STATEMENT DG-125

GENETICS AND CHRISTIANITY: An Uneasy but Necessary Partnership

by Michael McKenzie

Summary

The Human Genome Project (HGP) is giving us a bird's-eye view into our genes, the very blueprints of our bodies. As genetic knowledge increases, questions are being raised regarding the proper scope and limits of both science and medicine. Genetic science is on the verge of not only discovering possible cures for previously incurable diseases, but also bringing humanity to the brink of a "Brave New World." Now is the time for Christians to become involved in the ongoing debate regarding the HGP and genetics. Genetic technology will not wait.

In the past decade, the discipline of human genetics has undergone nothing short of a revolution. With the implementation of the Human Genome Project (see accompanying sidebar), the knowledge of genes and how they work in human development is growing at an exponential rate. Disturbingly, this overwhelming growth in knowledge goes virtually unnoticed by most laypeople, including Christians.

To study human genetics is to study the blueprints for life. As we learn more about the roles that DNA (deoxyribo-nucleic acid) plays in our development, Christians will be theologically pressed to think through questions of morality and how both nurture *and* nature influence those questions.

Certainly, few disciplines have within them so much potential for both good and evil. On the one hand, many debilitating diseases, such as Tay-Sachs, Huntington's, Lesch-Nyhan, and adenosine deaminase (ADA), are directly attributable to defective genes. Others are apparently the result of faulty genes working in concert with environmental factors. In any case, recent breakthroughs in identifying these genes for possible substitution with healthy genetic material offer amazing new hope for those previously doomed to either an early death or lingering lives of agony.

On the other hand, as genetic knowledge increases, so do the possibilities that this knowledge may be misused. Will it be possible someday to clone colonies of humanoids simply for the task of organ harvesting? Given the contemporary human drive for the "new and improved," will genetics be harnessed to the engine of social improvement? One of the most dreadful mistakes we could make is to think that eugenics is an idea that died with the Nazis.[1]

The intention of this article is not to swamp the reader with intricate details concerning the cutting edge of genetic science, but to inform Christians of what's going on in genetics generally, and to point in the direction of a Christian response. There are few, if any, pat answers, and Christians should read this article as the starting point for their own research and reflection.

GENETIC THERAPY AND EUGENICS

Four basic types of genetic therapy are listed here in order of increasing complexity and moral difficulty.[2] First, somatic cell gene therapy involves the injecting of healthy genetic material into patients with genetic diseases. This procedure has proven highly successful, and often provides the patient with a chance at complete recovery. Since the reproductive cells of the patient are not involved, the effects of the therapy — either good or bad — are not passed to the offspring.

The second type, germline therapy, involves the rearranging of the patient's own replicating genetic material in such a way that he or she produces the healthy genes. The complexity of this procedure makes it more risky. Moreover, since it alters the patient's reproductive genetic material, any deleterious effects unintentionally introduced into the patient are passed down to offspring. Thus, until risk to both the patient and offspring can be further assessed, we must be cautious about this type of procedure.

Third is enhancement therapy, which involves not the healing of disease, but the "improvement" of average or less than average characteristics. Hence, the principle behind this therapy is different from that of the previous two. No longer is it a case of "fixing a broken part," but of "adding something new to a normally functioning system."[3] Since no disease is treated, tremendous pressure has been exerted to expand the concept of disease in order to make this technique more acceptable to the general public.

The new definition would bring in the perceived psychosocial effects of being considered "less than perfect." For instance, most people might prefer normal height, but is short stature a "disease," which therefore needs a genetically produced "cure"? Or to take it one step further, should parents give genetically manufactured growth hormones to their normal sons in order to produce better candidates for basketball or football?

There are serious medical concerns as well. To correct a faulty gene presents little danger to the patient. But "to intentionally insert a gene to make more of one product might adversely affect numerous other biochemical pathways."[4] Such dangers are sharpened when enhancement therapy is joined with germline procedures, thereby passing any deleterious effects to the offspring.

This last type of genetic therapy is, in reality, no therapy at all. Eugenic engineering involves the altering of extremely complex traits in order to "improve" a given gene pool. In the past, eugenicists have oversimplified how genes are linked with behavior, either ignoring environment altogether or neglecting the polygenetic (many gene) character of most traits.[5] With the accelerated progress of the Human Genome Project, however, such polygenetic linkages may soon be identified, removing one of the scientific barriers that has, until now, prevented human eugenics from coming into being.

In addition, one social philosophy or another has always accompanied eugenics. Dorothy Nelkin argues persuasively that biological and genetic testing has always been linked with social pressure to conform and that there is a "tendency to reduce social problems to measurable biological dimensions."[6] Thus, whether it is the specter of Nazism, Marxism, or social Darwinism that looms on the horizon, the attendant political philosophy deserves as much scrutiny as the resultant science.

When evaluating the different types of gene therapy, Christians must focus on questions of disease versus enhancement, the purpose(s) of medicine, and the dangers involved in possibly releasing new (and unintended) harmful genes into the human gene pool. The primary purpose of medicine ought to be, in Nigel Cameron's words, "a tradition of healing."[7] This mission places both proper focus and limits on the art of medicine: focus, in that it gives proper place to the role of the physician; limits, in that it gives little or no place to the physician as either "enhancer" or "eugenicist." Therefore, as a corollary, it is not only possible but also necessary to sketch out a range of normal health and to keep genetics focused on *therapeutically* moving and keeping people within that range.

GENETICS IN THE WOMB

One of the fastest growing areas in the broad field of genetics is prenatal testing — the attempt to detect the presence of chromosomal abnormalities before birth. As will be shown, prenatal testing is inevitably linked with the larger issues of both abortion and genetic testing in general.

There are three different procedures for examining the unborn baby for genetic defects. One is amniocentesis, which uses a hollow needle that penetrates the abdomen and uterine wall, extracting amniotic fluid surrounding the fetus

for chromosomal, biochemical, and DNA analysis.[8] Normally it cannot be performed before sixteen weeks of gestation. When this period is coupled with the two or more weeks necessary for results to appear, the earliest a fetus can be diagnosed with a genetic abnormality by amniocentesis would be well into the second trimester of pregnancy (eighteen weeks or more of gestation).[9]

Another method is fetoscopy, which employs a fiber optic device that allows the physician to see the fetus directly. It is usually guided by ultrasonographic technology, which employs high frequency sound waves to create a picture of the fetus *in utero*. Ultrasound is often used by itself to examine for certain disorders, but fetoscopy allows the obstetrician to make much more certain judgments in borderline cases.

The third method of fetal examination is called chorionic villus sampling. It involves the extraction of membrane tissue adjacent to the fetus. This procedure is notable because, unlike amniocentesis, no incisions are necessary, and it is effective as early as twelve weeks into gestation.[10] In addition, other techniques for prenatal genetic diagnosis are on the horizon, which will likely make the preceding procedures obsolete and prenatal screening more common.[11]

Whatever type of prenatal screening is used, we must examine the *purpose* for the screening. Since prenatal genetic surgery is extremely limited in its current applications, abortion is usually the only option offered to the prospective parents of a genetically damaged child. Therefore, how one feels about prenatal screening and testing is inextricably bound up with one's convictions about abortion.[12] To exacerbate the dilemma, some physicians intensify pressure to abort by refusing to perform prenatal screening *unless* the couple agrees to an abortion if the genetic anomaly is "severe."[13] Insurance companies, hospitals, and HMOs can also exert their own pressure. Such institutions commonly offer prospective at-risk parents the choice of either a paid abortion or the termination of their health-care benefits, thus forcing many parents, who choose the latter, to pay enormous costs out of their own pockets for long-term care.[14]

Because our ability to diagnose genetic disease has far outstripped our ability to treat, many parents have been faced with tragic dilemmas.[15] If we start with the premise that real human life (or true moral personhood) begins at conception, should Christians opt for prenatal screening at all (knowing the abortion option will likely be presented)? Even if one considers abortion murder, some reasons for Christian parents to decide on prenatal screening still exist. If the parents are at risk to produce a genetically diseased baby, they may want to know beforehand in order to prepare financially, emotionally, and spiritually for the delivery and raising of the child. It is often a supremely difficult task to raise, for example, a Down's syndrome child, but often a supremely rewarding one, as columnist George Will can testify. When parents know beforehand that a "special child" will be entering their world, it often gives a chance for their family, as well as the body of Christ, to come together and show the family support.

Deplorably, however, more and more parents are opting for abortion for a host of reasons, ranging from mild retardation to even sex selection. Attempts have been made to rank the different congenital conditions in terms of their severity — the least severe being the so-called "fragile X syndrome" and the most severe being anencephaly (in which the babies are born with no cerebral cortex, and will die within days or weeks).[16] With the possible exception of anencephaly, it is extremely difficult to argue from an evangelical standpoint that abortion is the proper option for any of these diseases.[17]

Couples who are worried about being carriers for congenital disease may wish to undergo their own genetic screening before conceiving in order to assess their chances of a normal conception. The screening results may indicate that adoption is the best choice for such couples, thereby avoiding the pressures and risks of the "abortion dilemma." In any event, genetic knowledge is increasing at such a pace that "genetic counseling" is quickly becoming simultaneously more routine and extremely complex.

SECULAR SAFEGUARDS: THE NEW MAGINOT LINE?

Before the outset of World War II, the French placed their country's security against Hitler's aggression in the Maginot Line — a line of defenses, forts, and tunnels along their eastern frontier. Behind these impregnable barriers, they thought themselves safe from attack. When Hitler attacked, however, he simply went *around* the Line, turning the vaunted defenses into bastions of irrelevancy. Paris fell in six weeks.

In my view, the principles that have been erected in secular bioethics to safeguard humanity against genetic abuses have fatal flaws similar to the Maginot Line. While certainly helpful as general guidelines and better than no principles at all, when applied to real cases they offer little protection from abuse.

Bioethical textbooks cite either three or four principles that are used to guide bioethical decision-making: autonomy, beneficence, and justice. Sometimes nonmaleficence ("do no harm") is added as an additional principle; sometimes it is subsumed under beneficence. But whatever the number, all rules, ethical judgments, and actions must flow from the above three (or four) principles.[18] Two texts that are squarely within the bioethical mainstream are here used as the sources for these three principles.[19]

Patient autonomy, currently the principle most in vogue, is defined as occurring when patients are simply able "to determine their own destiny" without being "subjected to controlling constraint by others."[20] Thus little if any emphasis or concern is placed on the *content* of the patient's decision. As long as he or she is given enough information, the physician is normally obligated to abide by that decision.

Beneficence (and nonmaleficence) is concerned with the "doing of good and the active promotion of good, kindness, and charity," and may include "any form of action to benefit another....[and which helps] others further their important and legitimate interests."[21] How "good," "kindness," "charity," "important," and "legitimate" are defined is never explained, leaving doctors and patients to define such terms and concepts as they see fit.

Regarding justice, even the authors throw up their hands in dismay, saying that "it has proved an intractable problem to supply a single, unified, theory of justice that brings together our [the authors'] diverse views."[22] Thus this principle suffers the same fate as the others: what is "just" is never defined, leaving the physician and/or patient to again fill in the blanks.

These principles are ripe to create more problems than they solve. What happens when a patient's autonomy conflicts with a physician's duty toward beneficence? There is simply no way to rank the principles in order to decide a case. The current stress on autonomy degenerates into modern-day relativism: since nobody knows what is right, the patient's decision is as good as any and absolves the physician of any liability.[23] Thus these principles are empty of any specific content, being hopelessly vague and powerless.

Accordingly, no physician or secular ethicist can say whether it is "good" or "just" to undergo a prenatal screening, nor can they say whether it is right to undergo an abortion. The entire question has been thrown into the laps of the patients, and this year in America there will be well over one million abortions.

GENETICS AND MORALITY

Before suggesting how Christians might develop their own theology of genetics, it is important to examine the emerging issue of genetics and morality. In the past 20 years or so, there has been a huge shift in how we view behavior, disease, and morality. It is reflected in our modern vocabulary: drunkenness is termed alcoholism; gluttony is labeled compulsive overeating; promiscuity is called sexual addiction. Our society has shifted from a moral model to a medical or biological model in order to explain sinful behaviors. Sins are now complexes, phobias, syndromes, or addictions. Recently, a major weekly news magazine raised the issue of whether even adultery might be "in our genes."[24] There is indeed an obvious effort "to reduce social problems to measurable biological dimensions."[25]

Genetics is one of the engines propelling this new way of thinking. It is providing new challenges to the idea of human responsibility and morality. It is going beyond suggesting that our genetic makeup might *predispose* us to certain antisocial behaviors; now some suggest that our genes *cause* such actions.[26] That assertion raises sharp questions, especially for those who believe all people (both Christian and non-Christian) have "free will."

Can behavior be morally wrong if it is genetically predisposed or even determined? Is free will necessary at all for a biblical view of morality? Many Christians, following the thinking of Martin Luther (e.g., *On the Bondage of the Will*), would say no. Instead, they would point out that the fall of a perfect creation is bound to have certain physical effects, and we should not be surprised that those effects compel us to rebel against our Creator. In other words, sin is still sin, whatever its proximate cause and source. It is important to realize that whatever explanation of morality a Christian gives, this new flexing of muscles by geneticists will certainly cause Christians to reexamine the nature of

sin and the will, and the issue of morality.[27]

TOWARD A THEOLOGY OF GENETICS

Christians have what the secular world does not have: infallible and unchanging principles upon which to draw. This does not, however, reduce the Christian's task to merely prooftexting simple answers to complex questions. The complicated challenges facing Christians at the turn of the millennium call for urgent, thorough reflection, a fleshing out of unchanging biblical principles that speak strongly to specific situations.

Even after careful reflection has been given, not everything will be crystal clear; there will still be gray areas. But Christians have much more to go on, much more certainty on which to rest their principles, than does the secular world.

As starting points, let me suggest the following principles with their accompanying genetic applications:

> 1. Humans are both finite and sinful. We lack both the wisdom and purity necessary to decide matters of human "perfection." It is, therefore, immoral to use such genetic technologies as human eugenics and human cloning.[28] Thus a theology of health and disease (as opposed to "enhancement") must be developed in accordance with sound biblical guidelines.
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> 2. Human life, with the image of God and an accompanying ensoulment, begins at conception. We are also responsible for how we treat the most helpless in our society (i.e., what Jesus called "the least of these"). Thus there should be important limitations for prenatal testing, and genetic diagnostics must not be used to pressure parents into abortion.
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> 3. God's Word is clear that humankind — both corporately and individually — is fully responsible for actions the Bible calls "sin." Consequently, Christians should resist attempts to convert all antisocial behaviors into genetic diseases that nullify personal responsibility and accountability.
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> 4. Humans are God's highest creation and are commanded to be good stewards of the earth and its resources. Thus we have a mandate to engage in genetic research and therapy, *when it is directed toward the healing end of medicine*.

Implementing these principles in the secular world is clearly a daunting task. The outright failure of certain secular experiments — most notably the so-called "sexual revolution" of the 1960s — provides an opening for Christians to argue for biblical values. But getting a hearing for Christian ethics while remaining true to Scripture is becoming increasingly difficult. Perhaps evangelical Christians — long cool to the idea — will become more open to basing their arguments on natural law (God's moral revelation embedded in His creation) as a legitimate way to translate biblical values. It may be that Christians will be forced to more aggressively create their own structures and institutions (e.g., hospitals), which will be more friendly to religious values.

Whatever the strategy chosen, the history of science is crystal clear on one point: genetic science will not wait for Christians to catch up. By the time this work is published, new discoveries will have been made and new claims put forth. Under the flagship of the Human Genome Project, genetic information is accumulating at a staggering rate. Christians must first become genetically informed; then, with data in hand, they must be able to address highly technical issues with scriptural principles. Considering what's at stake, this task may be one of the most necessary — albeit one of the most difficult — ever faced by the body of Christ.

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NOTES

[1]Dorothy Nelkin warns of the disturbing reemergence of eugenic thinking in "The Social Power of Genetic Information," in *The Code of Codes*, ed. Daniel J. Kevles and LeRoy Hood (Cambridge: Harvard University Press,

1993), 182. Distinctions are also made between "positive eugenics" (the "enhancing of the genetic heritage of the species") and "negative eugenics" (the "prevention of the deterioration of the gene pool"). See Thomas Mappes and Jane Zembaty, eds., *Biomedical Ethics* (New York: McGraw Hill, 1986), 496. In ethical terms, such definitions function much like two sides of the same coin: to speak of "enhancing" one trait is to speak of the undesirability of others (i.e., the "deterioration" of the gene pool). Hence, this work treats eugenics as a unified concept embracing both aspects.

[2]For an excellent discussion of the different types of gene therapy, see W. French Anderson's "Human Gene Therapy: Scientific Considerations," in *Contemporary Issues in Bioethics*, ed. Tom Beauchamp and LeRoy Walters (Belmont, CA: Wadsworth Publishing Company, 1989), 513-19.

[3]Ibid., 518.

[4]Ibid.

[5]Daniel J. Kevles, "Out of Eugenics: The Historical Politics of the Human Genome," in *The Code of Codes*, 8.

[6]"The Social Power of Genetic Information," in *The Code of Codes*, 180-81.

[7]Nigel M. Cameron, *The New Medicine: Life and Death after Hippocrates* (Wheaton, IL: Crossway Books, 1992), 129.

[8]J. Robert Nelson, *On the New Frontiers of Genetics and Religion* (Grand Rapids: Eerdmans Publishing Company, 1994), 37. Also see Laurence Karp's "The Prenatal Diagnosis of Genetic Disease," in Mappes, 496-502.

[9]Nelson, 37. See also Karp, 497-98.

[10]Nelson, 38.

[11]Ibid.

[12]Ruth Schwartz Cowan acknowledges this relationship in "Genetic Technology and Reproductive Choice: An Ethics for Autonomy," in *The Code of Codes*, 246.

[13]See Karp, 502.

[14]See Nelkin, 184.

[15]See Nancy Wexler's "Clairvoyance and Caution: Repercussions from the Human Genome Project," in *Code of Codes*, 211, 223.

[16]See Nelson, 39-40.

[17]This observation does not lessen the extreme difficulty of the decisions involved.

[18]See Beauchamp and Walters, 28, or Beauchamp and Childress, 15.

[19]One is the already cited Beauchamp and Walters; the other is Tom Beauchamp and James Childress's *Principles of Biomedical Ethics* (New York: Oxford, 1989).

[20]Beauchamp and Walters, 29.

[21]Ibid., 30, 194.

[22]Beauchamp and Childress, 256.

[23]Beauchamp and Childress admit that the principles are "equally weighted," 222.

[24]See Robert Wright's "Our Cheating Hearts," *Time*, 15 August 1994, 44-52.

[25]Nelking, 180.

[26]See Nelson, citing the determinism of Edward Wilson, 105.

[27]See Nelson, 102ff.

[28]For more information on eugenics and cloning, see the sidebar on the Human Genome Project.

SIDEBAR:

THE GENOME PROJECT: Flying Under the Public Radar?

In the early morning hours of December 7, 1941, Army Air Corps radar in Hawaii picked up a large formation of inbound planes. Security was lax, and it was assumed that the planes were the expected arrival of American B-17 bombers. They were not. The tragic results of that miscalculation belong to history.

To identify the Human Genome Project (HGP) as an arriving enemy force bent on our destruction certainly presses the analogy too far. Nevertheless, given the monumental aspirations of the project, its potential for both marvelous good and monstrous evil, and the public's nearly total ignorance of its mission, one cannot but see disturbing parallels.

The HGP began on October 1, 1990. Its ambitious 15-year goal is the identification and mapping of all the genes of the DNA (deoxyribonucleic acid) molecule, which make up the chromosomes in each human cell.[1] The project is being undertaken at nine research centers at various universities and medical schools across the country. The HGP is government funded and is sponsored through the National Institute of Health (NIH) and the Department of Education (DOE). The total 1994 budget for the HGP was nearly 170 million dollars.[2]

Mapping of the genetic system means that scientists are identifying the location and sequence of the chromosomes in the strands of DNA. These chromosomes are our human blueprints and determine such characteristics as eye and hair color, height, and sex. They also affect, and in some cases determine, whether our bodies and internal organs function properly. Defective genes cause such debilitating diseases as Huntington's Chorea, cystic fibrosis, and Tay-Sachs. They have also been implicated in certain types of cancers.

OFFERING HOPE TO THE HOPELESS

One in ten Americans is estimated to suffer from congenital diseases.[3] Not all such diseases are severe, but it is often the case that the HGP offers hope to sufferers and their families when previously the outlook had been grim. In fact, it may well be possible for physicians someday to identify a disease-causing gene in a particular patient, substitute healthy genes for it into the patient's own genome, and then send the patient home cured.[4]

Such treatments — whether futuristic or present-day — belong to the broader family of gene therapy, which involves "the insertion of genetic material directly into cells for the purpose of altering the functioning of the cells."[5] In September 1990, W. French Anderson treated a four-year-old girl suffering from adenosine-deaminase deficiency — a genetic disease that attacks the body's immune system. Anderson transfused the girl with a combination of genetically modified white blood cells and retroviruses, which carry the genetic material to the target tissue. The treatment worked, pioneering the way for other examples of genetic medicine that aim to treat such serious diseases as cystic fibrosis, various cancers, and AIDS.[6] Such therapeutic applications of genetic medicine ought to be encouraged, exemplifying both the proper task of humanity in general and medicine in particular.

ETHICAL ISSUES

Many of the ethical issues raised by the HGP are also raised by genetics in general (see accompanying article). The HGP, however, also raises two of the most profoundly troubling issues of our time: the specter of eugenics and the cloning of human beings.[7] First, because of the powerful contemporary drive toward technological improvement, legitimate and beneficial genetic treatment will be under tremendous pressure to go beyond the healing of disease to the "enhancement" of normal people. The science of human genetics was born and nurtured in eugenics; it is not at all clear that it has severed the relationship.[8]

Cloning goes hand and glove with eugenics. After all, if "perfection" has been achieved in an individual, why not avoid the vagaries of the natural reproductive process and instead make "perfect" copies? Although human cloning is currently not possible, the HGP's goal of mapping the entire human genome makes the idea more than fanciful science fiction.

Should a sinful humanity be able not only to decide on, but also to create (again and again) its version of human perfection? Such a scenario raises crucial issues about the accountability and responsibility of science. It also raises pivotal theological and philosophical questions about human nature itself. Keeping in mind that a drop of blood or a lock of hair contains a person's entire genetic code, can homo sapiens be trusted with a technology that would make it possible to clone not only Abraham Lincoln but also Adolf Hitler?

TOWARD THE FUTURE

When evaluating the HGP, Christians must combine biblical insights with up-to-date HGP data. It must be emphasized that this effort is no simple matter of Scripture prooftexting. Instead, we must strive to formulate a biblical world view that balances the reality of human sin with the creation mandates found in the Book of Genesis.[9]

Frankly, both Scripture and history portray humanity as unfit to clone its idea of human perfection. Additionally, as the HGP comes closer to its goal, pressures may mount for a eugenic emphasis. Christians must staunchly resist this impulse. It is one thing to use genetics in animal husbandry or agronomy, or to heal genetically caused human disease; it is entirely another matter to attempt to enhance normal traits in healthy humans.

On the positive side, Christians must reaffirm the creation mandates given by the Lord. We have been manipulating the environment for millennia; humanity must do so to exist. Just as we benefit from the Industrial Revolution, the cures for smallpox and polio, and genetically improved strains of corn, wheat, and cattle, we must affirm legitimate genetic therapy as a blessing from God that enriches His highest creatures on earth.

By combining scriptural truths with current data on the HGP, Christians can make their theology anticipatory rather than reactionary. Christians must become better informed,[10] not leaving the hard work of genetic ethics to the "experts."

In my considered opinion, the issue is not whether the HGP will succeed, but whether it will do so without significant input from a morally reflective citizenry. Christians must become part of the ongoing conversation regarding the HGP. Those who ignore this technology because of its "worldliness" are not only practicing poor theology; they are also abandoning an enterprise whose consequences are potentially cataclysmic. We cannot afford to do either.

NOTES

[1]J. Robert Nelson, On the New Frontiers of Genetics and Religion (Grand Rapids: Eerdmans Publishing Company, 1994), 9.
[2]Selected Genome Information: A HGMIS Compilation (Oak Ridge, TN: Human Genome Management Information System, September, 1994), 1.
[3]Nelson, 39.
[4]So says genetic researcher W. French Anderson, as quoted in Philip Elmer-Dewitt's "The Genetic Revolution," Time, 17 January 1994, 46.
[5]C. Thomas Caskey, "DNA-Based Medicine: Prevention and Therapy," in The Code of Codes, ed. Daniel J. Kevles (Cambridge: Harvard University Press, 1992), 130.
[6]Nelson, 60ff. Anderson reports an even more recent and promising development, the successful insertion of healthy genetic material into three newborns, all suffering from the same immunodeficiency disease. In these cases, however, the infants are now — after two years — maintaining their own healthy immune systems without the need for additional treatments. See Thomas Maugh's "Gene Therapy Proving Success," in The Seattle Times, 10 May 1995, A6.
[7]Human eugenics may be broadly defined as seeking to improve a given population through the breeding of "ostensibly superior human beings" with a goal of a "normal, or even idealized, kind of person" (see Nelson, 3f.). Cloning is "the process of asexually producing a group of cells, all genetically identical, from a single ancestor" (see Kevles, 377).
[8]For the historical relationship between genetics and eugenics, see Kevles, 3-36.
[9]Genesis 1:26-31; 2:15-21; 3:23; 9:1-7.
[10]For more information on the HGP, contact Betty Mansfield of the Human Genome Management Information System at 615-576-6669. Her fax number is 615-574-9888, and her E-Mail address is MANSFIELDBK@ORNL.GOV. For further reading, The Code of Codes and On the New Frontiers of Genetics and Religion are recommended.