totally fail-safe, provides at least a context in which critical evaluation can occur before a project is started or when it appears that there may be harmful outcomes of a particular application of knowledge from a project.

The past debate over the safety of recombinant DNA research and the growing debate over the safety of nuclear power has brought forth a new model of a scientist: the scientist as advocate. In these debates, we see different scientists hurling technical as well as personal accusations against one another. The problem that is revealed is the possibility that experts in a field can and do disagree on both the facts and the interpretation of those facts. The disagreement, however, allowed scientists to be perceived by the public and their peers as advocates for a particular position or cause. Many scientists realized that they were in a new role and were often uncomfortable with it; they also realized that many of the issues that they were discussing were socially important enough to justify such a shift in role. Of course, the model of the scientist as advocate presents an interesting problem about the relationship between facts and values. Oftentimes the facts may be reasonably clear and apparent, but the framework for the evaluation of these facts may be quite different between scientists for a variety of personal and social reasons. For example, one scientist may be willing to accept different risks than another and this will color how he or she evaluates a particular problem. Thus, it is important for the scientist, when he or she assumes the role of advocate, to recognize as clearly as possible the personal, scientific, social and cultural sources of his or her viewpoint so that the advocacy can be on as reasonable a basis as possible.

2. Nature and Ethics. The second major area of discussion that is raised by some developments in genetics is the relationship between nature and ethics. One of the traditional viewpoints in this discussion is to see nature as a type of limit. I suggest the traditional natural law philosophy as an example of this perspective. In this tradition, one uses the order of nature as the basis upon which one elucidates moral principles. This is justified because the order of nature reflects the plan of God for nature which can be discovered and understood by human reason. Because this order of nature is normative, one can legitimately argue that nature in this perspective is a conservative or limiting principle. That is, it sets up limits or bounds beyond which one may not go. As an example we can refer to the traditional argument against the use of artificial contraceptives which, in simplified form, states that they sepa-

rate what nature united—sexual intercourse and procreation. Such a unity, it is argued, is inherent in the order of nature which reflects divine reason and, therefore, this structure limits what can be done in this area. Such a moral tradition tends to be conservative and would approach some interventions into nature with caution, if not suspicion.

A second perspective envisions nature as a model. This orientation, similar to the natural law perspective mentioned above, argues that we can replicate some occurences in nature. While this model may not allow any more interventions into nature than the previously discussed model would, it would certainly expand the kinds of things one could do on the basis of nature. In this framework, it might be legitimate to replicate certain instances of premoral evils that occur in nature as long as one has a proportionate reason for so doing. For example, it is the case that a fairly high number of zygotes are lost during the first several weeks of the process of conception and implantation and initial development. A number of these zygotes seem to be naturally aborted because of structural anomalies, hormonal imbalances within the uterus, or a variety of other problems connected with the necessity of many different systems coming together at precisely the right moment. Would it be legitimate, therefore, to replicate this instance of embryo loss in a laboratory during the course of efforts to fertilize human ova in vitro? A great number of research protocols could be justified in terms of the benefits both to future embryos and fetuses as well as the possibility of bringing benefits to those women who are unable to conceive in any other way. In this framework one would be replicating a natural phenomenon in the laboratory and justifying the pre-moral evil of embryonic loss on the basis of the benefits to be achieved by the research or the pregnancy, just as the high number of embryonic loss is justified in nature by the goods of family and children.

Such an argument is put forward by Richard McCormick who limits its application to efforts to achieve a pregnancy. He says: "It is not a violation of the right to life of the zygote if it is spontaneously lost in normal sexual relations. Why is it any more so when this loss occurs as the result of an attempt to achieve pregnancy artificially?"[5] Karl Rahner, basing his orientation of the doubtfulness of the personhood of the fertilized ovum, suggests that zygotes could be used as subjects of experimentation. "But it would be conceivable that, given a serious positive doubt about the human quality of the experimental material, the reasons in favor of experimenting might carry more weight, considered rationally, than the uncertain rights of a human being whose very existence is in doubt."[6]

This orientation is countered by Leon Kass. But although he takes a very strong stand against the use of embryos for research, he seems to allow the possibility of their use in research that leads to a pregnancy.

[5]R. McCormick, S. J., "Notes on Moral Theology," *Theological Studies* (March, 1979), 108-09.

[6]K. Rahner, "The Problem of Genetic Manipulation," *Theological Investigations* IX (New York: Seabury Press, 1975), p. 236.

> Parenthetically, we should note that the natural occurence of embryo and fetal loss and wastage does not necessarily or automatically justify all deliberate, humanly caused destruction of fetal life. For example, the natural loss of embryos in early pregnancy cannot in itself be a warrant for deliberately aborting them or for invasively experimenting on them in vitro any more than stillbirths could be a justification for newborn infanticide. There are many things that happen naturally that we ought not to do deliberately. It is curious how the same people who deny the relevance of nature as a guide for re-evaluating human interventions into human generation, and who deny that the term "unnatural" carries any ethical weight, will themselves appeal to "nature's way" when it suits their purposes. Still, in this present matter, the closeness to natural procreation—the goal is the same, the embryonic loss is unavoidable and not desired, and the amount of loss is similar—leads me to believe that we do no more intentional or unjustified harm in the one case than in the other, and practice no disrespect.[7]

The third model of nature defines nature as evolving. The first two models of nature that I presented basically assume that nature is reasonably static and that the order that is present will remain. This model of nature sees nature as continually evolving. This does not necessarily imply that there is no stability to nature or no laws of nature that can be known. It does suggest, however, that such laws and structures may not be as normative as the other models would suggest and that a much greater degree of intervention may be possible. This view, for example, would see change and/or development as normative rather than exceptional. The working assumption of this model is that things change, and that they change with respect to broader developments within the ecosystem as a whole.

Within this model the concept of history takes on an importance lacking in the other two models. History here is seen as linear or teleological, rather than cyclic or episodic. History has a future, and that future carries history forward. In Christianity, this orientation contains a dichotomy: the ultimate future transcends persons and their efforts at self creation but, through their interventions in history and nature, persons open themselves to this future and help to achieve it. As Rahner says: "This human self-creation will develop the concrete form of human openness which leads to the absolute future that comes from God. But it is never capable by itself of bringing about this absolute future. Christianity, precisely because it is the religion of the absolute future, must simultaneously send man out to his duties in the world."[8]

It is clear that future developments are not entirely knowable or predictable. Yet, on the other hand, we know that we are evolving and that we have an increasing capacity to determine various directions of evolution, including human evolution. Thus, developments in genetics, as well as in psychology, psychiatry and many of the behavioral sciences have made it possible to intervene in the development of human beings, and possibly into human nature, in a way never before thought possible. The previous two models suggested that nature may serve either as a limit or as a mirror of the kinds of interventions that might be ethically

[7] L. Kass, "Making Babies Revisited," *The Public Interest* (Winter, 1979), 54: 41.
[8] K. Rahner, "Experiment: Man," *Theology Digest* (February, 1978), 67.

possible. Nature will not necessarily have such limiting capabilities in an evolutionary model because the past will not necessarily possess qualities necessary to insure survival in the future. The past is no longer normative and the future assumes a greater role in defining efforts at self-creation. Such a possibility leaves us caught between the attempt to determine how much of our own self-perception and understanding of our nature is tied to our biology and place within the ecosystem and history, and the perception that we possess the powers to change the course of the direction of evolution in accordance with our desires and preferences. In this model, a variety of interventions becomes possible and will be justified in terms of survival value, adaptability and promotion of a model of human nature that is seen as desirable.

3. Problems of Knowledge. A third major problem area is that associated with problems of knowledge. We have all known the pains and anguish that come from knowing too little, especially about how to cure a particular disease that is killing an individual. Lack of knowledge often makes us helpless to solve a particular problem or to know how to develop a variety of strategies to provide for different contingencies. Limited knowledge has also made individuals hold on much too securely to that which is known for fear that if that is questioned the foundations will be shaken and the universe will collapse. Limited knowledge can lead to a repression of knowledge and we all know the terror that comes when the pursuit of knowledge is repressed.

In our day we have the problem of seemingly too much knowledge. The information explosion has caused facts, as well as the journals and books that report these facts, to proliferate at a rate which makes it impossible for a responsible professional to keep track of new developments, even within a very narrowly defined area of knowledge. Another problem associated with this information explosion relates to the qualitative dimension of that information. We are beginning to ask, and in many ways are being forced to ask, questions to which we really have neither a good answer nor a sense of how to go about answering the question. Our traditional sources of values are being strained to their limits by our technical capacities that follow from our gains in knowledge. A variety of disciplines including genetics, psychology, psychiatry, philosophy and theology have all coalesced to raise questions about the meaning of the human. Until fairly recently most of us were reasonably satisfied that we had a workable sense of who we were and what we were about. New discoveries and insights into the full range of possible meanings of the human have given us a new burden in that we are no longer quite sure of who we are or what we are to be about. The culture in which we live certainly reinforces this questioning but perversely casts us further adrift because it provides neither a common basis nor a set of values which can help provide a firm foundation on which to begin to construct a new answer to the question of what is human being.

In addition to these problems relating to knowledge, a third major issue is beginning to arise: discussions of the possibility of limiting or

restricting research. Freedom of speech and freedom of thought are, of course, two of the most cherished values of our American culture and serve as significant ethical values in many theories of ethics. Any suggestion that knowledge be restrained faces a most difficult challenge. In fact, the presumption is that any restriction on knowledge or thought is almost inherently evil. Yet if one keeps in mind the shift in the model of nature from one of discovering the truth to that of changing nature, the argument may change somewhat. The knowledge that is in question here is knowledge of application or knowledge of implication.

Few people argue that scientists should be restrained in thinking through a particular problem or speculating on a new theory. The traditional argument for this position is well stated by Key Dismukes: "A major factor in advancing scientific understanding and correcting error is the opportunity of critics to challenge prevailing views and, if they can adduce convincing evidence, to modify an existing consensus. This aspect of science is more than a convenient and useful tradition. It is essential to the operation of science as freedom of speech is to the maintenance of democracy."[9]

The critical problem arises, however, when such knowledge is applied or is translated into action. Here the lines are not so cleanly drawn, although there is the tradition in American law that, for example, religious freedom is limited to a freedom to believe whatever one wants, but not a similar freedom to act upon those beliefs. Some restrictions on actions are already in place, such as regulations concerning the participation of human subjects in biomedical and behavioral research and the regulations concerning the recombinant DNA technology.

One background issue in this discussion is the fact that progress has become an important value within our society. In many ways the knowledge explosion is a direct result of our valuing progress. The unconscious or uncritical assumption is that progress is in and of itself valuable and therefore must be pursued. To achieve this goal, research and development is necessary and has a high priority. But it is legitimate at least to question the value of progress and its role in our society, even though General Electric may continue to argue that it is our most important product. If progress is not morally necessary and perhaps optional, then it may be the case that a lot of what we perceive to be necessary may be interesting but superfluous. This is not a direct argument against the concept and reality of progress itself; it is a suggestion that mindless progress with its exponential generation of data may be inappropriate at this time. This is especially so in the light of diminishing resources, especially money and energy. At a time when the total budget to be spent on scientific research and development is diminishing, it may be appropriate to target certain areas of research as having priority because of their social necessity and value. In this light, limitations on research and knowledge could come about, not because of inherent distrust of the knowledge to be gained or problems with its application,

[9]K. Dismukes, "Recombinant DNA: A Proposal for Regulation," *The Hastings Center Report* (April, 1977) 27.

but rather because of the acceptance of a new system of social values and priorities. Greater care in the selection of research projects to fund would of necessity limit knowledge both quantitatively and qualitatively.

Yet, as Daniel Callahan indicates, our society at present values both basic scientific research and applied scientific research.[10] Because of this cultural value, he argues that the burden of proof must lie with those who are opposed to research. He makes two exceptions to this basic rule. The first would arise in a case where serious potential harm to the general public can be hypothesized with a degree of probability greater than 0. When that is the case those who wish to pursue the research must submit the issue to public discussion and judgment. A second exception arises when there is a high probability that harm would result from the basic research which would be of a magnitude such as to pose serious threats to human welfare. In that instance, Callahan argues that the research should not go forward at all, even if it would be supported by the public. Such an orientation, building as it does on the current cultural status quo, is persuasive in its argument that the burden of proof rests with those who are opposed to research. Yet it does allow for the possibility of restricting research when there is a probability of harm and of prohibiting research when there would be serious harm to human welfare. Although not foolproof and containing several ambiguities, such a position allows the discussion of this critical issue within our contemporary social framework.

In a recent article, David Smith suggests several reasons for restricting freedom of inquiry.[11] The first of these argues that knowledge may be immoral in its use and, therefore, may be restricted. This position would argue that the right to know must be less than absolute because some knowledge can end up doing more harm than good. While recognizing the problems and limitations with this orientation, Smith thinks that it is important to think through what consequences the use of knowledge will have. He also suggests that knowledge that is either obtained or disseminated in an immoral way should be restricted. Here he argues that knowledge obtained at the expense of violating a person's integrity or privacy is immoral and such attempts to gain knowledge by these means should be restricted. He also argues here that knowledge which is disseminated in a way that is destructive of just cultural institutions or practices is immoral and should be restrained because it threatens the very fabric and basis of our life together. Finally, Smith suggests that knowledge which can be destructive of us as persons should be restrictied. Some knowledge could shatter a person's world view, and Smith argues that perhaps that knowledge should not be communicated to that person. He also suggests that premature communication of scientific theories could be immoral because they are untimely and therefore may also be harmful to a person's self under-

[10] Callahan, "Ethical Responsibility," 10.

[11] D. H. Smith, "Scientific Knowledge and Forbidden Truths," *The Hastings Center Report* (December, 1978), 30-35.

standing. The basis of Smith's argument is his perception that knowledge is social and must be evaluated in a social context, not in exclusively individualistic framework. He also argues that a scholar or scientist has some responsibility for the repercussions of his or her speaking the truth and that, therefore, they should evaluate what they are saying, when they are saying it, and why they are saying it before they actually do say it. Thus, Smith concludes by arguing for a tradition of self-disciplined hesitation rather than censorship or repression.

III. PROBLEMS OF IMPLICATION

(A) The Technologies

One of the major spin-offs of our understanding of genetics has been the development of programs of genetic screening in which carriers of a variety of genetic diseases can be identified and information given to them so they can make a more informed reproductive decision. Such screening programs involve an identification of a target population and an examination of the chromosomes of the individuals in the population to determine whether or not they contain deleterious genes. Then the information is given to the individual, and further genetic counseling can be obtained if desired.

Another area that is of growing importance is genetic engineering in which a variety of therapies will be initiated by replacing or removing deleterious genes from an individual so that a disease will not occur or will be corrected. The technology of recombinant DNA also makes it possible to envision the development of new species. Future developments offer the possibility of intervening directly into an individual's genetic structure for reasons of therapy or the achievement of personal or social desires.

Another area of implication in genetics is really not a technology but an initial formulation of an academic discipline: sociobiology. This is the systematic study of the biological bases of all forms of social behavior in all kinds of organisms including humans. This new discipline is important because of the far-reaching questions it raises about the sources of various kinds of human behavior, especially altruism and freedom. The implications of such questioning of these valued forms of human behavior raises significant questions that need to be addressed at least in a preliminary fashion in a session such as this.

(B) Ethical Issues

1. Definitions of Health. One of the critical, thematic issues that is raised by both genetic screening programs and by genetic engineering is the question of what is health and what is disease. Such a discussion is extremely relevant because definitions of health and disease provide the baseline for a medical and ethical argument to determine whether or not intervention is appropriate. One can argue, for example, that definitions of health and disease should be mainly physiological.[12] That is, one

[12]C. Boorse, "What a Theory of Mental Health Should Be," *Journal of the Theory of Social Behavior*, 6: 61-84.

should view health as functional normality which looks to function according to design, to conformity and goals pursued by the organism, as well as the working out of the design of the organism. This orientation suggests that each structure or organ of the body has a particular range of activities and that if there is a deviation from that range, there is the possibility of a disease. If that disease becomes disabling, then it becomes an illness. This makes the task of diagnosis fairly simple.

This perspective is being incorporated into an ethical argument by Paul Ramsey who proposes that the first level of analysis should be what he calls a medical indications policy.[13] Here Ramsey argues that a decision to treat or not to treat should be made primarily on the basis of physiological criteria. That is, in determining whether or not there is an obligation to treat or not to treat, the base line is the determination of whether this treatment will benefit the patient or not. Such an ethical base line rests on a physiological definition of health and disease, as well as the presumption that such determinations can be made in a primarily value-free context.

A second orientation argues that definitions of health and disease, in addition to a psychological dimension, also contain a cultural or social component. This is especially true in the areas of psychology and psychiatry, although it is also relevant to the evaluation of genetic diseases. For example, it is relatively easy to diagnose a broken arm and have little, if any, disagreement about the problem; the same is true about a variety of other illnesses. On the other hand, when one is attempting to determine whether one is deviant, crazy or normal, the task is quite difficult and is open to a variety of interpretations based on both one's psychiatric theory as well as one's cultural and social values. While I accept and would argue that there certainly is such a reality as mental illness, I think it is imperative at the same time to recognize that there is a high component of both ideological biases and cultural values that influence how we perceive individuals whose behavior is seemingly outside the range of what is either accepted as normal or socially approved.

Such issues can affect an individual with a genetic disease in a variety of ways. It is clear that the phenomenon of Down's syndrome is heritable and that individuals who have the syndrome suffer among other things a diminished capacity for abstract reasoning. There are clear physiological criteria by which one can diagnose the disease, and there are also psychological markers by which one can determine the degree of retardation. Yet that is not the end of the story, for intelligence is highly valued within our society and puts the diagnosis of this syndrome into a different category. One who has this particular genetic disease is seen as a different kind of individual. He or she is one who does not merely have a disease; this individual is also socially impaired and disvalued.

Others suggest that knowledge of an individual's genetic constitution may significantly alter how that individual is raised. For example,

[13] P. Ramsey, *Ethics at the Edges of Life* (New Haven: Yale University Press, 1978).

several individuals possess the XYY syndrome, which physiologically is simply the presence of an extra Y chromosome. One of the early suggestions in the literature about the social effects of this syndrome was that it was a possible predictor of aggressive or antisocial behavior. If parents were to learn that their child was affected with this syndrome and that there was the possibility of this syndrome causing antisocial behavior, could this not significantly alter how the parents raise the boy? Should the parents perceive this child as healthy or ill, diseased or well? Regardless of how one answers these questions, we have here an example of a genetic anomaly that has a clear physiological criterion but an unclear social outcome with respect to its effects on the child. The way in which this boy will be raised may be in large part dependent upon whether one uses primarily physiological or primarily cultural norms to evaluate his state of health.

Another area of impact is the often unclear distinction between one who is a carrier of a disease and one who is afflicted with the disease. Being a carrier of a disease does not imply that one has the symptoms of the disease or is afflicted by the disease in any way. Genetic screening programs discover both those individuals who are carriers of a disease as well as those who are afflicted with it. If the distinction between such individuals is misunderstood or confused and communicated in this fashion to others such as insurance companies, individuals who are only carriers of a disease could be prevented from receiving insurance policies or other health care benefits because it would be assumed that they were unhealthy. Not only are such individuals unjustly deprived of health care benefits, but they are unfairly labeled, and this provides a possible basis for discriminatory treatment.

2. *Perception of Self and One's Descendants.* A second problem involves the perception of one's self and one's descendants. The traditional ethical model in which personal responsibility was exercised in relation to the earth and one's descendants was that of stewardship. This doctrine takes its point of departure from the creation narrative in the book of Genesis. As this doctrine was developed through the centuries, it was assumed that this stewardship was exercised in relation to the limits inherent in the orders of nature and society, both of which were presumed to be static and ordained by God. As such, this model suggested that there were limits inherent in the order of nature and society and that stewardship suggested both the maintaining of these limits and conformity to them.

In the light of the influence of the theory of evolution and advances within the science of genetics, some are suggesting that a more proper description of human responsibility might be that of co-creator. Ironically enough, Robert Francoeur locates this perspective in the same biblical narrative.

> But it seems to me also that in our panic we have deliberately avoided one of the most basic premises of our Judeo-Christian tradition. We have always said, often without real belief, that we were and are created by God in his own image and likeness. "Let us make man in our image, after our likeness"

> logically means that man is by nature a creator or at least a cocreator in a very real, awesome manner. Not mere collaborator, nor administrator, nor caretaker. By divine command we are creators. Why, then, should we be shocked today to learn that we can now or soon will be able to create the man of the future? Why should we be horrified an denounce the scientist or physician for daring to "play God"? Is it because we have forgotten the Semitic (biblical) conception of creation as God's ongoing collaboration with man? Creation is our God-given role, and our task is the ongoing creation of the yet unfinished, still evolving nature of man.[14]

This orientation, while containing some overtones of a promythian presumptiousness, suggests rather that humans now have the ability to enter into the process of evolution, to shape it, to direct it, and to redesign different life forms. As Karl Rahner notes: "He no longer simply takes stock of himself, but changes himself; he contents himself neither with steering by his own history merely the alteration of his sphere of existence nor with the mere actualization of those possibilities which have always offered themselves to man in his commerce with his fellowmen both in peace and in war. The subject is becoming its own most proper object; man is becoming his own creator."[15]

The model of co-creator assumes that nature is dynamic and changing and that the end of the process is open, but related to the absolute future of humans. The exercise of responsibility in this model comes about from helping to shape and direct the evolutionary process according to values and criteria that are perceived to be appropriate in the light of goals that will promote human and social goods. Given this new stage in development as well as a new understanding of nature, the model of co-creator seems at least as appropriate as that of stewardship, if not more appropriate.

Along with this debate on the model through which responsibility should be exercised, there is a continuing debate surrounding the whole understanding of personhood. The discussion centers on both indicators of humanhood as well as on qualities that are appropriate for human beings in the pursuit of their ends and goals. Joseph Fletcher made the initial contribution to the former debate by suggesting a variety of indicators of humanhood which included criteria such as minimal intelligence, self-awareness, self-control, a sense of time in the past and future, a capacity to relate to others, concern for others, communication, control of one's own existence, curiosity, changeability, a balance between rationality and feeling, idiosyncracity and neocortical function.[16] In a later article, Fletcher singled out neocortical function as the essential trait, the key to humans.[17] This is because of the role of the

[14]R. T. Francoeur, "We Can—We Must: Reflections on the Technological Imperative," *Theological Studies* (September, 1972), 429.

[15]K. Rahner, "Christianity and the 'New Man,'" *Theological Investigations* V (Baltimore: Helicon Press), p. 135ff.

[16]J. Fletcher, "Indicators of Humanhood: A Tentative Profile of Man," *The Hastings Center Report* (November, 1972), 1ff.

[17]Fletcher, "Four Indicators of Humanhood—The Debate Matures," *The Hastings Center Report* (December, 1974), 4ff.

neocortex in providing the biological sine qua non of all human activities. There were a variety of responses to Fletcher's original criteria which were more or less happy with them, depending on one's starting point. Nonetheless, in spite of the somewhat cavalier attitude with which they were proposed, Fletcher did provide a service by pointing to several problematic areas in defining a human being and stimulating debate on these problems. Even so, we must remember that even widely accepted criteria of indicators of humanhood would not provide the total basis on which a determination of the value of a human being would rest.

Another contribution towards the understanding of personhood in terms of desirable qualities is provided by Alasdair MacIntyre.[18] MacIntyre establishes his criteria not by setting minimal criteria by which one would be judged to be a person or not, but by arguing for qualities that would be desirable in designing one's descendants. These include: an ability to live with uncertainty, an understanding of one's past which provides a sense of identity, the ability to engage in non-manipulative relations, finding a vocation in one's work, accepting one's death, developing the virtue of hope and a willingness to take up arms to defend one's way of life. These are very suggestive elements that are important for understanding who persons are and how they relate to others, to society and to nature. The first quality that MacIntyre suggests, the ability to live with uncertainty, is a very critical virtue, especially in light of the theory of evolution. It had previously been thought, and was a deep psychological consolation, that the orders of nature and society were stable and normative. They were perceived to be rooted in an unchanging order of the universe, established by its creator. For better or worse, we know that this is not the case, and one of the realities with which we must make our peace is the fact that our world is changing and will continue to change. Therefore, the ability to live with a lack of certainty is a highly desirable personal quality. MacIntyre very wisely, however, roots the quality of being able to face an uncertain future in a sense of identity that comes from a strong sense of the past, one's place in a family, in a neighborhood and in a community. Knowledge of self and one's origins provides the strength needed to face an uncertain future. Two other of the qualities that he mentions are very important. The first is the need to find meaning through one's work. There is a twofold suggestion here. One is that we need to find meaning in our lives and one of the places where we can best find this is through the vocation that we have in the world. The other dimension is that there are some things that are worth doing and that it is important that they be done regardless of their consequences. The second element that is of importance is the virtue of hope which is belief in the reality that transcends what is available as present evidence. The virtue of hope helps take us beyond a purely rational orientation to reality and provides us with a larger framework with which to both see and evaluate what we might be about as we face our uncertain future.

[18] A. MacIntyre, "Seven Traits for the Future," *The Hastings Center Report* (February, 1979), 5ff.

Both of these orientations towards understanding the person suggest important issues. Fletcher, in his own way, emphasizes the role of rationality and planning in defining human qualities. In other writings, he has suggested that the more something conforms to rationality, the more human it becomes. For Fletcher the use of genetic engineering, screening programs, amniocentesis and the like in insuring the birth of a perfect child is more human because such processes make more use of rational planning techniques. On the other hand, MacIntyre looks at broader qualities which appear to make persons more human. He suggests, by implication, a stance towards nature which presupposes the rational but transcends it in a sense of both humility towards the future as well as a sense of hope that one can remain in control of the processes that will unfold before us. Both of these models have their strengths and weaknesses. Both point to significant dimensions of personal experience and the sense of the self and both suggest a variety of relationships towards nature that will be important in re-evaluating the two senses of responsibility toward the world described immediately above. In some respects both of these orientations are departures from the traditional model of the person found in classical western philosophy and theology with its emphasis on a static nature within a static world. But they are important because they suggest and allude to critical dimensions of the person that were not fully taken into account by that classical tradition. Thus they are extremely helpful in elucidating several qualities that will be necessary to cultivate as we begin to redefine our place within the world.

Another element in the perception of self is the articulation of one's relationship to one's descendants. This question, of course, looms large on the horizon because of our growing perception and experience of the scarcity of resources. It appears to be the case that we have already left our descendants an environment which is damaged and a world which has been depleted of many of its resources. This is not a very positive statement about ourselves and even less of one about our concern for others.

Certainly our descendants, whoever they may be, will have a number of interests similar to those that we have. The problem is trying to define the basis on which those interests should be respected, if at all. Although utilitarian and contract models may not provide totally satisfactory resolutions to the problem, both suggest that one should at least look forward to future when calculating total utility or when trying to define how to act justly. Another approach would suggest that we know that our descendants will need certain basic goods and that, therefore, they are entitled to these as a matter of human rights. The orientation here is not to harm future generations, rather than promote their well being. Both of these approaches might suggest that we should leave our descendants at least as well off as we are, for in doing so we respect their interests and leave them the resources necessary for an adequate quality of life.

My orientation towards this problem will also be affected by how I see myself in relationship to other human beings. If, for example, I see

myself as a solitary individual with few links to my neighbors and my community, then the whole question of responsibility to others has a less significant place in my ethical calculations. If, however, I see myself in a community which has come from other communities and which is producing future communities, then it is more likely that I will be concerned with the environment that I hand on to my immediate descendants. These moral connections form the basis for evaluating my actions in the light of my needs as well as those of my descendants.

Another framework for analyzing this problem comes from one's orientation toward the end of the world. If one adopts a more apocalyptic viewpoint, then the question of future generations becomes somewhat less critical because when the end comes, it will come quickly and reality will cease to have significance. The apocalyptic orientation suggests that life may not be as teleological as we would hope and that while all of us may have goals and aspirations that we wish to see fulfilled, ultimately the world ends and we with it. On the other hand, if one has an eschatological viewpoint which sees the future as the source of goals and values, then one can see one's self as building toward a reality that will come to fruition. In this framework it is important to build for one's descendants a world that can be lived in and can be a continuing source of hope. If one views the future through the apocalyptic lens, the question of the future is not that important because the end of the world is the end of significance. In the eschatological framework, however, what goes on within history and culture is important and stands in relation to the future that will, eventually, be reached. In this framework, the relationship to one's descendants is important and must be evaluated much more carefully.

(3) Biology and Behavior. A third important element is the relationship between our biological structure and our behavior. Such issues, although traditional in their origins, have received a tremendous revival from the growing perspective of sociobiology and the sophisticated knowledge we have of genetics.

The concept of altruistic love, expressed as either giving one's life for another or in being one's brother's or sister's keeper, has formed one of the major pillars of the Western ethical tradition. One of the suggestions of sociobiology is that perhaps such a high exercise of altruism is not entirely voluntary and therefore not responsible on the part of an individual. Rather, such behavior may be programmed into us by our genes, and thus our altruism is simply a mechanism of biological survival rather than an important moral virtue. A British biologist named. B. Haldane suggested the genetic structure of such altruistic behavior when he indicated that he would lay down his life for two brothers or eight cousins. The reason for that formulation was that it took that many of each group to achieve a genetic identity to his which would make his own sacrifice genetically acceptable—i.e., insured the same number of similar genes to remain in the same gene pool. The basic implication of such a posture is that one is altruistic towards those who are genetically similar to me because even if I do not benefit myself, I do benefit those who have

genes that are similar to mine. Therefore, from a biological point of view it makes no difference whether I survive or they survive, because the same genes will survive and be present in the gene pool to replicate themselves.

In the framework of E. O. Wilson, one of the contemporary founders of sociobiology, egoistic behavior is behavior which guarantees that the genes will in fact cause copies of themselves to exist; altruistic behavior is behavior that insures that copies of genes that an organism contains will survive, although they may be contained in another organism. These biological definitions of egoism and altruism are then used interchangeably with the ethical concepts of selfish and unselfish. The problem is that a direct translation appears to be rather difficult. On the one hand, behaviors that we experience as selfish or unselfish are usually conscious and the result of an evaluation or consequences. A strategy for a genetic replication is typically unconscious and therefore not under our control. Also the way in which the words egoism and altruism are used refers primarily to actions which affect the gene pool. One could infer that actions which have no significant impact on the gene pool must be neither egoistic or altruistic or, in value terms, selfish or unselfish. That, however, does not correspond to our experience. Therefore we must be aware of such an easy and uncritical translation of biological categories into ethical categories.[19]

Even though Wilson may not have the translation of genetic terms into ethical terms that he may wish, Arthur Caplan argues that there is a point at which such verifications of biological behavior would be relevant to ethical theory. He illustrates this by his discussion of psychological egoism and ethical egoism. The theory of psychological egoism is a factual theory about human motivation which claims that persons always try to act in their best interest. If such a factual theory were true, Caplan argues that the only reasonable basis for justified ethical behavior would be a theory of ethical egoism which argues that morality is a matter of self interest; that the only acceptable and meaningful ethical principle is always to act to promote your own individual good as much as possible. A significant part of the argument for this position would be to determine that genes both actually cause specific behaviors and that they are the sole causal agent for them. In addition to the empirical data that a person would have to gather to prove this position, one would also need to accept a great deal of reductionistic theory which has its own theoretical problems.[20]

Sociobiology also becomes involved in discussions of freedom and moral responsibility, as has already been suggested in the discussion of altruism. Part of the problem in this discussion involves the clarification of the concepts of freedom and determinism. If by freedom is meant a

[19]J. B. Schneewind, "Sociobiology, Social Policy and Nirvana," in M. S. Bregory, A. Silvers, and D. Sutch, eds., *Sociobiology and Human Nature* (San Francisco: Jossey-Bass, 1978), pp. 234ff.

[20]A. Caplan, "Genetic Aspects of Human Behavior: Philosophical and Ethical Issues," *The Encyclopedia of Bioethics* (New York: The Free Press, 1978), Vol. II, p. 541.

radical freedom in which the person is bound by no constraints whatsoever, then it is clear that sociobiology as well as traditional philosophy and theology would be able to mount a strong case against such a concept. On the other hand, if one accepts a more modest theory of freedom in which choices are possible but only within certain parameters, then sociobiology may not be able to argue as strongly against this as some of its proponents may suggest.

The discussion of freedom must also be related to a discussion of determinism. Again, two extremes can be posed. Hard determinism holds a theory of universal causation which argues that for every effect and event there is a cause and that by definition freedom is incompatible with this perception of reality. From a sociobiological viewpoint, this could mean that each of us is genetically determined and, therefore, subject to irresistible compulsions and coercions and must do what our biology tells us to do. Self-determinism would also hold a theory of universal causation but suggests that some causes originate with human beings and that freedom is compatible with determinism; this is a theory of self-determinism. From a biological perspective, it could be argued that each of us has a set of predispositions within us that can cause us to move in some directions rather than in others, but that no one specific action is totally determined.

A theory of hard determinism rules out a sense of both freedom and moral responsibility. If one cannot control one's actions and if one is simply acting in a preplanned manner, one cannot be responsible for one's actions. On the other hand, it does seem necessary to be able to trace a certain chain of causality in one's actions to be able to assign responsibility for them. If one cannot argue back to a variety of factors that caused one to act in a certain way, one could similarly argue that the individual is not responsible. Human behavior cannot simply be reduced to a set of biological coordinates. Such reductionism is contrary to our conscious experience and does not take into account all of the behaviors which we attribute to free choice and for which we assume people are morally accountable. In this perspective, moral responsibility and freedom are argued for in terms of the causal efficacy of human intentions and volitions in relationship to genetic and environmental factors. Such a theory focuses on self determination rather than genetic determination. It attempts to subsume into itself a variety of data from different perspectives arguing, however, that the self is the reality which is ultimately responsible for what is done and assumes that responsibility can be justified on the basis of a variety of causalities operating at different related levels.

The final topic in this section deals with the setting of social policies which are based on some concept of justice or equality. Although a variety of meanings may be read into these concepts, they have functioned as primary values in American society and as the basis upon which many policy decisions have been made. The belief that all persons are created equal is the cornerstone of the American way of life. Yet over the past several decades many allegations have been made about

genetic differences between people that would seem to challenge these values. There are claims, for example, that intelligence is related to one's racial group or that aggressive behavior is related to the presence of an extra Y chromosome. Such claims, it is assumed, would make a significant amount of difference with respect to the social treatment of individuals within these populations.

It needs to be said immediately that a particular social policy does not necessarily follow from a set of empirical facts, whatever they may be. The fact that an individual may belong to a particular group that actually has less genetic potential with respect to a certain level of achievement has no necessary relationship to the specific policy that is directed to that group. Thus, for example, a policy could be articulated that would argue that these individuals need more protection because they have less potential; on the other hand, a policy could also be formulated which states that because these people have less potential, they should simply be ignored.

What would be important, though, is that if it would be the case that certain individuals have a particular genetic potential or lack of potential, that fact, when it is established as a fact, should be taken into account in policy making so that realistic policies and goals can be set. This is simply saying that we should not try to do, much less legislate or mandate, that which we are not capable of doing, whether this be biological or psychological. It is both inappropriate and unjust to devise programs to help individuals reach potentials which they are utterly incapable of achieving. On the other hand, the fact that they might be incapable of reaching a certain potential does not mean that they should be discriminated against, rejected by the society or in other ways ignored in terms of sharing in the basic goods of that society. Facts need to be taken into account in setting policy, but social and cultural values mediate those facts as they are incorporated into policy. Genetics does not provide a totally adequate basis for such a social evaluation.

Sociobiology and other research in genetics does suggest that there may be problems ahead for those who have assumed that the concept of equality of persons means equality in all respects. It is quite clear that people are biologically different and therefore have a vast amount of different potentials. It seems quite clear that the potential of each person is limited by his or her genetic background as well as the environment in which they are raised. The fact that people are unequal with respect to their potential does not mean that they are unequal with respect to their moral value as individuals and as persons. Such an evaluation of equality is independent of biological and environmental differences. Sociobiology and other research in genetics could provide a useful service by providing information about individuals who may have limited potential so that unreasonable accomplishments would not be expected from them. This could protect these individuals from having unreasonable demands made of them and help eliminate some degree of frustration from their lives. However, the determination of such differences does not and should not jeopardize the unique moral value of these individuals as persons.

IV. CONCLUSION

Recent developments in genetics have provided an opportunity to review and re-examine many traditional and thematic principles and concepts in ethics. I have included several of these topics and shown how this new knowledge can help reformulate a concept or challenge a traditional orientation. New discoveries in genetics as well as other areas of the life sciences will continue and new applications and implications of that knowledge will occur. I hope that this presentation has provided a framework for examining these problems as well as suggested some helpful directions in thinking about the resolution of these new ethical dilemmas.

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