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MAKING WHOLE PERSONS
Ethical Issues in Biology & Medicine

"The fear of the Lord is the beginning of Wisdom." Psalm 111:10

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MAKING WHOLE PERSONS

Ethical Issues in Biology & Medicine

Selected Readings from the

Journal of the American Scientific Affiliation

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PREFACE

This collection of papers from the Journal of the American Scientific Affiliation is the second in a series of readings in the interface between science and the Christian faith. The first, "Origins & Change", presented an alternative to the "young earth" viewpoint by providing a broader and more appropriate framework for creation which was faithful to both Scripture and science. It was edited by David L. Willis and appeared in 1978.

The sponsoring organization, the American Scientific Affiliation, is comprised of some 3,000 professionals with degrees in the sciences who are evangelical Christians. It was begun in 1941 "to investigate any area relating to Christian faith and science" and "to make known the results of such investigations for comment and criticism by the Christian community and the scientific community." This dual responsibility remains our stance to this day and is reflected in this collection.

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Situations, Values & Responsibility -- An Introduction

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A young woman attended a conference at which I spoke on the theme of genetic control and human values. Later that day she started to tell her mother about the discussion only to be cut off by the response: "Don't say anything more. I won't listen."

I would hope that this publication will not be treated in a similar manner. These papers are not science fiction, nor do they represent an over-claim for science. The topics are treated responsibly, and yet in an interesting manner. Although the prospects are sobering, there is no need for a fearful refusal to listen.

A different sort of response that is sometimes encountered is the opinion that evangelical Christians are not interested in such topics. Presumably it is thought that the issues are so technical and specialized that serious attention is not justified. Yet in the materials reprinted here you will find discussions of such questions as: What does it mean to be human? What is the nature of responsibility? What is the practical significance of the belief that God is Creator? These are not trivial questions.

From another front comes the charge that scientific advances have created such completely new options that old values and ethical principles are no longer of any help. The writers represented here, however, make the claim that it is precisely these Biblical principles that are needed to give some coherence and perspective to the puzzling and sometimes threatening prospects we face. To be sure, the new situations that emerge as the result of scientific and technological changes require a new application and interpretation, but the basic problems remain.

The original publication of these articles, and now their compilation, are quite consistent with the goals and objectives of the American Scientific Affiliation. The members of the ASA are persons who seek to understand the language of science and the languge of faith, and who look for the relevance of one for the other. The papers presented at ASA meetings and published in its journal tend to be scholarly and liberally supplied with footnotes, an indication that the problems are taken seriously. At the same time, however, there is the desire to explain and interpret the issues to other professionals and to the general public.

In college and high school classes these readings will complement and go beyond other treatments of bioethics, since the topics are treated from a Biblically oriented world-view without becoming sectarian in approach. They will be appropriate for stimulating discussion in churches and seminary classes as well.

The most impressive aspect of the readings is the balanced handling of the three elements that enter into bioethical considerations: the situations encountered, the underlying principles and values, and the responsible individual. Problems can arise if any one element is given undue emphasis. "Situation ethics," for example, seems to imply that each situation is unique and that there are no general principles that can serve as guides. On the other hand, an exclusive attention to principles can result in a pattern of legalism. Ethical choices result when the individual understands his or her own values and applies them thoughtfully to the options available in particular circumstances.

A wide range of *situations* are treated herein, including brain studies, recombinant DNA research, organ transplantation, genetic therapy, psychotherapy. It is argued that if theology is to be relevant it must encompass such secular issues. Furthermore, there is the suggestion that the church can overcome its anti-science image by supporting science in general and by opposing specific areas of research only when they infringe Biblical principles or supplant something better. The treatment of science and technology is up-to-date, although a few specific points already have changed with the passage of time. For example, the possibility of a catastrophic event resulting from recombinant DNA research now seems much less likely than it did earlier, but the cautious approach was both necessary and desirable. *In vitro* fertilization has now been accomplished. In both cases, however, the discussion of the underlying issues is still relevant.

Among the *principles* considered, there is a strong emphasis upon the significance of the family as the context for health care in general, and for genetic choices in particular. The worth of individuals should weigh heavily in many decisions, and we must oppose attempts to "improve" man according to unspecified goals. Several writers ponder the relationship between the quality of life and the quantity of life as ethical norms. Throughout the papers is the persistent reminder that values or moral criteria are not intended to serve us at all; instead they judge us.

Responsibility is seen as given by God for exerting authority over the environment and over one's self, but only for good motives and not for exploitation. Our responsibility includes future generations, who have a right to be as fully human as this one. In all of our choices we are answerable to God no less than to society. That answerability extends to the purposes for which the scientist seeks knowledge, and for the use for which he or she commends and approves it. A serious problem arises when scientific knowledge is isolated from the question of its ethical use.

Some may have hoped that the sciences would settle our questions, but now we realize that new technologies will continue to produce new options. There is no reason, however, to become perplexed and bitter over this prospect, however, for the continuing struggle with these issues provides new opportunities for the testing of personal faith and the creative application of Biblical perspectives and insights.

PART I - HUMAN ENGINEERING

Making New Men: A Theology of Modified Man

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Revolutionary Times

You and I are living in revolutionary times. In this, of course, we are far from unique. Most ages have been revolutionary in one way or another. And yet I believe there may be a profound difference between today and earlier times. While previous revolutions have undoubtedly exerted a considerable influence on numerous parameters in the life of man, including the structure of his societies, his physical and mental well-being, and his philosophical and religious outlook, they have principally been *external* in origin. And so, although they have increased man's control over his environment and to a lesser extent over himself, and although they have served to modify man's view of himself, they have had only a limited effect on man *as man*.

There is however, a revolution currently under way with implications for man as man far beyond anything yet experienced. And this is what I will refer to as the *biological self-identity revolution*. This is just one of the revolutions in progress at the present time and yet I consider it underlies all the others and is basic to them. The biological self-identity revolution is a crisis in the life of man, stemming from the control man is beginning to exercise over his very existence and destiny as a biological and spiritual being. In other words, this revolution has its origin in what man *is* and in what he is *going to be*. If this revolution comes to fruition it may well force us to revise our concepts of man and of his role and status on this planet. This is because the man who may emerge from the biological self-identity revolution could be radically different from the man we now know.

Let me quote a few examples from writers concerned with this question.

> Coming: the control of life. All of life, including human life. With man himself at the controls. Also coming: a new Genesis—The Second Genesis. The creator, this time around—man. The creation—again, man. But a new man. In a new image.
>
> What we believe about man, what we want for man, will profoundly influence what actually happens to man.[1]

> Man, who has already learned to remake his physical environment, will now acquire . . . . the capacity to remake himself. The dust of the earth, having become conscious of the dust of the earth, will be able to recreate itself without benefit of the original creator's breath—and to recreate itself in virtually any image, thus becoming an active participant in the new Genesis.[2]

> Man himself is a part of nature, and he *is* now capable of changing the rules. It is not vanity to say that man has become like a god. Since, god-like, we can now alter nature, including that part of nature which is man himself, we can no longer console ourselves with the thought that a search for scientific knowledge is its own justification. It has ceased to be true that nature is governed by immutable laws external to ourselves. We ourselves have become responsible.[3]

> Man is already so marvellous that he deserves all our efforts to improve him further.[4]

> The development of biology is going to destroy to some extent, our traditional grounds for ethical beliefs, and it is not easy to see what to put in their place. I think that in time the facts of science are going to make us become less Christian.[5]

> Biomedical scientists are encouraged by that curious new breed of technotheologians who, after having pronounced God dead, disclose that God's dying command was that mankind should undertake its limitless, no-holds-barred, self-modification, by all feasible means.[6]

These quotations, from writers with varying viewpoints, demonstrate very clearly the concern and hope currently being expressed at the directions in which some areas of biological research are pointing. Basic to them all is the belief that man's nature is capable of radical modification, and will indeed be radically modified, in the foreseeable future. The consequences of such modification will probably be momentous for the human race, and will pose questions of major importance for scientists, lawyers, sociologists, philosophers, theologians and last, but not least, the ordinary human being.

My aim in this paper is to analyse the implications of some of these advances from the stance of one hav-

ing Christian presuppositions. I will therefore be primarily concerned with theological repercussions, and not with sociological, biological or legal consequences, legitimate as these latter concerns are.

Christians and Relevance

The reasons for my interest in this topic may be worth outlining. In the first place, I believe Christians should be *prepared to meet the future*, meaning the future in all its guises—tomorrow with its very practical problems, 1984 with its inevitable overtones of totalitarian regimentation and strict biological control, the year 2000—that climactic finale to a century of madness and chaos or the dawn of a new age pregnant with boundless, undreamt-of possibilities. And on into the distant future so optimistically depicted by Julian Huxley and Teilhard de Chardin, those mid-twentieth century dreamers of scientific humanism. And finally, into the mists of eternity, radiant with hope for those committed to the lordship of Jesus Christ, dark and mysterious for so many others. It is my contention that evangelicals have for long felt at home in "eternity", being expert at arguing out a particular view of the millenium and second coming and yet tragically uninterested in presenting a cogent Christian position regarding the social and biological problems looming over us. It is these issues with which I will be dealing here, although the more distant future encompassing the cosmic role of Christ is one which Christians should also be seriously studying.[7]

In the second place, I am convinced that if theology is to be relevant it must encompass what may be termed secular issues. As a biologist I find it distressing to turn to the theological works on "man", and find nothing of direct relevance to a contemporary understanding of man with his specifically twentieth century problems. If theology therefore is to speak to *real man*, it must delve into the issues which confront man in a real world. And it is at this point that the Christian grounded in biblical and theological principles and trained in a particular professional discipline has his specific contribution to make. He alone is in a position to enhance that wider body of theology, by seeking to enunciate theological principles relevant to his sphere of interest. It is for this reason that I have subtitled this paper "a theology of modified man".[8]

Third, and more specifically, the human race is heading at alarming speed into a totally unknown and unexperienced realm where man himself becomes the controller and potential manipulator of his own body and brain. This is where the novelty so alarmingly described by Toffler[9] comes into its own. This is where "the human body . . . until now a fixed point in human experience, a 'given' . . . . will no longer be regarded as fixed".[10] This new biology will raise, and has even started to raise, questions with far-reaching implications chief amongst which must be "what is man?" Will the old answers stand up to the assault of previously unimagined changes? If not, how may our view of man be altered, and what guidelines will be required in formulating new concepts? The contribution of Christian thinking to this debate should be a central one, indeed *must* be a central one, if man is to survive.

The man who may emerge from the biological self-identity revolution could be radically different from the man we now know.

Areas of Critical Importance

I want to deal with three principal areas of research, because it is these which are most likely to eventuate in the near future and which pose the most serious questions for the human race. These are the areas of (1) prenatal manipulation including genetics, (2) organ transplantation and (3) brain research. Each of these is well-under-way at present, and each has already brought about marked changes in human attitudes. There is every prospect therefore, that within the next 10–20 years research within these fields will bring us face-to-face with the profoundest of questions concerning the meaning of man and the extent to which he can be changed and still remain human.

It is these areas of investigation and debate which lie at the heart of *biophilosophy*, or as Rosenfeld has termed it *biosocioprolepsis*, i.e., the anticipation of biology's impact on society.[11] The prospect of men *making new men*, which implies different or modified men using biological techniques, may not readily appeal to us and yet is in sight. What I now want to do is to spell out briefly the evidence for such a prospect and the questions which inevitably follow.

Prenatal Manipulation

> One egg, one embryo, one adult—normality. But a bokanovskified egg will bud, will proliferate, will divide. From eight to ninety-six buds, and every bud will grow into a perfectly formed embryo, and every embryo into a full-sized adult. Making ninety-six human beings grow where only one grew before. Progress.
>
> Standard men and women; in uniform batches. The whole of a small factory staffed with the products of a single bokanovskified egg. 'Ninety-six identical twins working ninety-six identical machines!'[12]

> The wife is stimulated with hormones to produce several ova in a mentsrual cycle. By means of minor surgery under general anaesthesia one or more ova are withdrawn through the abdominal wall, a procedure that can be done repeatedly. The ova are then fertilized with the husband's sperm, and within five days or so have grown in the laboratory to more than thirty-two cells. The last step to be taken when more is known about the embryonic development will be to replace the embryo in the wife so that it will implant and grow to full term to be delivered naturally.[13]

In vitro fertilization

The gap separating Aldous Huxley's *Brave New World* (written in 1932) and Robert Edwards' embryology research of the late 1960's and early 1970's may appear a formidable one. I would suggest however, that this is more illusory than real, because once it has been proved possible to interfere with the early stages of human development *outside* the body, the remaining far-more dramatic developments will be accomplished given time.

What is the state of the art? The quotation I have given from the paper of Edwards and Sharpe describes *in vitro* fertilization of human ova, that is, fertilization outside the body. In 1966 Edwards demonstrated how

ova extracted from human ovaries could be cultured in the laboratory ("test-tube") with the development of ripe eggs. This was followed in 1969 by the fertilization of such ova using human sperm, and subsequent, apparently normal development of the fertilized ova. Taking these techniques further Edwards, together with a gynaecologist Patrick Steptoe, reported that they had been successful in taking some eggs as far as the blastocyst stage, by which time the fertilized egg had divided into as many as 60-100 cells.[14] This is true "test-tube fertilization", and while the blastocyst represents a very early stage in development it is sufficiently advanced for implantation into a woman's uterus to undergo subsequent maturation.

Recently the first reports have come to hand of the implantation in women volunteers of ova fertilized *in vitro* and the subsequent normal development of these fetuses. The applications of this technique put forward by Edwards and his colleagues as justification of their research are (1) the alleviation of infertility brought about by a blockage in the wife's uterine tubes; (2) the ability it bestows on investigators for sexing the embryo—this in turn is important because, since many genetic disorders are sex-linked and hence usually occur in males, these could be avoided by replacing only female blastocysts; and (3) modification of the embryo itself in an attempt to mask various genetic diseases.[15]

In spite of these assurances, the technique of *in vitro* fertilization even in its present stage of development raises problems. The very act of growing human eggs outside the body means that a large number will "die" in the laboratory. This is implicit in the technique because in order to guarantee one successful implant as many as ten or so eggs will have to be used. While there is probably nothing illegal in destroying or allowing to be destroyed unimplanted blastocysts,[16] some may object on ethical grounds to the deliberate destruction of fertilized human eggs. The fact that certain contraceptive devices, such as intra-uterine devices (IUD), probably act in much the same way is no solution to this problem.

The ethical issue is taken further when we consider that a fetus produced *in vitro* may be malformed. A considerable percentage of naturally fertilized eggs are malformed, most of which are spontaneously aborted. There is no reason for believing the percentage will be any lower with *in vitro* fertilized eggs. Indeed the manipulation processes themselves could conceivably increase the possibility of malformation. At present there is no way of guaranteeing that the fetus will be normal, as it is not yet possible to check that the implanted blastocyst is free of damage. It is not difficult to imagine the psychological trauma which may be experienced by a couple whose infertility has been overcome by *in vitro* fertilization, only to be presented with a malformed baby. This possibility however, is also present after other forms of treatment for infertility, and therefore should not be unduly emphasized.

What then should our reaction be to this dilemma? There are, it would appear, three major approaches. In the first place there is the attitude of researchers like Edwards and his colleagues. Their aims are chiefly guided by the needs of their patients, and by the medical well-being of any resulting children. Edwards has written: "We believe it essential that doctors and scientists are free to pursue research into aspects of knowledge that could contribute to the well-being of humanity provided the rights of the patients, including those of the fetus, are safeguarded as far as possible."[17] He sees no objection to "selecting against afflicted blastocysts"[18], that is, discarding those with genetic abnormalities, believing this course of action to be preferable to either aborting affected fetuses or producing handicapped children. He is fully aware of the controversial nature of his work and that it will bring him into conflict with established social attitudes. He contends however, that "the rights of blastocysts must be subordinated to the general good of society",[19] a position he defends by reference to prevailing liberal attitudes on abortion.

If theology is to be relevant it must encompass what may be termed secular issues.

In the second place there are those who, while not unsympathetic to this position, feel that human experimentation should wait until equivalent animal experiments are further advanced.[20] Embryo transfer experiments have been confined mainly to mice and rabbits, while embryos of these species have been maintained for about one-third of their total gestation periods in various laboratory media. Linked to these developments are efforts aimed at designing an artificial placenta. Experiments of this nature using laboratory animals present ethical objections to only a limited number of people, and from a broad developmental biology point-of-view have many advantages over human material.

A third approach to human *in vitro* fertilization is that typified by Paul Ramsey who has written: "The decisive moral verdict must be that we cannot rightfully *get to know* how to do this without conducting unethical experiments upon the unborn who must be the 'mishaps' (the dead and the retarded ones) through whom we learn how."[21] Basic to this attitude is the possibility of harm to the fetuses as a whole, and coupled with this the objection that a hypothetical or unborn child is being submitted to a dangerous procedure.[22] This leads into the consideration of when in the course of development a living human embryo acquires *protectable* humanity.[23] While this latter point raises many well-known, and virtually unanswerable, questions, it also introduces a new principle for this debate. This is that, in contrast to abortion where a fetus already exists *in utero*, a fetus is deliberately being created in this new situation by experimental procedures. Does this introduce new ethical considerations?

For myself, I would prefer much greater emphasis at present on animal experiments, particularly primate ones. As with all experiments on human patients, techniques should previously have been brought as near as possible to perfection using animal trials. I can see no reason for abrogating this principle with respect to *in vitro* fertilization. Assuming this principle is adhered to, and human trials are one day inaugurated with a substantial chance of success, what then? I would tend to agree with Edwards that the needs of couples and the welfare of their children are paramount. Blastocysts

and even much later stages of fetal growth must be viewed as of secondary importance. There are however, two important points to be borne in mind at this juncture. The first is that these procedures are carried out within the family situation. The second is that in adopting this position I am allowing inroads into the control man is exerting over his reproduction and hence over himself. In doing this I am aware of at least some of the consequences. Using the well recognized "wedge principle", what I am allowing is but a start. Once this form of control has been successfully exploited, far greater degrees of control will follow. These are on the horizon at present and I will discuss them in a moment.

My reason for allowing this is that man has been given responsibility by God for exerting authority over his environment and over himself. Later on I will return to this principle. At this point I simply wish to suggest that the techniques I have been describing do not contravene this principle, as long as they are carried out for the benefit of society. Of course this type of control over human reproduction is itself simply an extension of current, and generally-accepted practices. This does not justify *in vitro* fertilization, but it should make us question current methods of controlling and modifying human reproduction and ask what ethical issues they too may raise.

Certain contraceptive techniques prevent the implantation of blastocysts, while A.I.H. (artificial insemination by the husband) removes by one step the human aspect of reproduction. A.I.D (artificial insemination by a donor) introduces many further difficulties, ethical, psychological and legal, and yet it is estimated that up to 10,000 A.I.D. children are born each year in the United States alone. It is not my intention to discuss A.I.D., except to point out that it, plus its extensions, sperm bank A.I.D. and "space-time" sperm banks,[24] are procedures currently in use or feasible at present. They reflect a considerable degree of manipulation over human reproduction and represent half-way houses between natural reproduction and rigorously controlled reproduction. The future is very close and prenatal manipulation plays a role in many of our lives. But where is our theology of prenatal manipulation?

Prenatal adoption

I have spent some time in discussing *in vitro* fertilization because it is a contemporary development and constitutes the springboard for all other forms of prenatal manipulation.

I would agree that needs of couples and the welfare of their children are paramount. Blastocysts and even much later stages of fetal growth must be viewed as of secondary importance.

The implantation of a fertilized ovum need not be into the same woman from whom it came. It could be donated by another woman, the gestational or host mother as opposed to the biological mother, who would then carry the developing embryo to term. This has been characterized *prenatal adoption* by Bentley Glass[25] who sees its use in the future, adapted for eugenic purposes. He writes: "In the future age of man it will become possible for every person to procreate with assurance that the child, either one's own or one prenatally adopted, has a sound heritage, capable of fully utilizing the opportunities provided by society for optimal development".[26]

The possibility of host mothers to incubate someone else's fertilized ovum has led to extravagant pictures of "wombs for rent", given the appropriate social structure. After all there have been "wet nannies" in the past, why not "host mothers" in the future? This is far from idle speculation. It is an accepted method of transporting a number of embryos within an adult animal of the same species, for example, in sheep and rabbits.

Such a technique could be used, in theory at least, for maintaining an ovum fertilized in the normal way where the wife has uterine abnormalities either preventing the implantation of the blastocyst or maintaining a normal pregnancy. The disadvantages of the technique would appear enormous. The parent-child relationship may be dramatically altered, bearing in mind that it is questionable whom the child would regard as its parent. Apart from psychological uncertainties regarding identity, it is likely that by the time such a procedure became feasible it will be possible to bring fetuses to term in the laboratory.

Chimeras

Moving further into the realm of manipulation brings us to the mixing of cells within a fetus. The injection of donor cells into an embryo, and their subsequent multiplication during fetal growth leads to the partial colonization of organs. The resulting fetus is a *chimera* or *hybrid*. The emotional way of envisaging chimeras is in terms of man-animal hybrids[27] or cross-species cannibalization.[28] It is difficult to know how seriously to take these nightmarish fantasies, except that intraspecies donation of cells is far from fantasy and opens the way for genetic engineering and composite organ transplants within pre-implantation embryos.[29]

Genetic engineering

Genetic engineering must be distinguished from negative eugenics which is the elimination of bad genes

Fetal Experiments

It is presently against the law of the United States to experiment on any "living" human fetus, before or after induced abortion, unless the purpose of the experiment is to save the life of that particular fetus—an unlikely circumstance. The law does not say what it means by "living," which, in this case, is not easily defined, but one minimum rule of thumb appears to be that, if the fetus has a beating heart, hands off.

The controversial moratorium on fetal research, which will be in effect at least until early next year, is a provision of the National Research Act, better known as H.R. 7724, which deals with both the training of biomedical and behavioral researchers and the ethics of human experimentation.

Barbara J. Culliton, *Science* 185, 426 (1974); copyright by the American Association for the Advancement of Science.

Changed now —

from the population and *medical genetics* which involves counselling prospective parents on the risks of serious hereditary diseases in their children. Genetic enginering, by contrast, is the attempt to impart new characteristics to forthcoming generations by manipulating the genetic material. In other words, this is *positive eugenics* or, to use Lederberg's term, *euphenics* –the engineering of human development.[30]

The substitution of one gene for another by replacing DNA (deoxyribonucleic acid) with "better" DNA is possible in organisms with a very simple chromosomal apparatus, and amazing results have been reported from a variety of plants and animals including peas, bacteria, tadpoles and newts. Whole genes have been transferred from one cell to another, suggesting that gene transplants may be possible; inactive genes in cells have been "switched on" to produce enzymes which those particular cells normally do not produce, while RNA (ribonucleic acid) foreign to a cell has been introduced into cells to induce them to behave in novel ways.

The controversy surrounding genetic engineering is intense, even in scientific circles.[30a] The one reaction which is not warranted is *complacency*. Even a few years ago geneticists would have put genetic engineering in the twenty-first century. Today however, many geneticists would view it as a human possibility on a limited scale within 15 years.[31]

While the processes I have just sketched apply to relatively simple organisms, an increasing range of procedures is now possible in mammals. For example, specific genetic material has been introduced into a mouse cell to replace a deficiency. This is still a very long way from what is generally envisaged as successful genetic engineering in the human, which will involve germ cells rather than body cells and which will have to be exceedingly exact. This will require major technical advances, and yet such is the rapidity of genetic advance that a discussion of its implications is in place.

On the positive side genetic engineering will enable a genetic defect, say haemophilia, to be remedied by fertilizing a couple's eggs and sperm in the test tube and inoculating blastocysts with normal non-haemophilic cells. The resulting child, which will be carried in the normal way, will be a haemophilic–normal mosaic, who will in all probability be normal. Many other so-called "missing gene" defects could probably be rectified in a similar manner.[32]

While the replacement and modification of single genes in the human lies in the future, these procedures are well within the bounds of reality, and will be seen one day as *gene therapy*. And so just as today complete blood tranfusions are caried out on unborn children suffering from severe rhesus incompatibility with the mother, very early embryos will have 'gene transplants' to overcome a wide variety of genetic disorders.

But what about the *misuse* of genetic engineering? This is one of the supreme realms in which the writers of scientific futurism strive hard to outdo the writers of science fiction. Rosenfeld writes,

> When this kind of biochemical sophistication has been attained, when man can write out detailed genetic messages of his own, his powers become truly godlike. Man will presumably be able to write out any set of specifications he might desire for his ideal human being. And who can find fault with ideal human beings?[33]

I will return to this question later on. For the moment though, how likely is this prospect? In the foreseeable future it would appear to be very slim, simply because complex qualitities such as intelligence are determined by numerous sets of genes. And of course the final product of genetic inheritance, that is, the individual human being, is considerably influenced by his environment and the diverse pressures resulting from the environment. Even if it were ever possible to produce our "ideal human being" in genetic terms, the resulting genetic/environmental product might be far from ideal unless, of course, the environment too were ideal.

The controversy surrounding genetic engineering is intense, even in scientific circles. The one reaction which is not warranted is complacency.

Perhaps J.B.S. Haldane best summed up the issue. According to him, the only problem with creating a race of human angels is to find the genes for wings and for moral perfection. Humorous as that statement may be, it contains a profound truth geneticists and anatomists are rarely willing to face. There is more to life than genes, organs and ideal bodies.

Linked to this, there is an ethical issue we need to consider. The preceding discussion has assumed that conception has taken place or will take place regardless of genetic or other difficulties, even when the likelihood of such difficulties is recognized. It is then up to the medical geneticist to rectify the abnormality, even if it involves dispensing with the fetus. It has become unfashionable to question the wisdom of these steps. Paul Ramsey however, sides with the unfashionable.

Preventive genetic medicine

> has a number of familiar, proven options more desirable than gametic manipulation. If we want to promote responsible parenthood by means of our knowledge of genetics . . . the first question is not whether, assuming the child must be, we should make it of this or that genetic composition, but whether a conceptus should be conceived at all. We ought not to choose for another the hazards he must bear, while choosing at the same time to give him life in which to bear them and suffer our chosen experimentations.[34]

Taken to its logical conclusion this position precludes practically the whole of genetic engineering, and this is the direction in which Ramsey himself tends. It does however, have even wider connotations than this, because with or without genetic engineering we *are* responsible for bringing children, some of whom are known to have medical defects, into the world. We choose to give them life. They have no choice. This is the ultimate dilemma of certain existentialists, including Sartre. Man is responsible, but never for his own birth. Quite apart then from the potential of modern scientific investigation, we must accept the momentous re-

sponsibility of ushering into this world further lives. This is the essence of our God-given responsibility as members of the human race, and from this stems all our actions on the unborn fetus.

Cloning

This may be termed *biological predestination.* It is the process of producing carbon-copies of individuals or, more dramatically, "people from cuttings."[35] It is this technique which will allegedly enable us to produce an endless stream of exact copies of Mozart or Einstein, or Hitler, of course. Alternatively if your preference is for an army of a few thousand identical soldiers, all appropriately selected for certain conditions of battle, cloning will be the technique of choice. And so one could continue. Probably more alarming nonsense has been written about this technique than any other in the genetic arena, ideas put forward including plans for establishing international boards of control and the best age for cloning in various groups of the population.[36]

In essence cloning is *asexual* reproduction, with the result that the new individual or individuals are derived from a *single* parent and are genetically *identical* to that parent. Hence the exact copies. Cloning is brought about by the removal of the nucleus from a mature but unfertilized egg and replacement by the nucleus of a specialized body cell of an adult organism. The egg with its transplanted nucleus proceeds to develop *as if* it had been fertilized, and produces an adult organism which is genetically identical to the organism which served as the source of the transferred nucleus. In this way it is possible to produce an unlimited number or clone of identical individuals. Up to the present cloning has been effected in animals such as frogs, salamanders and fruit flies.[37]

There is no theoretical reason to prevent human cloning and it will probably be feasible within the next few years. It is difficult however, to find reasons for doing it. Organ transplantations between members of a clone would present no problems; if one partner in a marriage had a severe genetic defect the other could be the clone-parent; it would be a sure way of selecting the sex (and much else) of a child. These dubious benefits of cloning are hardly worth serious consideration as there will relatively shortly be other, far more responsible, ways of overcoming these drawbacks.

Cloning may be termed "biological predestination." It is the process of producing carbon-copies of individuals, or, more dramatically, "people from cuttings."

On the deficit side cloning is almost universally condemned, even by relatively liberal commentators.[38] The major problem is that cloned "specimens" would lack any sense of individuality. It denies to these specimens "the right to be one's self", and if ever such specimens should exist they will be in the unenviable position of *knowing* without a shadow of doubt that they are merely biological replicas, who are essentially preordained and whose biological future is mirrored in someone else.[39]

This is a truly frightening possibility because it means we will be able to produce people who are not people in that they are denied the chance of themselves experimenting with life. They will simply reflect a previous experience. The psychological trauma which may result from this is unimaginable. Of course it is possible to argue that they will *not* be identical to their cloned-parents or even to their cloned-siblings, because of their different environments. If this is the case, and it probably is, why clone? Instead of the original genius, one may end up with a pathetic travesty of the great man.

Cloning is an extreme technique and yet it is valuable in that it points to the extent of dehumanization which will be possible via prenatal manipulation. Kass has put forward a valuable principle which sums up this section: "We may *not* be entitled, in principle, to a unique genotype, but we *are* entitled not to have deliberately weakened the necessary supports for a worthy life. Genetic distinctiveness seems to me to be one such support."[40]

Organ Transplantation

I will not deal at length with this topic as the ethical decisions which principally surround it are not directly related to modifying man. They have chiefly to do with the definition of death, which results from the use of cadavers as donors. Important as these issues are they are peripheral to my main concern in this study.

The transplantation of kidneys, hearts, livers, lungs and eyes does not usher in the brave new world. Some of it may be heroic surgery, other aspects are virtually routine surgery, but the patient plus his transplanted organ is still much the same original human being. What about brain or head transplants? For very many reasons, including technical ones and difficulties concerning the supply of donors(!), such transplantation while making good science fiction reading is out of the question.[41]

A more profitable line-of-investigation, although still remote in the future, if even realistic, is the concept of the *cyborg.* This is the term used for a cybernetic organism or automated man, in which the machine component of the organism receives instructions from the man and also informs him of the conditions it is encountering.[42] For instance, one can imagine a cyborg designed for astronautics. He may resemble a man but many of his bodily functions, such as respiration and communication, would be carried on cybernetically by artificial organs and sensors. However fanciful this sounds, far more fantastic man-machine schemes have been suggested. While I am not concerned with the details of such prophecies it should be remembered that they are based on two current developments: the increasing efficiency and growing use of mechanical prostheses, and the development of the computer.[43]

Arthur C. Clarke envisages that *Homo sapiens* will give way in the distant future to *Machine sapiens.*[44] However likely or unlikely this speculation may turn out to be, it is based on the belief that machines capable

of *greater* intelligence than man will be evolved. This in itself is a highly debatable point, and I will not enter that controversy. The modification of man by way of machines and the computer, however, has its roots in man's *present* dependence on these artifacts, and we should ask ourselves to what extent man has *already* been modified by them.

Machines are simply extensions of ourselves, because in one sense our bodies are machines. It is true we identify with our bodies, and it is this which enables me to refer to "my body" and to "me". Is an artificial limb or are artificial heart valves a part of "me"? For those possessing such gadgets, normal life would be impossible without them. To what extent then, do artificial protheses affect our identity? To what extent does our body, or parts of our body, contribute to our knowledge of ourselves as individual and distinct beings? In the end we are faced with that perplexing question: "Who am I?"

In the light of our answer to this question we may be able to decide what modifications a human body is able to undergo and still retain its identity. This applies to protheses and transplants as well as to genetic manipulation and assaults upon the brain. Apart from our heredity, the greatest present contributor to our identity is undoubtedly the brain. And the brain is particularly vulnerable to external assault, which is an application of our technological expertise.

Brain Research

> The possibilities of misapplication of the results of brain science are already frightening to many people. Could it be, they ask, that here at last we face the ultimate Pandora's Box, a secret whose uncovering would be the destruction of human society? Has brain research gone far enough, if not too far, already?[45]

These words of Donald MacKay written in 1967 are even more appropriate today than then. Brain research has burgeoned over the past few years, and while we are still on the threshold of any overall understanding of it, our potential for manipulating various aspects of its functioning is increasing daily. So real is this advance that some people are throwing up their arms in despair and complaining about the "rape of the mind."

There is a major difference betwen the application of this type of research and that considered previously in the realm of prenatal manipulation. Whereas intervention before birth affects the lives and characteristics of those not yet in existence, brain manipulation will be carried out on those with *known* personalities which may consequently be modified during adult life. Investigations upon the brain therefore may pose an even *greater* threat to the integrity of individuals already conceived and already possessing recognizable identities. It may not be an overstatement to say that the power to change the brain confers a corollary power which is the ability to change personality and even self-identity. This is the crux of the biological self-identity revolution, and the issues it raises lie at the heart of biophilosophy and, dare I say it, contemporary theology.

I will deal with the two areas, which it seems to me are crucial in this debate. These are the electrical stimulation of the brain and mood-controlling drugs.

Electrical stimulation of the brain (ESB)

In very general terms we can say that the brain consists of a number of lobes which are interconnected and which, by virtue of their relationship to the rest of the body and the outside world by way of the spinal cord and peripheral nervous system, constitute a functioning whole. There is therefore constant interplay between the brain of an individual and the world that individual has to cope with, the brain receiving continuous stimuli from the surrounding world and putting out appropriate information to deal with that world. The picture which an individual gives of himself to other individuals is very much the result of these interactions.

Machines are simply extensions of ourselves, because in one sense our bodies are machines. Is an artificial limb or are artificial heart valves a part of "me"?

It is not difficult to appreciate then that damage of the brain upsets these interactions and may well alter the picture others have of the affected individual. In other words, brain damage may alter the individual's personality and in so doing may alter the person himself. Brain damage may dramatically change a person's behaviour patterns, and the question may then be asked: what *is* a person's *real* nature? Do we have a basic personality on which life, and certainly disease, imposes distortions, or is our personality nothing more than the construct of our experience?[46] These questions become the more pressing when we turn from disease to interventions in the brain, because issues which were previously unavoidable now become subject to man's control.

Within the lobes of the brain there are various areas which have relatively specific functions. For instance there are areas concerned with speech, vision, hearing, motor and sensory functions etc. In addition there is a region involved in organizing the metabolism of the body and hence with sensations of hunger and thirst, fear and rage. One of the principal ways in which these functions have been localized to specific regions in both laboratory animals and humans is by inserting small electrodes into the brain under local anaesthesia and observing what happens when a small current is applied. For example if a motor region is stimulated an arm or leg may involuntarily move, while with an auditory region the patient may hear a non-existent conversation or weird sounds.

Using this technique Dr. James Olds found in 1953 that when he stimulated a region of the brain known as the *hypothalamus* in rats, they appeared to enjoy it.[47] Olds concluded that the parts of the hypothalamus giving this reaction constituted *pleasure centers*. Further research indicated that of the pleasure centers one appears to be associated with eating and another with sexual emotions. Besides these pleasure centers there is also evidence that *aversive* or punishment centers exist in the hypothalamus, while other centers are apparently involved in the development of obesity, thirst and hunger. An area close to the hypothalamus, known

as the *amygdala*, gives a variety of actions when it is stimulated, the best known being rage.

It is not difficult to understand why many people regard these data as detrimental to a *human* view of the brain. Once these data are assimilated, much of the mystique of the brain, and possibly of the human person, disappears. ESB has therefore, a great deal to answer for. This is not all, because with understanding comes potential control. ESB not only facilitates accurate mapping of the brain, it also ushers in the prospect of modifying human behaviour.

Some of the most dramatic examples of this technique are illustrated by the work of José Delgado.[48] For instance, he has shown that a five-second stimulation of a particular spot in a monkey's brain will make the monkey stop whatever it is doing, make a face, and turn its head to the right, walk on its hind legs around its cage, climb the cage wall and return to the floor. With cessation of the stimulation it grunts, stands on all fours and resumes normal activity.

The point here is that each time the button is pressed the monkey goes through exactly the same ritual. And so one could give numerous examples to illustrate this point. Cats can be induced into either paroxysms of rage or excessive contentment simply by stimulating the appropriate brain region. In one instance Delgado, with an excessive degree of showmanship, went into a bull-ring and stopped a charging bull by stimulating one of its brain regions by remote control. Taking these developments further, it is possible for an animal to stimulate its own brain by pressing a lever or button connected to electrodes implanted in its brain. And it is from this that one gets the terrifying picture of a rat continuously stimulating its own pleasure centers, regardless of food or water, until only exhaustion brings this tragic sequence of events to a conclusion.

There is *no* reason why ESB should not bring about this same kind of thing in human beings. In principle it is possible now. And under certain circumstances it is used now.

At present its use in humans falls into two categories—as a therapeutic tool and in the continuing treatment of emotional disturbances.

The power to change the brain confers a corollary power which is the ability to change personality and even self-identity.

A term often applied to these uses is *psychosurgery*.[48a] By increasing the current passing through the implanted electrodes, brain tissue can be destroyed. This is used to destroy tissue in certain cases of intractable epilepsy and Parkinson's disease and sometimes to gain relief from intractable pain. Frontal leucotomy, which was in vogue in the 1930's and 1940's and which was, and still is occasionally, resorted to in cases of severe depression is a rather less refined example of psychosurgery.

Far more difficult ethically is the use of psychosurgery in modifying behaviour. Consequently it may be employed in people characterized by violent outbursts of rage, to destroy the brain region concerned.[48b] Or it can be used not to destroy brain tissues but simply to quiet a violent psychotic individual by stimulating electrodes implanted in his brain. This latter application of ESB is currently used on a limited number of patients in mental hospitals, but its potential is obvious.

Is there any objection to using ESB as an antidote to specific symptoms? We do this every day with drugs and conventional surgery. Why not by surgery on the brain? The underlying question we have to answer is: "What is normal?" What are our expectations of the normal individual? When I am calm, am I any more *me* than when I am angry? How do we distinguish between what may be regarded as "normal" anger and "pathological" anger? And who decides?

"Who controls the controllers?" Rosenfeld states the dilemma very perceptively: "The notion of a man controlling his own brain is one thing. But the prospect that a man's brain might be controlled by another is something else again."[49] This issue is an intensely practical one because it brings us into the area of *criminology* and of the expectations of society.

If it can be shown that there is a high correlation between deviant behavior and brain damage, what is the best way of controlling the deviant behavior? Is it by primitive measures, coupled perhaps with moral coercion, or by a direct approach to the brain of the deviant? An answer to this type of question would take us into deep philosophical waters, as it involves the relationship between the brain and the person. Difficult as this issue is, it requires an urgent answer because increasingly courts are having to decide whether a person should be sent to jail or a psychiatric institution. Who or what is at fault—the man or his mental illness? By what criteria do we decide that a man is or is not responsible for his actions?

Mood-controlling drugs

Many of the questions raised by the use of these drugs are the same as for ESB. The main difference is that these drugs are freely used in the community at present, and so while their effects may not be as dramatic as ESB, their overall significance may be just as great.

There is now a bewildering array of mood-controlling drugs, the principal groups being (1) sedatives or hypnotics, e.g., barbiturates; (2) stimulants, e.g., amphetamines; (3) tranquillizers, e.g., imipramine (Tofranil) and isocarboxazid (Marplan); and (4) hallucinogens e.g., LSD, i.e., the psychedelic drugs.[50]

At present the majority of these drugs while acting within certain general limits, are not unduly specific. They raise or lower the threshold of action of general systems in the *drug–biochemistry–behaviour* triad. Of course this may change. The specifity of these drugs will undoubtedly improve. Are we to be concerned about this?

In my view the principal dangers arising from the widespread use of these drugs do *not* lie in a totalitarian foisting of them on a population. Rather it is the *voluntary* taking of psychoactive agents as a means of escape from the real world that is far more disturbing. While some of these drugs are highly useful in many circumstances and are probably *indispensable* in present-day society, their overindulgence can be a

means of shielding people from pressures they should face squarely and if possible resolve.

Drugs are modifying our behaviour patterns far more profoundly than we may care to realize. What is happening is that we are looking for *technological* solutions to our problems, as opposed to *social* solutions. It is generally far easier to prescribe drugs to alleviate symptoms than to tackle the social situation giving rise to the symptoms. While this use of drugs is undoubtedly justified, the increasing dependence upon drugs by an increasing number of people and by society as a whole may actually lead to a change in the *quality* of life.[51]

A disturbing side-effect of this trend is that seen in society's treatment of certain social misfits. The condition of "minimal brain dysfunction" is a relatively recent condition characterized by children whose behaviour is socially unacceptable. Children who are "hyperkinetic" on the basis of their school reports are regarded as in need of treatment with a daily administration of doses of amphetamines.

Great care needs to be taken in equating unacceptable behaviour or personality disorders with brain malfunction. The latter should first be proven before neurobiological or neuropharmacological action is taken to "cure" it.

We do not know how far the techniques of ESB and mood-controlling drugs will develop. Let us hope the day never comes when men and women will sit down comfortably in their armchairs and stimulate their pleasure centers for hours on end. This is hardly an endearing prospect, but whether it is any different in principle from living on a diet of tranquillisers, alcohol and T.V. is a debatable point.

Perhaps the brave new world is already here, and yet because of our obsession with the *horrors* of technology and not with its benefits, it has quietly overtaken us.

Towards A Theology of Modified Man

The modification of man raises some of the profoundest issues we will ever face. I will briefly outline what appears to me to be some of the essential principles requiring consideration in formulating a theological approach to them.

1. *Research will continue*

There can be *no* moratorium on future biological research, unless this is desired by the scientists involved, as may be the case with certain forms of bacteria research termed "plasmid engineering." It would be fallacious though to rest our hopes on any such limitation. Research will continue, and will probably also continue to escalate.

It could be argued that because the aims of certain workers in these fields are essentially humanistic, this type of research should be opposed on Christian grounds. To suggest this is to confuse philosophical principles and the scientific enterprise. Scientific research is not dependent upon the aspirations of its exponents in this simple manner. Christians therefore are to be concerned with analyzing each technique on its merits rather than inveighing against these areas of research as a whole on questionable philosophical grounds.

2. *Man is viceregent for God*

Man has been given dominion over the created order by God.[52] He is therefore to be responsible for it, in that he is to exercise his power in accordance with God's moral nature. "His sense of responsibility," as Montefiore has written, "no less than his status in creation, must be little less than God's"[53] As Montefiore has further written in regard to the environment,

> Man, because he is in God's image, is a moral being, accountable to God for his actions; and because he is made in the image of God, man is also an intelligent being, under an obligation to use his mind in the exercise of his dominion and therefore unjustified in abusing his environment through indifference or lack of foresight.[54]

These words are just as appropriate in discussing man himself. Man is responsible for the well being of man, as an individual, as a neighbor, as a society and as a species. This further implies that each man is to be treated as a responsible human being with the power of choosing his own lifestyles and destiny. Each person should be able to choose what he does or does not want inflicted upon his own body. This is his prerogative and no one else's. The more technological society becomes the more difficult it becomes to maintain this principle, and yet it is an *indispensable* one from a Christian angle.

Man is also responsible for *future* generations of man, as much as for the *present* generation. There is a limit therefore to the degree of tampering with future generations which can be permissible in terms of this principle. Future generations have a *right* to be as fully human as this generation.

This biblical position is our life-line when considering modified man. Cast it away and no clear principles remain. Macfarlane Burnet believes that "Man is no longer something made in the image of God, but (is) a part of the whole world of living things".[55] Hence the title of a book of his *Dominant Mammal*. But where does this take us? How does it guide us through the maelstrom of perplexing issues facing us? Leach believes that "we *could* act like gods". To what end? "That we can act confidently with a sense of purpose." We need a sense of *direction* to guide us in the choices we have to make. Furthermore, we need the perspective of *eternity*. Without this it is more than likely that man will exploit himself and his world to the full for selfish and self-defeating purposes.

Apart from man's knowledge of his relationship to God, of God's standards and of God's requirements for the created order, what *model* does man have for modifying man? Jacques Ellul has made the rather unflattering comment that those with the power of remodelling man will make the new human in their own image.[57]

3. *The "ideal" human being*

This leads on to the question of what is the *aim* of modifying man? Is there such a being as the "ideal" man? Is there a holistic view of "man" at all, or is the being we call man composed of a series of almost unrelated normalities and abnormalties?

These are crucial philosophical questions for our generation, because humanism has brought us to the point of denying the existence of a meaningful man. Instead, what it presents to us is a mass of determined, reductionistic pieces of information that, by modifying human beings, it is attempting to build into a "new" man

–the humanistic ideal of a human being.

The concept of the "ideal" is itself a humanistic one, and so the "ideal" human being is a vision of ethics and moral philosophy, not of biology.[58] Carl Henry works out the consequences of this position a little further. He recognizes that

> central to the current conflict over the ideal image of man is the contemporary uncertainty about who or what man really is. It has not yet dawned on our contemporaries that their creative postulation of a novel man, if consistently ventured, must involve a total severance with man as Christianity has known him–man ideally imaged in Jesus of Nazareth, man who owes his existence to a divine creator and preserver.[59]

Man as we know him is therefore the man we are to strive to help, and the guidelines we follow in modern biology are found in man as we now know him. Does this principle then invalidate much of the genetic transplantation and neurobiological developments I have been discussing? My answer is "No". We are surrounded by individuals suffering from defects of one sort or another; the remedy of these defects and the alleviation of suffering are cardinal principles of medicine which apply as much in modern biological medicine as in more traditional medicine. A line must be drawn however, between this approach and that which attempts to *improve* man according to unspecified goals.

Even this principle though may lead to a surprising degree of modification of man within certain limits. It does not justify reactionary cries of alarm. We are to be modern but in a Christian way.

4. *The dehumanization of man*

This is intimately involved in the search for the "ideal" man. The danger is that it ends as a dehumanization, involving a depersonalization, of man. A great deal of thought needs to be devoted to working out the implications of dehumanization. As a start it might be worth suggesting that deviation from the *creation ideal* is implied in dehumanization. As a part of the creation ideal we see a close association of sex and marriage, marriage and parenthood, and child-rearing with home.[60] While these associations may or may not be inviolable rules, they are clear pointers in the direction God intended human life to proceed.

Any major cleavage within them is an aspect of dehumanization. The extent to which any of the procedures I have outlined are dehumanizing will have to be considered. Are there, for example, any circumstances under which A.I.D. would be acceptable from a biblical standpoint? Does it automatically breach the marriage bond? It can be argued that it imparts into the marriage relationship something from outside, something which does not stem from the relationship itself. Viewed in this way it falls short of the creation ideal,[61] and opens the way to mechanistic trends. In relationship to A.I.D. I believe an essential consideration concerns the *reasons* for desiring it. Are these motives humanistic or are they concerned with the welfare of the two parties in the marriage? Does the latter motive ever justify A.I.D. from a biblical perspective?

Similar questions need be asked in all the areas I have considered. Is ESB to control rage ever justified? Again, there may be situations in which biblical principles will allow it, and others in which they will contraindicate it.

Man is also responsible for future generations of man, as much as for the present generation.

5. *Freedom and change*

The biological developments discussed in this paper bring us face-to-face with the reality of *change* in our lives. This presents us with the challenge of confronting change, both in the biological world and in our attitudes, and of deciding what we are prepared to do with it. Are we determined to resist change, come what may, or will we accept it and strive to see it in a Christian perspective so that we can help decide the *kind* of change to be adopted?

Attitudes have already changed enormously. For instance contraception has had a vast effect on attitudes towards marriage, the fetus and perhaps the quality of life for our children. Has Christian thinking promoted any of these changes, or has it been defeated repeatedly as it has unsuccessfully resisted them? We must think through issues concerning modified man, because the issues either are, or will shortly be, on our doorsteps. Change will not slow down to allow the Christian Church to catch up.

Accompanying these changes in the life of man is an increase in his *freedom* and in the extent of his control over himself and others. Man however, is not as free as humanists often assert, and yet he has *greater* freedom than we sometimes like to admit. Society is not a vast laboratory as some would believe, but neither is it a museum. Man *is* on the move, and it is the task of the Christian to remind scientists that the "man" they wish to control is a fellow citizen, a human like themselves. It is also relevant to point out, as Langdon Gilkey has suggested, "that there is *less* freedom in the knower and controller through his knowledge than most descriptions of the potential uses of science seem to assume."[62]

6. *Optimism or pessimism?*

New men have not as yet been made, although the old man can, within stringent limits, be modified. Does this hold out hope for a glorious future? To some humanists, it does.[63] To some scientists, it does; to others, it is more like the brink of catastrophe.[64]

Sir George Pickering confronted with the possibility of an indefinite extension of human life commented: "I find this a terrifying prospect, and I am glad I shall be dead and will have ceased to make my own contributions to this catastrophe before it happens".[65]

For the Christian it should remind him of the conflict between man's old and new spiritual natures, and of the conflict between good and evil within the universe. Whatever man can make of man, it is God who is in ultimate control, and however allpowerful man may appear, he remains the creature in a God-upheld world.

The Christian is to continue living in faith, knowing that God's purposes for him and for mankind are no less exciting in the 1970's than at any period in the past. The Christian is to reflect the image of God in

his life, his thinking and his contribution to society. It is for him to see that, as far as he is able, man is modified according to God's and not man's precepts.

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[48]For descriptions of some of Delgado's experiments see Rosenfeld *op cit.*, pp. 197-211; Leach, *op cit.*, pp. 227-233; also Delagdo, *Physical Control of the Mind,* Harper and Row, N.Y. (1969)
[48a]For a critique of psychosurgery, see Valenstein, E. S., *Brain Control,* Wiley, N.Y. (1973)
[48b]Mark, V. H. and Ervin, F. R., *Violence and the Brain,* Harper and Row, N. Y. (1970)
[49]Rosenfeld, *op cit.*, p. 211
[50]For a brief account of these drugs see Alexander, D., *Beyond Science,* Lion Publishing, Berkhamsted, 1972, pp. 25-32
[51]For an interesting discussion of this issue, see Rose, S., *The Conscious Brain,* Weidenfeld and Nicolson, London, 1973, pp. 294-303
[52]Genesis 1 : 26, 27; Psalm 8 : 5 ff; Hebrews 2 : 7-9
[53]Montefiore, H., *Can Man Survive?* Collins Fontana, London, 1970 (1969), p. 57
[54]*Ibid.*, p. 58
[55]Burnet, Macfarlane, *Dominant Mammal,* Penguin, Ringwood, 1971 (1970), p. 28
[56]Leach, *op cit.*, p. 809
[57]Quoted by Alexander, *op cit.*, p. 25
[58]Hertz, K. H., What can man make of man. In K. Haselden and P. Hefner (eds.), *Changing Man : the Threat and the Promise,* Anchor Books, Garden City, 1969 (1968), p. 104
[59]Henry, C. F. H., The new image of man. In C. Hatfield (ed.), *The Scientist and Ethical Decision,* Inter Varsity Press, Illinois, 1973, pp. 170, 171
[60]Alexander, *op cit.*, pp. 206, 207
[61]*Idem.*
[62]Gilkey, L., Evolutionary science and the dilemma of freedom and determinism. In Haselden and Hefner, *op cit.*, pp. 72, 73
[63]See for example Burnet, *op cit.*, p. 215; Lederberg, J., Biological future of man. In Wolstenholme, *op cit.*, pp. 268-270; Glass, *op cit.*, p. 29.
[64]Examples quoted by Taylor, *op cit.*, pp. 239, 240
[65]*Ibid.*, p. 239

Addendum to Making New Men by D. Gareth Jones

An article of this nature all too readily demonstrates the speed with which this form of biomedical research is moving. First, the first babies born by *in vitro* fertilization (test-tube babies) are now all-too-well documented, and the first is into her second year of life. This in no way dispenses with the need for serious ethical discussions on *in vitro* fertilization. Rather, it stresses the practical relevance of these discussions on a technique which could become a routine means of circumventing some forms of infertility. Second, the recombinant DNA debate has surfaced and largely disappeared since this article was written. A discussion of this debate is to be found in a symposium published in the *Journal of the American Scientific Affiliation, 30,* 73-81 (1978). Third, the oddity of the cloning debate was highlighted in 1978 with the publication of David Rorvik's book, *In His Image* (Nelson, Melbourne), claiming to be the account of the birth of the first cloned child. The bravado of the book's claims has been amply matched by the skepticism of its authenticity.

Some of the issues considered in this article are dealt with in greater detail in my booklet, *Genetic Engineering* (Grove Books, Bramcote, Nottingham, U.K., 1978).

Reports from a National Conference

Human Engineering and the Church

The American Scientific Affiliation, together with the Center for the Study of the Future, the Christian Association for Psychological Studies, the Christian College Consortium, the Christian Legal Society, the Christian Medical Society, the Evangelical Theological Society, the Institute for Advanced Christian Studies and the Institute for Christian Studies (Toronto), cosponsored the International Conference on Human Engineering and the Future of Man, July 21-23, 1976 at North Park College, Chicago, Illinois. Here, two distinguished participants in that conference give their response/report on the conference for Journal ASA *readers.*

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The Conference brought for many of us not only the opportunity to think through more carefully the implications of human engineering, but also the prospect of achieving a distinctly Christian and biblical strategy. We live in a groping, foundering society, a "land of broken symbols," as Tillich expresses it. And the inequities and uncertainties of modern culture are nowhere more obvious than in the application of scientific and technical developments to human health.

We were reminded that the biblical view presents man as made in God's image, to rule the earth as servant-son of his heavenly Father. But man is also a fallen creature, sinful and rebellious, inherently self-centered. The original aim, to glorify God in his personal life and in his family and corporate relationships, is easily forgotten. And, too, man is finite, which condition prescribes that, even without sin, the task to subdue the incredibly complicated earth would be a prodigious one.

Yet our deliberations have led us to just this conclusion: there is no shrinking from our obligation to do good—to rule benevolently, in spite of the obvious harm that can come if our good intentions go awry. We must also be aware that our good intentions may be tinged with human greed and personal ambition. As recently pointed out by the Science For the People group in Boston, "in the name of improving human health, newer and more potent threats to health are being developed. It is unclear to us that the development of these genetic technologies is really in response to national health needs, and not simply in the interests of us professional scientists who make our living from such technological developments."[1]

Senator Hatfield reminds us too, in sobering reference to the misuse of science under dictatorship in Nazi Germany, that scientists can quickly fall under the spell of an ideology and play into the hands of a far from benevolent dictator, if indeed they are not already bent for their own prejudiced reasons upon destructive methods in dealing with the chronically ill and unwanted of society.

In light of these recollections, our desire to engineer for better human health must be conceived humbly and cautiously. It must be done (a) with a view to the need to educate the scientist and to understand his thinking and his needs, (b) with an understanding of the way the public perceives science and technology and (c) for the Christian, with an imaginative and

believing faith that the Church of Jesus Christ can be a truly redemptive community to encourage the good and to critically evaluate the suspect in the human engineering enterprise.

Educating the Scientist

To understand the scientist, it might be well to consider the character analysis by Gerald Holton[2] at a recent conference on science and ethics. He points out that scientists possess an almost irrepressible optimism about the future, a simplified and lucid image of the world. They are generally a little impersonal, tend to be logical rather than emotional, aspire to simple answers and an economy of thought, display an intense curiosity, and psychologically lean toward the obsessive-compulsive. All this, it is pointed out, makes it quite difficult for the scientist to think seriously about social and ethical problems. The few exceptions are often those who have attained world-wide recognition, and then it might be suggested that they are different only in that they have found a "Nobel mountain" to hide behind. Dr. Robert Sinsheimer too, was lamenting the fact that so very few scientists at Cal Tech are interested in ethics. In fact, Holton points out, fewer than 1% of scientists indicate any interest in ethics.

Given this strange category of *homo sapiens*, what can we recommend for his sensitization for ethical concerns? In the short term, conferences like that sponsored by the New York Academy of Sciences on Ethical and Scientific Issues Posed by Human Uses of Molecular Genetics can be a mechanism for the education of the scientist to social concerns. In addition, the various research-supporting agencies should expand their support of studies which address themselves to the effect of human technologies on model systems which approximate the patient. The Asilomar Conference of February 1975 on molecular recombination technology[3] addressed itself primarily to the containment of public health hazards associated with the production of new microorganisms which might inadvertently carry tumor virus or antibiotic resistance genes into the human population. The ethical implications of future gene therapy for the genetically diseased were not considered, probably because the working scientist would view such considerations as premature, given the primitive state of the art in the use of bacterial and viral agents to carry human genes into the cells of higher organisms. It would seem to me that a logical next step would be to study the effects of such agents in human organ and cell culture systems, examining a variety of physiological parameters in order to assess not only the success of genetic transformation, but also the possible *deleterious effects* of such treatment. In addition to the possible production of tumor viruses and the development of resistance to various antibiotics, studies should also be carried out of possible altered mutation rates and the cells should be examined for histological and ultrastructural aberrations. The support of research along these lines would have a two-fold benefit; it would provide a measure of the hazards which might be expected in human gene therapy, thereby sensitizing the scientist to the ethical implications of his work, while at the same time providing valuable data on the metabolic fate of extracellular genetic material. The fundamental assumption of this proposal is that molecular biologists are not naturally inclined to concern themselves with what appear to be future ethical and moral issues, and therefore research support has to be redirected to move the scientist in his thinking and his research in this direction. The same should be true for behavioral scientists and those interested in surgical intervention in brain disorders, though the gap to be bridged might not be so great in these cases.

There is no shrinking from our obligation to do good—to rule benevolently, in spite of the obvious harm that can come if our good intentions go awry.

To further meet the needs of the scientist for training in social and ethical concerns it would seem appropriate to extend these ideas beyond the confines of the conference format to the printed page, especially to those technical journals whose present editorial policies exclude all but the most rigorously precise and succinct technical papers. The number of scientists who read such journals almost exclusively is probably a considerable fraction of the total, and in many cases these individuals represent the keenest minds in their fields. The editors of these journals would appear to be an important group to influence. Federally-funded conferences with ethicists, and efforts on the part of the scientific societies which publish these journals to influence editorial policy would doubtless be rewarding.

Beyond this, ethicists are quick to point out that the rewards which are offered to the scientist are invariably directed toward greater focus in his own discipline, whereby he maintains a circle of close colleagues who often cooperate in research and by whom he is judged for the awarding of research funds. Promotion is also still measured largely by the output of publications in prestigious and strictly technical journals. Sabbatical study is directed toward the narrow discipline. Fellowships for faculty members who wish to work on the social and ethical implications of their work are at present available from only one agency, the National Science Foundation, and these are not available to the clinical researcher. The National Institutes of Health should hasten to establish a similar program for medical scientists, and both programs should receive strong funding and be widely advertised.

In making these various recommendations, the goal has been to help the scientist to move into the realm of social and ethical concerns without intimidation and at the maintenance of good science. The alternatives of government moratoria and especially what has been referred to as "adversary proceedings in the media"[4] should be avoided. The Christian should be critical of the critics who foment anxiety and damage reputations without clear cause.

On the other hand, we recall that scientists tend to be optimistic and enthusiastic about the future, and so might be an easy mark for a controlling power which was bent upon evil. One must also take seriously the view of scientists like Jonathan Beckwith[5] that the

scientific community has been subverted by the power structure of our nation for purposes of maintaining both theirs and the latter's wealth and position, and that human engineering will surely be misused to further subjugate the poor and silence the political dissident. Indeed, we all would profit from a serious examination of the Post-American view which "holds little confidence in the American political system" and suspects that "change comes more through the witness of creative and prophetic minorities who refuse to meet the system *on its own terms*, but rather act out of an alternative social vision upon which they have based their lives."[6]

Educating the Public

Engineering for better human health can be done ethically only if it also is understood by an alert and educated public, the recipients. It is therefore recommended that ethicists, and scientists with ethical training prepare suitable articles for publication in the popular magazines, in Sunday newspaper supplements, and in business and trade journals. These articles should address themselves to the kinds of people who do science and how they are trained, to the nature of scientific inquiry and to the importance of freedom and integrity in scientific pursuits. As emphasized throughout this conference, we regard the practice of science as an appropriate and redeeming activity for one who seeks to glorify God. The notion that science, because it describes phenomena in terms of mechanisms, must inherently dehumanize and depersonalize, is mistaken. Several times in this conference reference has been made to the godly men who were in the forefront of science at its beginnings and who were noted for their deep respect for man's wholeness and personhood. Scientific study, seen as uncovering the greatness of the universe and the remarkable order of its parts, is a deeply spiritual experience. The alternative of reducing *man* to a mere mechanism has been the lamentable choice of those who wrongly ascribe to science exclusive hold on *all truth*, an error which Dr. MacKay has appropriately labeled "nothing butterv."[7]

Mobilizing the Church

Finally, in responding to the challenge of human technologies, we come to the Church. "To whom much is given, much shall be required."[8] The Church, the Body of Christ, stands in a position of great privilege and blessing; in the Scriptures we have the revelation of all that was, and is, in God's heart for man, and the Church looms large in those thoughts. It is also the Church's responsibility to express the heart of God, the love of God to brother and neighbor[9] working as a redemptive community.

The Christian Church has the responsibility to train its seminarians and Bible school students in the crucial areas of medical ethics and philosophy of science.

When we come to human engineering, I believe the Church can perform a tremendously important function in at least two respects. In the first, we must make a serious commitment to social action, with special reference to those who choose through reasons of conscience to reject human technologies. It is quite likely that the future will see pressures brought to bear on our society to decrease the health care burden by altering the genotype of the genetically diseased and the behavior of the mentally impaired. Those who refuse these procedures may be called upon to bear the burden of care for the afflicted rather than have that expense fall upon society as a whole. If an individual believes, after fully examining the situation, that it is God's will that they accept the responsibility to care for their own or another *in lieu* of technological intervention, then we in the Church should make every effort to insure that choice—to make the Church a haven for responsible freedom. Dr. David Moberg, in his book *Inasmuch*[10] has pointed out a number of volunteer services which have proved of great benefit and has urged the evangelical church to move into these areas of social concern. High on the list of priorities for the genetically and mentally impaired would be day care centers for mothers with mentally retarded children and homemaker services for the handicapped. These services often require specialized skills and the Church should seriously consider the increased support of college programs for the training of such workers. Indeed, we may eventually find ourselves goaded into social action, just by the fact that everyone else in the community is doing it. In Massachusetts, recent state law prescribes that the mentally retarded are to be taught, insofar as is possible, within their home school systems. Other state and federal programs are also moving to the local level, in what appears to be a long-term trend in the direction of greater community responsibility in the social sphere. Let us be in the vanguard of this movement, and not grudgingly bringing up the rear!

The second function for the Church relates to the need for good science and technology performed sensitively and faithfully. As we contemplate engineering our own genetic and mental health, we desperately need men and women of compassion to staff our research laboratories and health care centers. Considering the characteristics of people who do science, it would seem that their education should be shifted strongly toward the humanities, long before they propose their thesis problem or write their first research grant application. I can think of no better starting point for a scientist than a Christian liberal arts college with a strong science program. Here, a solid moral and ethical basis for scholarship can be presented side-by-side with competent yet sensitive academic preparation for future graduate and professional studies. Sadly, the number of Christian colleges which I can speak for to the rest of my Admissions Committee in considering medical school applicants in miniscule. Perhaps the present Conference with its concern for good science as the handmaiden of good theology, will provide an impetus for Boards of Trustees of Christian colleges to re-direct their efforts toward the development of academic programs in which the natural and social sciences are given the same level of support enjoyed by biblical studies (and athletic programs). Parenthetically, this might also lead to a significant increase in enrollment as parents realize that their children will have many

additional options for future graduate or professional study.

Finally, I believe the Christian Church has the responsibility to train its seminarians and Bible school students in the crucial areas of medical ethics and philosophy of science. (In fact, a program of this type was begun a year ago at Gordon-Conwell Seminary in S. Hamilton, Massachusetts). Leaders in the local churches should in turn be involved in developing courses and seminars which bring ethicists, scientists and physicians before their congregations to discuss these crucial issues. An important benefit of this program would be the production of individuals within the local church whose Christian perspective and sophistication in social and ethical problems would make them invaluable as members of the numerous interdisciplinary advisory panels which will doubtless be established as decision-making in human engineering becomes increasingly complex. My own experience, as a member of the Psychosurgery Committee of the Boston City Hospital, which seeks to advise patients who appear to suffer with temporal lobe epilepsy, has been most rewarding. The Committee is chaired by psychiatrist Dr. David Allen and consists of a psychologist, a sociologist, a lawyer, an evangelical minister, a medical student, a philosopher of science and a medical school biochemist. Our usual procedure is to meet with the neurosurgeon and his psychiatrist colleague first to discuss the case, then to see the patient and then the family, and finally to meet separately to discuss the merits of surgery and to form an advisory opinion for the patient. One reward of such endeavors comes from the opportunity to bring a Christian perspective to a very difficult decision-making process. I would strongly encourage other technically–and theologically–trained Christians to develop a background in ethical and moral decision-making in order to be available as the future presents opportunity to bring Christ's compassion into the human engineering arena. A second reward comes from the chance to meet and learn from others of different religious or philosophical persuasion who are likewise concerned with what Albert Jonsen of the President's Commission for the Protection of Human Subjects of Biomedical and Behavioral Research has called "a refined concentration on what is human and appropriate to human dignity."[11]

FOOTNOTES

[1]Proposals on Research Involving Gene Manipulation–Genetics Study Group, Science for the People, Boston, Mass.
[2]Holton, G. Conference on Ethical and Scientific Issues Posed by Human Uses of Molecular Genetics, New York Academy of Science, May 1975.
[3]cf. Berg et al, Science 188:991, 1975.
[4]Hecht, F., Biomedical Res.: Ethics and Rights, Letters, Science 188:502, 1975.
[5]Beckwith, J. in "Ethical and Scientific Issues Posed by Human Uses of Molecular Genetics" (M. Lappé and R. S. Morison, editors) Annals of the New York Academy of Science 265, 46 (1976).
[6]Editorial, Post American, August-September, 1975.
[7]*The Clock Work Image*, InterVarsity Press, Illinois, 1974.
[8]Luke 12:48b
[9]Galatians 5:13-15.
[10]*Inasmuch*, Erdmans, Grand Rapids, 1965.
[11]Letters, Science 188, 175.

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How should Christians view human engineering? Seeking the way of humility, our first reaction might be strongly negative. "I'm content with what God gives me; I don't want to interfere." This reaction may be reinforced by sheer inertia. "It's dangerous. We don't know enough. Where will it all lead? Best keep out . . . let the world get on with it if they will."

But will this do? "He that knoweth to do good and doeth it not, to him it is sin." It appears from these new developments that the sum of misery in the world is reducible. God is the *Giver* of the new knowledge. It is He who will one day ask: "What *good* did you do with it?"

At the outset, Dr. Callahan raised the key question: "Do we have a positive *obligation* to do good, or is our obligation only to avoid doing harm?" In response it was generally agreed that the Christian cannot stop at avoiding harm. We do have an obligation to do good, if the good is well identified and in our power.

The first thing we are faced with, however, is the ever-present risk of *superbia, hubris,* human pride. Even if Christianity rejects in principle all pagan and superstitiously fearful attitudes towards the natural world and natural laws, self-glorification is a constant temptation. Dr. Spencer reminded us that neither self-glorification on the one hand nor terror on the other are appropriate responses to the Biblical perspective on our human situation.

Secondly, Dr. Callahan reminded us that our power is *bounded*, limited power. It is an illusion to think that we can proceed without limit in any of these directions, because sooner or later costs catch up with us. It is therefore essential that we go slowly and if possible reversibly, remembering incidentally that we are not only finite, limited in our wisdom, but also sinful, therefore warped in our motives.

Thirdly, even good aims can conflict, especially between the different levels, individual, family, and

corporate, at which human fulfillment is to be sought. For example, reduction of infant mortality, which is surely an individual and family good, conflicts with the aim of preventing mass starvation, unless we can find a humane and acceptable way of avoiding exponential population growth. There are many examples where it is not a simple matter of choosing whether or not to do good, but rather one of wondering whether we could ever see clearly enough to add up the sum of good and evil, and work anything out as a clear and final answer. We are continually fumbling for an understanding of the controls of an exquisitely complex mechanism, which we can all too easily wreck. We shall need all the wisdom that its Creator can give us if we are not to do more harm than good by our intervention.

Fourthly, the achievement of material goals and improvements can all too readily swamp the spiritual point and purpose of our human existence. We remember the rich man in Christ's parable: "Soul, thou hast much goods laid up for many years; take thine ease, eat, drink, and be merry." And the answer of God, "Thou fool, this night thy soul shall be required of thee." The question with top priority is always: "How will it all end? To what end is it all being directed?" These things can conflict miserably.

Fifthly, the manipulative approach, even when well intentioned, can degrade human subjects. The sweeping generalization that medical science converts people into things we must reject as typical of the sort of extremist propaganda which brings discredit upon arguments that might otherwise deserve respect. But the danger is not to be ignored.

Sixthly, there are no human engineering substitutes for personal salvation, even if some feel that some of the virtues listed as "fruits of the Spirit" can be assisted by the kind of reinforcement (or perhaps encouragement is the ordinary word for it) that behavioral psychology is beginning to understand.

Principles and Situations

Where do we turn for guidance in such a maze? Will the old Judaeo-Christian values still serve? An immediate answer is that values or moral criteria don't *serve* us at all. They *judge* us. But it is a good question whether the old *slogans* will still serve to articulate the relevant Biblical criteria as applied to these new situations. Take, for example, the slogan of "the sanctity of life." This can be confusing if we take "life" in too strictly a biological sense. We have responsibilities to God as *procreators* to do the best we can with the data He gives us to bring God-glorying lives into being. To use only the slogan "the sanctity of life" to determine whether a fetus should survive for example, seems to many inadequate and simplistic. Again, the slogan of the sacredness (or the rights, or the worth) of the individual is admirable, and thoroughly Biblical as applied to the normal grown human being. But in borderline cases we may have to ask whether we in fact have an individual *person* here to whom it is meaningful to attribute rights. We sense here the difficulty of the duty to tread the middle way of Biblical realism between, on the one hand, an arrogant lack of respect for the fullest potentialities of the biological situation that exists before a conscious child comes into being, and on the other hand, superstitious and meaningless talk of "responsibilities" to *non-persons*. We have to recognize that the fetal situation at an early enough stage is essentially a physical and biological, not a personal one, whatever the potentiality may be. In all this the Creator is beside us, knowing the facts better than we, and affronted if we underestimate through carelessness or any other unworthy motive the personal capacities of that biological situation. By the same token, we must remember that if in God's sight, in a particular abnormal case, there is not anyone there with a claim on us, then we will do Him no service by going through pious or superstitious contortions as if there were. Nobody would wish to minimize the difficulties in *practice* in determining what is in fact the case; but at least it should help if we can get straight the questions for which we need answers.

In this connection it is important to beware of an illicit and confusing form of argument that I might term "Thin-end-of-the-wedgery". This (a twin brother of "Nothing-buttery") often crops up when people ask "At precisely what point in time do we have a fully human individual with rights?" This sounds a sensible and even an urgent question; if we cannot justify a precise answer the "thin-end-of-the-wedger" is liable to argue that there is then "no real difference" between a conscious human infant and a fertilized egg, or between a responsible human agent and a brain-damaged 'human vegetable'.

The logical fallacy is exposed if we consider a parallel case. Nobody can rationally establish an exact number of hairs, N, such that anyone with N hairs on his chin is bearded and anyone with N-1 is not. But this in no way proves that there is no real difference between being bearded and being beardless. In all such cases we recognize the difference by looking for contrasts between the *ends* of the continuous spectrum, and not by discovering a precise dividing line.

So it is, I think, with the way we should think of the development of the embryo. The search for a precise point at which we can prove that we have a "living soul" may be vain; but this in no way tends to debunk or reduce the real distinction between an object that is the body of a living human person, and an object that is too immature or too deformed to be so.

The same point arises when we ask under what circumstances it is meaningful to seek the "informed consent" of a mentally defective patient before operating. The suggestion was made that when either immaturity or infirmity made true dialogue impossible, the ethics of proposed treatment might still be checked by considering what answer one would make to an imaginary "advocate". For the Christian, Christ Himself is always a real "advocate" in that capacity, to whom we must answer in sober truth at the bar of judgment. When the fullest attention to the available facts, including the data of Scripture, leaves us perplexed, it is in dialogue with Him, asking His Spirit to illuminate for us the relevance of His revealed will and the other data we have, that the Christian has his most realistic resource for the good of his patient and those he seeks to serve. No casuistic book of rules, however expedient it may be in our sinful world, offers an adequate substitute for this experimental test that the Christian servant can and must make.

It is important however, that we should distinguish between this insistence on the need for direct reference to Christ for the wisdom of His Spirit, and what is

popularly called "situation ethics". The point is not that in these cases a single clear Biblical law applies. The point is that we are confronting situations where several Biblical principles (respect for human life; compassion for other people including relatives; desire that God may be glorified by the fulfillment of human possibilities, and so forth) seem to tug us in different directions. This is the sort of situation where I believe reliance on the Holy Spirit, not apart from Scripture but showing us the relevance of Scripture and illuminating our minds to see the relevance of other things, is meant to be a reality for us, something very different from thumbing through a rule book. In the same way we must be careful to distinguish between what one speaker referred to as the "continual transformation of the Christian mind", which we recognized as a Christian duty, and what is popularly advocated as "the revision of our values in the light of new knowledge". Someone quoted C. S. Lewis as remarking that you could no more expect to discover new values than to discover new primary colours. The kind of "openness" that we recognized as a Christian duty can never be expressed by way of blindness or disobedience to revealed truth.

So far I have been summarizing points of caution; but the Bible has much to say also on the positive side. Not surprisingly, very little of this is in the way of direct commandment. Encouragement comes more indirectly from the Biblical perspective and Biblical priorities.

(a) First among these, for the scientist and the human engineer himself, is the most general principle of all: "Seek ye first the kingdom of God and his righteousness." This we found to be a very thoroughgoing one, especially bearing in mind all the risks of counter-attractions.

(b) Secondly, for the people we are seeking to serve, God's first priority is that they should be enabled to glorify and enjoy him for ever.

(c) To that end, the Bible urges upon us the creation ordinances of marriage and family life, and the moral ordinances of the law. Particularly relevant are the values of fidelity, integrity, loyalty, obedience in the family and in corporate relationships agreeable to the law of God.

Are these truisms? They are certainly familiar enough; but as I have already suggested, to work through what these things should mean in particular cases may be the best and most realistic way to get our eyes open to God's will in each case. What does it mean in this context for example, that man is made in the image of God? Primarily, no doubt, it means that he is answerable to God: he can be 'Thou' to God, and knows what it means to be challenged by God. It also means that we are meant to be like God. In particular, God is *dead straight*, so our being in the image of God means that we are to be dead straight. I feel this is a major key to our problem. Almost every procedure we have considered is one whose merits have depended on whether and to what extent we envisaged the people concerned as *trustworthy* as well as adequately informed. You could make any of them sound sinister by imagining a case where the motives of the scientist were unworthy. Conversely, almost any can be envisaged as a duty of compassion in certain defined circumstances. This said, however, we find ourselves forced to recognize, sadly, that in a fallen world legislation may have to be framed for, if not the worst case, then at least a far less ideal case, than if everyone were guaranteed to have only the most transparent intentions and the best of motives. In all our discussing and thinking we must be careful to distinguish between what might be *legitimate* in God's sight—perhaps, in particular cases, obligatory in God's sight—and what ought to be made *legal*.

We are confronting situations where several Biblical principles—respect for human life, compassion for other people, desire that God may be glorified—seem to tug us in different directions.

The Christian Church

What then should the Christian church be doing? First, the church might redeem its past by becoming the champion of science in areas where fearful and less informed people might perhaps oppose scientific research. It is essential, however, for the church to be a critical champion: criticizing in love, and being merciless if there are any signs of unbiblical tendencies. The implication would be that the church should oppose research only if it infringes Biblical principles, or if the research would take the place of and prevent our doing something still better, something more glorifying to God. This last point may be important. There are always going to be enthusiastic people who are bitten with an idea and want to sell it. To argue that "there is nothing in the Bible against it" is not good enough. Part of our responsibility as Christians, as indeed of anyone else in an effective community, is to consider whether there isn't something still better, or more urgent, that needs doing. We have to do our homework before we can be clear that it would be still better—more glorifying to God, but it is certainly part of our obligation to ask.

Secondly, a major responsibility of the church is to clarify some key concepts in the debate. By "the church" here, of course I mean Christian people; I don't necessarily mean parsons, let alone general assemblies. But qualified Christians ought to be busy, for example, working in what is at the moment a live area in philosophy, seeking to clarify such concepts of human nature, the person, human rights, consciousness, death. What "rights" can meaningfully be assigned to a fetus? Must a body which shows no signs of a continuing conscious personality be preserved because it is biologically alive? There is a huge package of concepts that need clarifying.

In another context there is a continuing need to clarify the concept of "chance", distinguishing its innocent technical use in science from that of its pagan metaphysical namesake. To speak of the "Rule of Chance," for instance, as if "Chance" were an alternative agent to God, can be grossly misleading as well as scientifically unjustified. What the scientist means by "chance" is simply that which could not have been predicted on the basis of prior data. So when geneticists

speak of "taking a hand from the genetic deck of cards," they must not be taken to be advocating a pagan theology. The metaphysical overtones have no basis in their *physical* image of the process. Moreover as far as the Bible is concerned, when 'the lot is cast into the lap," "the whole disposing thereof is of the Lord". In that sense, "chance" is a biblical concept without any pagan overtones.

Then take the concept of *"liberty"*. Several papers brought out the need for deeper analysis of this notion in the present context. For the Christian, liberty does not mean just "doing one's own thing;" it also means "being subject to one another, for the sake of Christ". This is a humbling yet richly rewarding concept of liberty. Where the world in general thinks in terms only of absence of restrictions, the church should have much to contribute by way of a corrective emphasis. By the same token, current uses of the concept of "equality", penetratingly explored by Dr. Sinsheimer, need evaluation and illumination in biblical terms.

Another task for Christians could be to promote and spell out in detail the implications of what Dr. David Allen called the "principle of reciprocity". "Would I want the same done to me?" he asked us. In sufficiently clear-cut cases that is a good test. But of course there are awkward cases. If we are considering whether a fetus with Down's syndrome should be allowed to develop into a mongol child, there is little help in asking "Would I like it done to me?" I can never know what it would be like to be a fetus or a mongol. There are many borderline and gray areas where the outworking of the principle of reciprocity is far from clear.

Again, we were reminded by Dr. William Wilson that protecting the *right to treatment* might be as important as protecting the right to refuse treatment. Since the latter finds more advocates at present, Christians might well be on the alert to safeguard people's rights to the treatment that could help them.

Dr. Perry London gave us a text on which perhaps the church might well preach from time to time. "Only the *responsibility* for the future of man rests with man: not the *future* of man." We are responsible for what we can do to shape our future; we are not responsible for the real future. Responsibility for our future rests with God. This might be an interesting sermon to preach, because the distinction is not often observed in either utopian or anti-utopian literature.

Finally, Dr. Carl Henry suggested that one of our prime functions as Christians is to seek to "sensitize the conscience of the nation". No evangelical with a sense of history could dissent from this. At the same time we would do well to be wary here of the subtle and seductive temptations of *scaremongering*. There are many in our day who make a reputation out of being scaremongers: whose books sold because of the shivers they send down people's spines. Works of this kind, when they obscure the factual issues in clouds of emotional fog, bring despair to those fighting for proper and intelligent safeguards against the abuse of science. Christians must beware of jumping on the bandwagon of the scaremongers. It is a temptation, perhaps especially to evangelicals who have awakened suddenly to their social responsibilities, to be mere echoes of contemporary "doomsmen," rather than critics of the critics. Most critics today use essentially pagan criteria. Christians do not help by uncritically echoing them.

In this respect the church has surely its part to play in the most difficult part of this whole enterprise for our society, namely *learning what to want*. The theory of behavioral manipulation makes it clear that the greatest power lies in the hands of the man who can determine what we want, so that this is a sensitive and fateful area of the discussion on human engineering. What ought we to want? It is important for the Christian not to take the stance of the man who knows what he wants, and other people have just to listen. We will have to be ready to listen just as much as the non-Christian, even though our ear is bent primarily in the direction of God's word.

One more note of warning. The church needs to be wary of affiliating with groups who do not respect God's priorities and pursue them with all their hearts, because we can quickly find ourselves trapped in unrealistic compromise. We may then be rightly stigmatized as "letting the group down" if at some later point it becomes clear that it does make a difference whether or not you believe that man's chief end is to glorify God and to enjoy Him forever. Equally, we must pay specially loving attention to any misgivings expressed by those in the church who are not equally informed, and may be more hesitant and fearful than we. The function of the church as salt in the earth is a corporate one. Our thinking in this area must be a fully corporate enterprise if it is to be fully open to such guidance as the Spirit of God can give his church. The more conservative and fearful are equally members of His body. Whatever their difficulty in becoming articulate in our terms, we have no right to expect that His Spirit is going to be given more to us than to them in seeking the path of wisdom for His church.

I have tried in these reflections to indicate how the balance has swung, first one way and then the other, during our deliberations. Above all, what I heard us say to one another was: Let us be positive. This I think is not trivial. It was not at all to have been assumed in advance that a gathering of evangelical Christians should have consistently sought for positive good to come out of these new developments, one after another, and to have acknowledged by implication our obligation to further this positive good as God would enable us. It is remarkable, I think, that we had so much agreement. I trust and pray that it augurs well for evangelical involvement, with all the fear and trembling that Paul commands, and no self-confident strutting or arrogant postures, in the development of legitimate human engineering for the good of man and the glory of God.

ADDENDUM:

I have dealt further with some of these topics in *Modifying Man: Implications and Ethics,* edited by Craig W. Ellison, University Press of America, Washington, 1978; and in *Human Science & Human Dignity,* Hodder & Stoughton, London, and InterVarsity Press, Downers Grove, Ill., 1979.

Human Engineering and Christian Ethical Values

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The bio-medical revolution has produced techniques with great potential for affecting the nature and behavior of man. Accompanying this power, however, are grave ethical problems. Our knowledge of techniques of human control has not been accompanied by equal wisdom in the employment of these techniques. The Christian, however, has a high stake in the application of such methodologies.

There are three basic methods of arriving at ethical conclusions: the legalistic, the situational, and the principial. Of these three, only the principial seems to hold promise of being of help to us in solving these problems. Accordingly, we must ask what principles the Christian faith supplies us. Among the pertinent ones are man's role as a dominion-haver, the importance of freedom, truth, and the significance of individuals.

In July, 1975, a group of scientists, theologians, and ethicists gathered at Wheaton, Illinois, in an International Conference on Human Engineering and the Future of Man. Here evangelical Christians grappled with ethical problems growing out of three areas of human engineering: genetic control, brain control, and behavior manipulation.

The necessity of such a gathering is a tribute to man's success, not his failure. The progress of man in natural sciences and behavioral sciences has given him an increased ability to understand, affect, and control human behavior and even human nature. For this we should be properly appreciative. Man's ethical understanding has not progressed at an equal pace, however. How to handle the problems produced by our improved technologies—this is the real issue.

It is encouraging that evangelical Christians gathered to discuss these issues at *this stage* of the development of the problems. Too often the Christian church has had little to say about great ethical issues during the formative period, perhaps because Christians were unaware of the real issues at that time. Then when someone began to apply the insights and methods in ways offensive to Christian morality, Christians protested. The issues are still at the stage where public policy is being determined, and can be affected by our input.

Nature of the Problem

Let us utilize for a moment the technique sometimes employed in movies and books, referred to as 'flashback." Consider the following alternating scenes which move between biblical incidents and contemporary ethical problems. It might go something like this:

Scene 1. Gideon believes that Jehovah God is leading him into battle with the Midianites. He wants to ascertain that God is really going to deliver Israel by his hand. To determine this definitely, he places a fleece on the ground and asks God to show him if He will do this, by making the fleece wet and the surrounding ground dry, and then reversing the process, making the fleece dry and the ground wet. This God does, and Gideon goes out to defeat the Midianites.

Scene 2. A young couple sit with their family doctor, as he interprets for them the results of their genetic screening test. Carefully he explains to them that should they decide to have children, there is a 25% possibility that any child born to them will have cystic fibrosis. What should they do, they wonder. Ought they to proceed, or not?

Scene 3. A man is brought before a judge of Israel, charged with having killed another man. Calmly and carefully the judge determines the facts of the case. Witnesses testify that this one did indeed take the life of the other. There is no evidence that this was an act of

self-defense, or an accident. Quickly the verdict is reached and announced: the law says this man must die.

Scene 4. A lecturer is sharing with an audience the possibilities of electronic stimulation of the brain. He pictures for them a situation in which a group of demonstrators advances upon City Hall to present their grievances to the mayor. Only a group of unarmed police stand between them and their goal. The police chief presses a button on a small radio transmitter in his hand. The protestors stop. He pushes another button and, like the bull in Jose Delgado's experiment, the group turns and obediently trots away.[1] They were responding to an electrical signal sent to a control center of their brains via electrodes surgically implanted during an earlier imprisonment. Now, the lecturer asks, is this type of control right and legitimate, or is it improper?

Scene 5. Jesus and the Pharisees are engaged in heated debate about the observance of the Sabbath. The charge raised by the Pharisees is that Jesus and his disciples have broken the Sabbath. They have performed miracles of healing on the Sabbath day. They have also on another occasion been guilty of gathering food on the Sabbath. These activities constitute labor, and violate the law, which says that the Sabbath is a day of rest, and no labor is to be done on it. "No,' says Jesus, "you have misunderstood. The Sabbath is made for man, not man for the Sabbath."

Scene 6. Two parents of an elementary school child are discussing with the school principal the educational philosophy and methodology employed in the school. Because incentives are employed to encourage certain types of activity, the parents believe the children are being manipulated.

It is confusing, is it not? Were we able to have an actual sound-and-sight presentation, it would be even more bewildering. The sudden shifts between the biblical world and that of virtual science fiction seem strange indeed, because of the radical differences between those two worlds, both of which may seem rather foreign to most of us. They highlight however the problem faced by those who would be responsible biblical Christians, trying to live with one foot in the Bible and the other in this strange world of developing issues. How does the Christian relate the teachings of the Word of God to these problems? The selection of a style of ethical decision-making must precede the actual determination of solutions to any of those problems. Several different approaches to applying the Bible to ethical problems have been suggested, and are currently being practiced by various Christians.

Types of Ethical Methodologies

One of these is sometimes referred to as the legalistic approach. It attempts to derive specific absolute statements from Scripture, in the fashion in which a prohibition of murder is deduced from Exodus 20:13, "You shall not kill" (murder). On this method of treatment, unexceptionable rules can be established on a one-to-one basis, from Scripture.

The problem with this approach for our purposes is that it is exceedingly difficult to find biblical statements which can be employed in this fashion. The situations which we are considering here did not arise in Biblical times, nor were they even imagined then. Their problems were not sufficiently similar to these cases that we could simply treat the latter as instances of the former. This method scarcely can succeed.

Once the enduring ethical principles of Scripture have been found and extracted, these must be carried over from biblical settings and related to contemporary situations.

The second major option is situationism. This would ask, with respect to any issue, "what is the most loving thing to do?"[2] On these grounds, nothing is really right or wrong in itself. Anything, even murder or adultery, is potentially good and right and is made so by whether it most fully embodies and expresses *agape* love. The problem with this approach, however, is that it is insufficiently concrete to be of real help. What really is the most loving course of action? Without knowing what is best for man, without being able to distinguish clearly the different courses of action and knowing their consequences, it is very difficult to choose among them. The problems connected with situationism and its calculating method have been elaborated at considerable length in several places. The dilemma seems to be that situationism either slips into a new kind of legalism on the one hand, or else is unable to make any objective ethical judgments, on the other.[3]

The third method of ethical decision-making is principialism. This maintains that there are objective sources of ethical guidance in the biblical revelation, but that these are found (for our present purposes) not in concrete rules, but in principles which are more numerous than simply the general principle, "act in the most loving way."[4] This would seem to be the only approach available to us that can give us any real guidance.

In this principial method, the concrete forms of biblical ethical injunctions are not absolutized as they appear in the Scriptures. Rather, an attempt is made to determine the underlying principle upon which a command or prohibition is based. This will be more general than a rule or law. In some cases the principle will be so closely tied to the particular rule in which it is embodied in Scripture as to be virtually identical with it, but often this is not the case. The principle will be of a timeless character while specific biblical rules may be culture-bound.

Once the enduring ethical principles of Scripture have been found and extracted, these must be carried over from biblical settings and related to contemporary situations. Often this will mean that two or more ethical principles will bear upon a given situation, and the relative weight of these will have to be determined, and the principles combined into new currently appropriate guidelines or directives. This will not be easily done, but it is extremely important.

The aim of the remainder of this paper is consequently to trace out some of the salient biblical and theological principles that bear upon the decisions encountered in the areas which have been presented to us. At some points we suggest implications of these principles for the ethical decisions, but for the most part we offer

these only as aids and suggestions to be incorporated into our decision-making.

Pertinent Ethical Principles

As the psalmist contemplates what man is and does he shows both pleasure and amazement (Psa. 139:14). And well he might, for man is truly the summit of God's earthly creation. He, of all the creatures, is described as being in the image and likeness of God. In the creative genius of man both man and God are glorified, for it is God who is the source of all man's positive powers, and who has entrusted to him the abilities which we see displayed in the activities of knowledge gathering and control. The knowledge explosion of the past few decades is virtually overwhelming in its depth and magnitude. With knowledge goes power, the power to predict and control, especially as the potential for applying it to man increases. In the techniques of human engineering there is great possibility either for good or for evil. Man may employ this to magnify and heighten his likeness to God, or to negate this Godlikeness.

Care and caution are required in these endeavors, because man is limited in his understanding. He possesses the ability to discover truth which he does not have the wisdom to apply. Although the technology is morally neutral, man's finiteness means that he might unintentionally do harm with it. The inventors of thalidomide undoubtedly intended that their discovery should bring only good results, but were unable to anticipate some of its side effects. Further, the Bible teaches that man is a sinner, both by birth and by choice. Consequently, there is considerable likelihood that he will pervert good into evil by misapplying it.

When God created man and placed him in the Garden of Eden, He commanded him to have dominion over every living thing (Gen. 1:26-28). This Christian doctrine of dominion-having has sometimes been blamed for the ecological crisis which threatens to overwhelm our world.[5] Supposedly, the command to have dominion has instead been understood to mean to dominate, so that man has exploited and plundered the creation. This, however, is a misunderstanding of the nature of the command. In its background is the concept of the sovereign or monarch in ancient Israel.[6] The ruler there was not to dominate the people for his own self-aggrandizement. Rather, his position was a trust given him in which he would use his authority in such a way as to develop the kingdom for the maximum benefit of his subjects. He ruled for their sake, not for his own. Thus man as dominion-haver is not to extract all that he can from nature for his own satisfaction. Instead, he should seek to understand it in order to develop it to its maximum potential, that it may fulfill God's intended plan for it. Thus, if we conceive the command to have dominion as including the study, understanding, and control of those aspects of man which he shares with the rest of creation, it is essential that this be done for the benefit and development of man, never for his exploitation.

Three other biblical concepts that bear upon the question of human engineering are freedom, truth and the importance of individuals. These are part of the nature of God Himself, and part of what He expects of man.

The freedom of man is assumed everywhere in Scripture. This is particularly evident in God's dealings with him. Each person is given the opportunity of choosing to accept or reject God's offer of grace. Never is he coerced. When Jesus related to persons, He respected their freedom. In the case of John the Baptist (Luke 7:18-23), He did not threaten or cajole. He did not simply assert His authority and demand response. He presented John with the evidences and let him make his own decision. Rather than creating a set of robots or manipulating men, God took the risk of giving them genuine freedom, knowing that some would abuse it.

This means that in human engineering, care will be taken to preserve that same human freedom. Freedom, unfortunately, is one of those slippery words which frequently are simply used undefined. It would seem to mean at least that the person should be as aware as possible of the factors which are influencing his decisions and behavior. Hence, any type of control through electrical stimulation, like that envisioned by Delgado[7] (improbable though it may be) would seem to be improper. Here the person would be driven by factors which he does not understand and with which he cannot cope. Similarly, none of these techniques should be employed upon a person unless he has freely given his consent, or if he is permanently incapable of doing so, someone else responsible for him has given such consent. In some areas such as genetic control, it is difficult to judge whether an encroachment upon the freedom of the person is involved, or whether it is rather a case of actually constituting him what he is to be. Here it would seem that the parents at least should make the decision.

In this connection we should also note again the dominion-having referred to earlier. This role was assigned to Adam, the head of the human race, who at this point was actually the entire race. The word Adam is not only a proper name. It is also a Hebrew noun, meaning man. Thus the command was given not just to an individual or to part of the human race, but to all mankind. All persons have this privilege and authority. It is therefore wrong for one person or group to exercise dominion over another individual or group, in such a way as to deprive them of their dominion-having. On these grounds, slavery is clearly wrong. The same is true of any form of control in which one's human initiative is surrendered to another. We must be certain that any techniques adopted and employed do not violate the basic rights of persons.

Another significant issue is truth. Basic to the very nature of God is this matter of veracity. He always represents things as they really are. Similarly, He expects that man will seek to know things as they truly are and will represent them that way. God is the author of reality, and truth basically is genuine contact with that reality, or knowing it as it is. The devil is the ultimate source of error or of deception, which is a misapprehension of reality. Experiencing reality correctly is therefore good, for it in effect puts one into relationship with God's works. Thus processes and procedures which conduce to a more correct experience of reality would be good while those which lead him to experiences which are not faithful to the way things

really are must be regarded as bad.

All human emotions have their proper place. It is appropriate to feel any of them in certain situations. Anger, fear, depression, elation, excitement should be felt in certain circumstances, but not in others. Any type of technology or control which helps the person experience an emotion appropriate to the situation is right and ought to be practiced, while any control which produces emotions for which there is no objective basis ought to be avoided. Hence, a frontal lobotomy which eliminates irrational fears would (on this criterion) be permissable, while a person simply pushing a button endlessly to produce feelings of euphoria when there is no real basis for such feeling, or even in the face of stimuli which ought to produce the contrary reaction, would be illegitimate.

Part of the reason is this. Emotions, like physical pain, can be used by God to alert us to situations we might otherwise overlook. For example, depression, fear, or anger call our attention to a situation needing to be dealt with. If the person has been so affected that he does not feel these emotions in the presence of the objective circumstances which ought to call them forth, he may fail to cope with them, and harm may come either to him or to someone else. In this sense, our control or engineering ought to be aimed at contributing to and enhancing fully informed response to reality, rather than detracting from it.

We also note the importance of each individual person to God. Jesus indicated this in numerous ways: In His statement that no sparrow can fall to the ground without the knowledge of the father, and that we are of more value than many sparrows (Matt. 10:28-31); in His declaration that God knows even the number of the hairs of our heads (Matt. 10:30); in the parable of the lost sheep, in which 99 were safely inside the fold, but the shepherd left them to go and seek the one lost sheep (Luke 15:30). All of these indicate that each individual is an end in himself, valuable to God. Each ought to be treated that way, not as a means to the end of another's welfare. Thus, it would be wrong to experiment upon a person, even if many other persons might benefit from it, unless that person fully understands what is being done and why, and has given his informed consent. This means that extra precautions must be taken with populations which are under a certain amount of constraint, such as the military and prison inmates. The CIA's experimentation with LSD upon certain of its employees is particularly reprehensible on these grounds.

Having noted these several cautions and limitations upon our attempts at human engineering, we must see the nature of the positive responsibilities which we have in this connection. Among the values taught and practiced by Jesus were such qualities as compassion and mercy. Frequently, Jesus Himself healed those who came to Him with diseases. He still works miraculously on some occasions. He has, however, also given us medical science and a host of allied disciplines as means to the continuation of His ministry of mercy. Therefore as His agents we should employ every legitimate means to alleviate suffering, or preferably, to prevent it.

There is a particular responsibility to refine and develop these techniques and to make persons aware of their availability. For example, genetic control properly applied has great potential for preventing some of the serious genetically linked diseases such as sickle cell anemia, cystic fibrosis, and PKU. The Christian has a stake in encouraging research in genetic screening, in order to develop tests for additional diseases, and more accurate tests for those which can be tested for. Those who are in a position to influence prospective parents, such as pastors doing premarital counselling, should inform them of the possible dangers of genetic defects, particularly where indicated by family history, and the availability of screening. The principle of freedom mentioned earlier however, indicates that the decision to avail themselves of this information and the action to be taken upon it should be made by the persons themselves.

A problem arises in connection with cases where the actions of persons will affect the welfare of others. In the example above, the parents are making a decision which may bring into existence a child who will experience a great deal of suffering, or who will be a severe economic burden upon society. At what point society should intervene for the benefit of others is a question which cannot easily be determined.

In brief, it would seem that the use of these techniques to remove defective or diseased conditions is permissable or even desirable, while attempts to produce some superior qualities or even a superior breed of human beings would be considerably less justifiable. Problematic is the question of just what is "normal," and what is not. Without an answer to this question, the line between the therapeutic and the superadditive is exceedingly difficult to draw.

The possible spiritual value of human engineering ought not to be overlooked, either. Frequently, the Christian's need to grow in the qualities that constitute Christian character requires more than merely instruction in Christian matters. The connection between truth understood and believed, and the actual behavior of the person frequently is imperfect. This means that irrational factors modify the response of that person. Maturity would mean the reduction or elimination of these factors. It would therefore seem proper to use psychological and other means to help bring about a functioning connection between beliefs and actions. These should not be regarded as a substitute for or competition with the grace of God. Rather, they should be considered means through which He can and does work.

Excessive optimism about the spiritual accomplishments of human engineering should be avoided, however. Some, such as Delgado, have expected to be able to accomplish considerable changes in the human race.[8] There will never be spiritual salvation by genetic, brain, or behavior control. The problem of sin runs deep in man: it will be rectified only by that direct, supernatural act of God which Jesus referred to as the "new birth."

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Human Engineering - State of the Art

1. Genetic Manipulation

An Ethical Evaluation of Biogenetic Engineering

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The Ramm Defect

In his article on the "Prenatal Diagnosis of Genetic Diseases" Dr. Friedmann[1] tells us that there are 1600 diseases traceable to genetic defects. May I add one more. It is the Ramm defect. It is a defect which prevents a person from saying "no" to a request beyond his education, experience and competence.

Some unknown biologist describes it (by anticipation) as follows,

> Oh chromosomes, my chromosomes,
> How sad is my condition!
> My grandsire's gift for writing well
> Has gone to some lost polar cell
> And so I write this doggerel,
> I cannot do much better.[2]

If I knew when I was asked to discuss this issue what I know now, I would never have accepted the request. The more I read the more impossible seems the task. Many times I wanted to send in a letter of resignation but I was restrained by Christian charity. I knew that I would be hanging the weight of the dread anchor on some other dear Christian's neck.

Purpose: To Propose Ethical Guidelines

My purpose was to read the literature on the subject, to attempt to sort out the ethical issues, and to propose some guidelines of an ethical nature in the matters of genetic engineering — the latest of the scientific explosions.

I make no pretense of being a quasi-doctor or quasi-lawyer. The technical details, statistics and mathematics of the subject can be learned from the informed literature on the subject. My specialization in this issue is in ethics. I have never delivered a baby. I have never seen genetic materials through a microscope. I have never tried a case at law. My practice of surgery has been limited to extracting slivers from the hands and feet of my children.

When I read the genetic materials, I had one aim in mind: what were the ethical implications of what was

being said? When I read an article, I would ask myself: "What are the writer's ethical presuppositions?" "What criteria of an ethical bearing is he using to sort out the right from the wrong?" "What ethical imperative dictates his conclusions if he makes such conclusions?" It is this sort of specialized reading of the literature that gives me the confidence to write this paper.

The most difficult part of my assignment was that the materials on genetic engineering were so heavily loaded with factual material, and so little with ethical issues.[3] Perhaps ethical opinions about some specific procedure were expressed but we are far more interested in broader ethical theorizing. For the most part it was left for me to do the ethical diagnosing or interpreting. This involves risk and I simply had to take the risk. There is also the dilemma of bibliographical materials. *Time* magazine reported in a recent issue in its essay on man that in a given year 25,000 books on science were published and 1,000,000 articles.[4]

A Basic Cultural Shift Concerning Genetic Defects

The first major fact that I encountered as I started reading the materials is that a major cultural shift has taken place in our society in the past century.

In my reading of the sermons of the nineteenth century I found that the general prevailing opinion about defective children was that God had sent them to us that we might learn the lessons of grace (Calvin had said earlier that God sent us idiots from time to time that we might thank him for our reason.) The care, the labor, the money and the love given to a defective child were to teach us how God loves poor, needy sinners. Our care of defectives, whose whole existence depended on our sacrificial care, would enable us to grasp with some depth the meaning of divine grace for helpless and guilty sinners.

This kind of mentality has not ceased to exist. A very lucid illustration of it can be found in Dale Evans Rogers' book, *Angel Unawares*.[5] In this book she relates how she, her husband, and her other children learned depths of compassion and love far beyond them if they had not cared for a defective child.

In the mid-twentieth century married couples have come to look at defective children as a heavy burden. They are apprehensive of the implication that there was "insanity in the family." But even more. The care of such a child interferes with their social life as well as their vacations. Besides the special hours of care and energy spent, there could also be hundreds of dollars of medical bills per month. They also read of the damage that a defective child could have psychologically on the other children of the family. Hence a defective child is no longer looked upon as a lesson through which we learn of God's mercy and patience with sinners, but as a terrible burden on one's time, a severe limitation of one's social life, and a heavy strain on the family's financial resources.

The proof of this transition in mentality is substantiated in genetic counseling.[6] One of the most significant things to inform parents who have had a defective child is the statistical possibility of having a second such child. The figures vary with the nature of the disease so they may run from 1 out of 4, to 1 out of 400. Surprisingly the most important factor in the minds of couples with regard to having another child is not the statistical possibilities but the sheer bother of having a defective child. Stated another way this means that the prime concern of the couple being counseled is the nuisance potential of another defective child.

In the mid-twentieth century married couples have come to look at defective children as a heavy burden.

Why Ethical Guidelines are Difficult to Formulate

Most of the definitive original statements about medical ethics have been made by Roman Catholic moralists prior to the time of our current detailed medical information. A moral rule without adequate factual basis can be a very mistaken one. Our first task is to unburden ourselves from decisions made in the past without adequate medical knowledge.

General moral virtues such as wholeness, love, "the good," or redemption are difficult to translate into the specifics of medical ethics. Two Christians dedicated to the same ethical virtue may arrive at opposite conclusions.

It sounds as if this next observation contradicts the previous one but in reality it does not. Medical ethics is a special case of ethics. Ethics in turn emerge out of one's total outlook on life. Hence to have a system of ethics one needs first a philosophy; from this philosophy one proceeds to construct his ethics; and from ethics in general one goes on to medical ethics and finally to genetic engineering. We have been asked to fill out a questionnaire (*Journal* ASA, June 1974) with several specific items. The list of questions gave me the impression that the Christian was to attempt to find the Christian solution for each question as he worked his way through the questionnaire. My point is that a really comprehensive Christian view of life and reality is required before one is able to answer the particular questions.

The speed of the acquisition of new knowledge poses a very difficult task for any person working in the field of ethics. Scientific knowledge is supposed to double every five years. On the other hand, moral principles and systems of values take decades and centuries to pound out. A new breakthrough in science may come overnight. A moral evaluation of the implications of the breakthrough may take a century to mature. With the principle advances in genetic engineering hardly a decade old, the ethicist simply has not had the time to think through all their implications.

Our American society is becoming increasingly pluralistic. The more pluralistic a society becomes, the smaller becomes the common ground to which appeal can be made for ethical decisions. This "paralysis of pluralism" spills over into medical and biological ethics and makes it difficult to arrive at common ethical interpretations.

Our society has no methodology for resolving the very difficult nest of ethical problems our technological explosion has produced. This technological explosion is felt the strongest in the embarrassing position into which it has placed medical ethics. Let us look at the ways this problem has been attacked.

(a) Leroy Augenstein reports in *Come Let Us Play God*[7] that he would present a typical problem in medical ethics to a congregation. Then slips would be passed out and a vote taken. It was not unusual to get back 80% of the slips blank! Apparently we cannot solve our medical ethical problems by appealing to the common consent of Christian conscience. Such problems are too bewildering for the lay mind to interpret.

(b) Suppose that we appeal to Christian theologians who have specialized in medical ethics. Unfortunately there is no consensus here. Paul Ramsey is very cautious and conservative; Joseph Fletcher is very pragmatic and utilitarian; and Gabriel Fackre is open-ended and wide-eyed in his medical ethics.

(c) We may turn in another direction. Perhaps we could appeal to a representative committee from the community, as if such a carefully chosen committee would represent the common moral consciousness of the community. This was done by the Swedish Hospital in Seattle and is known in the literature as "the Seattle experiment." The problem in this situation has already been anticipated. In our pluralistic society we have no common value system. How, then, can we determine who is the most valuable man for a community among a list of candidates for a dialysis machine? Is it the pharmacist who is the important link between the doctor and the patient with our healing medicines? Or is it the social worker working on healing the ills of the community? Here again we encounter failure or at least serious difficulty in practice.

(d) Then some one approaches us from our blind side: the lawyer. Perhaps it will not be the scientist, nor the philosophers, nor the theologians, nor the priests who will write our text-book on medical ethics, but the lawyers.

As seen in Michael Hamilton's book, *The New Genetics and the Future of Man*,[8] and in *Should Doctors Play God*,[9] edited by Claude Frazier and Morris Fishbein, the lawyers have already entered the discussion. The suggestion now comes that the new medical ethics will be worked out in hard cases at law.

Germain Grisez has written the most thorough book on ethics and abortion in recent years,[10] (*Abortion: The Myths, the Realities and the Arguments*). He has made the most thorough investigation of the decisions of courts, especially about the legal status of the fetus. He has found that the general trend of the law is to treat the fetus as a legal person and not merely a piece of tissue in the mother. My point here is not to settle anything about abortion, but to show how large a role the courts play in settling matters of medical ethics.

A new breakthrough in science may come overnight. A moral evaluation of the implications of the breakthrough may take a century to mature.

Recently we have had the Supreme Court itself making a decision about abortion. It did not make a mere general ruling about abortion, but set out the legal status of the fetus (by implication) during the three periods of pregnancy.[11] The point again is not to comment on abortion, but to comment on how medical ethics is being settled by courts, and not by theologians, philosophers, rabbis, priests, or doctors.

The Seriousness of Ethical Issues

Why has such an enormous literature mushroomed up around genetics and ethics? How much is at stake?

1. The public and the academic worlds respond more strongly toward developments in the life sciences because they eventually may be applicable to man, whereas there are not the same kinds of existential implication in the more impersonal sciences. The one exception is ecology; here physics and chemistry are part of man's concern because their use in industry is part of the infection of the planet upon which he must live.

2. In genetic engineering the biologist and doctor are working with the building blocks of life itself. Granted the division between our genetic cells and our somatic cells is not as sharp as once thought, the distinction still remains in a broad sense. Hence to experiment with genetic cells is to experiment with our future in a way that is not done in working with somatic cells.

3. There is the factor of irreversibility. One of the reasons scientists deplore the extinction of a species is that with its extinction goes the loss of its genetic materials. It brings us to the end of a line. By the very nature of genetic materials we can go down a street so far that we cannot turn around and come back.

4. Doctors can now keep alive 90% of babies born with genetic defects. This success in lifesaving leads to what is called the contamination of our genetic pool. Just as some have spoken of the heat-death of our world, others now project the genetic death of the human race through such genetic contamination.

5. There are the "weirdo" speculations about genetic warfare (drop virus dust over the enemy and so weaken him genetically that he has no will or capability to fight), cloning soldiers, geniuses or athletes (which will affect the Olympic Games!) or modifying men so that we can have legless astronauts, etc.

6. We should do all we can to eliminate as many as possible of the approximately 1600 genetic oriented diseases. By amniocentesis we can detect at this point (according to Dr. Friedmann) about forty genetic

diseases; we must seriously face what this means for the current practice of medicine.

7. Genetic counseling is one of our newer specialties. Fewer defective children will be born the more expert genetic counselors we have. If I interpret the nature of sickle cell anemia correctly it would be eliminated by expert genetic counseling with no recourse to abortion.

Alternative Ethical Systems

The literature soon made apparent to me that writers in the fields of genetics and medicine were making ethical decisions based on a larger ethical system. For me, then, the issue was to attempt to locate and define these larger ethical systems. The systems that I present are to be seen more as programs or policies rather than as a set of tight ethical rules. To some measure they overlap and for purposes of communication I have given them labels. Some scholars consider a label a libel, but I felt for the purposes of clarity I would run the risk of this criticism.

Theory I: Person-centered medical ethics. Each patient is a person before he is a patient and when he becomes a patient he is still first a person. He is a unique center of values and must be so respected. If he becomes only another case, another bed or the unwitting subject of experimental medicine his dignity as a person has been violated. All biological and experimental and genetic work must be done within this framework. (Ramsey. Kass).[2]

There are five reasons why person-centered ethicists think the way they do. These five reasons are also criticisms of the utilitarian view which we review next.

1. They are apprehensive of the amount of unannounced medical experimentation that is taking place today in medical practice. This raises the problem of consent, which is one of the stickiest in medical ethics.[13]

2. They are still apprehensive of the terrible abuse of medical experimentation by the Nazis – a paradigm of what may happen whenever the state makes the rules in medical ethics.

Recently it was suggested that each baby be tatooed with his social security number in his arm pit upon birth as his permanent identification. The arm pit was chosen, as in all kinds of accidents that part of the human body was most likely to survive destruction. The protest of the Jewish doctors present was immediate and forceful, for still strong in their minds was the Nazi practice of branding people with numbers on their arms.

3. They are very apprehensive of the recency of the major advances in genetic engineering—most from the 1960's—and therefore the tentative character of our knowledge. We are in no position as yet to have any sort of policy or program in genetic engineering for the masses.

4. They are very apprehensive of a certain amount of double-talk in the literature. The word "therapy" is used many times when it is not therapy at all. To eliminate a person from existence is not therapy! For example, an abortion, no matter how well it may be justified, is not therapy. The notion here is that certain practices may not be contested if called "therapy," but might be if more accurately labeled as "feticide."

5. The theological wing of this school believes strongly that Genesis 1-2 set out the pattern in which our true humanity is discovered and realized. It is in the male-female, husband-wife, and parent-child relationships in which we realize our humanity. Our humanity is destroyed and not established in the world of test tube babies, plastic wombs, frozen embryos and computerized ovum and sperm banks.

In our pluralistic society we have no common value system. How can we determine who is the most valuable man for the community among a list of candidates for a dialysis machine?

Theory II: Utilitarian medical ethics. Utilitarian is not used here in a pejorative sense. Rather, it is the best description of the general policies governmental agencies follow in matters of public health. The health of a large population cannot rest upon personal choices. We do things on the principle of the best possible good for the most number of people. Rules of immunization, sanitation, purity of food, and control of drugs are all city, state or national policies. This is the only way we can live together in safety and freedom from plagues and epidemics. Therefore in that we are all part of the one human genetic pool such matters of medical decision should eventually be made on a utilitarian basis as they are with infectious diseases.

I register this as a dominant mood in the literature although I cite no names. However it was the implication of numerous articles and books, although the authors might be startled to know that in essence they were arguing for a utilitarian ethic.

For example, one segment of Jewish descent suffer a high incidence of Tay-Sachs disease. Deterioration and death occur within four years in infants so affected. As far as I could ascertain in my reading, all Ashkenazy Jews wish that they were free from this disease; this is a utilitarian judgment.

Or all blacks could wish that sickle cell anemia could be eliminated from blacks in America. In fact some extremists have charged the practice of medicine by white doctors as a form of racial genocide in their ignoring of sickle cell anemia among blacks. The black desire for the elimination of this disease among all blacks is a utilitarian judgment.

The logic follows, then, that if 1600 of our diseases are of a genetic origin, there should be some sort of law that helps to reduce that number. Further, the more extreme of these diseases of genetic origin cause such suffering, demand so much money and care, and require so much personnel for maintenance of life, that some sort of across-the-board law should exist for the decrease and at best elimination of these severe diseases. We are all together in the human genetic pool. Hence only a ultilitarian ethic is adequate to cope with the problems.

Already Denmark has adopted the utilitarian ethic: no couple in Denmark with a serious genetic defect in their heritage may marry without sterilization. The beginning of a genetic, utilitarian ethic is found in the U.S.A. in states like Massachusetts and New York which have a mandatory sickle cell anemia test for children entering their school system.[14]

There are two opposing points that should be made with respect to a utilitarian ethic. First, does the very nature of genetic diseases (being involved in the reproductive process) keep the ethics of practice of our genetic knowledge forever in the personal dimension? To many the obvious answer is "yes." Second, if genetic diseases do affect the total genetic pool, and if way down the line we may even dream of the genetic death of man, does not this demand that to some measure our ethics about genetics be utilitarian? Those who believe that as we eliminate infectious diseases and other diseases that kill especially children, we also materially increase the incidence of genetically originated diseases, will say "yes."

Theory III: Utopian or Futurologist medical ethics. Given enough time with the growth of our knowledge of genetics we may eliminate most if not all of man's genetically caused diseases. Furthermore, we may use this knowledge for the continuous perfection or use of the human race. (Gabriel Fackre, A. J. Muller, R. L. Sinsheimer).

A. J. Muller has written in most technical detail of the continuous contamination of our gene pool. Although he does not have the dreams that Fackre does, he does believe something remedial must be done to preserve the relative purity of our genetic pool.[15]

In glowing terms Sinsheimer projects a genetic utopian future:

> We now glimpse another route—the chance to ease the internal strains and heal the internal flaws directly—to carry on and consciously to perfect, far beyond our present vision, this remarkable product of two billion years of evolution. We are, it is true, very young for this task—young in skills, young in wisdom—but also fortunately young in heart.[16]

Gabriel Fackre has written many articles on man's genetic future, characterized by "futurology." This is a new mood in theology called neo-optimism or even neo-postmillennialism. According to Fackre, God has turned the universe over to man to subdue it. This means to Fackre not only to clean up crime, poverty and injustices, but to do miracles with our new genetic knowledge. He operates with the categories of liberation and *shalom*. Among the many things meant by liberation is liberation from all genetic defects. By *shalom* (the Hebrew word for peace) he means wholeness, richness, and the healing of defects. If man is guided by *shalom* in his genetic engineering, he will not do the terrible things the Nazis did. Fackre has written much more on futurology, science and genetics but we cannot give his views more space.

Both Christian and non-Christian are slowly coming to the conviction that the supreme norm in ethics is the quality of life and not the sheer fact of life.

Utopian ideals indicate that genetic engineering is concerned not only with clearing up problems of health and disease, but also with those speculative and positive things it might do. We may gradually increase the "intelligence quotient" of the entire population; we may breed a man with more moral and artistic sensitivities; we may clone geniuses by the dozens and accelerate science, or art, or whatever we wish. It has already been prophesied that the Olympic Games twenty years from now will reflect genetic engineering to produce better athletes. Cloning may also solve the problem of tissue rejection in transplants. Perhaps we shall solve some of our pressing problems in the area of aging. The greatest achievement of all was suggested by a theologian, no less, who said that we should locate the gene which carries original sin and knock it out with a laser beam!

Fackre faces the issue raised by Ramsey about Genesis 1-2 and the meaning of life. He thinks there are many ways of creating meaningful human relationships other than the Genesis pattern. Therefore the new world of genetic engineering does not disturb him at this point. We might add that the Russains and Chinese apparently consider children the ward of the state and have set up massive day care centers with minimum contact of mother and child. In time we will know if such a distrubance of the traditional family pattern is harmful or not.

Theory IV: The humanitarian ethics of scientists. It is unfair to pick out the biologists and doctors and make them special targets for discussions about ethics. They are scientists among scientists. They have their own internal control and standards. They do not torture animals. If pain is involved in any experiment it is treated as humanely as possible. If we trust physicists, chemists, and geologists, why not trust biologists and doctors? Their aim is the good of man and we may then trust them in their laboratory work and not mark them out for subjects of ethical harangues.[17]

The argument is not difficult to construe. Scientists make progress only as all options are open to them. Geneticists and doctors need this breathing room too. If society puts restrictions upon them in the name of humanity they may be doing a very inhumane thing inadvertently. A certain experiment may outrage somebody's sensibilities, but it may lead to a cure for schizophrenia. What may appear to some person as a barbarous treatment of a colony of rats may lead to the cure of cancer.

If there are 1600 diseases of a genetic origin, the genetic engineer should be encouraged in every way and not hemmed in by law or censorship.

There is another assumption which goes with this theory. In fact, the assumption may be the theory itself. If scientists achieve the cure of a disease it is then assumed that the cure is moral. If the cure is moral, then the means of achieving the cure is moral.

It could be argued that this is the history of medicine. We no longer consider the dissection of a body as desecration of the human body. When a surgeon operates on us we want him to know our interior geography very expertly. We no longer consider anaesthesia an attempts to avoid the pain from our "curse unto death". Millions of surgeries performed every year to heal bodies and save lives would be impossible without it.

In short, if the proof of the pudding is in the eating, then an edible pudding is an ethical pudding. This comes out clearly in the study of Roman Catholic medical ethics. The Roman Catholic laymen are steadily drifting towards a medical ethics which virtually says

that what cures or helps is moral, rather than taking their guidance from Roman Catholic moralists. About 100% of the girls brought up with strict Roman Catholic training will (prior to the time of their marriage) consider birth control to be wrong. After they have had five or more children, 60% and perhaps more will accept it as moral.

Applied to genetic engineering, this approach means that as geneticists rid us of our genetic diseases or greatly reduce their effects, we will consider their work as ethical. Reenforcing this is the concept that the fundamental consideration in medical ethics should be the quality of life and not the mere existence of life.

Concluding Observations

1. I think that, of the four options mentioned, the first is the most viable for most Christians. At least they are more comfortable with it. It is a general conviction that the more morally sensitive portion of our population (theologians, priests, rabbis, ministers, humanitarians, scientists) should have a larger say in medical ethics than lawyers and politicians (speaking of them as a class and not as persons).

2. I think that the medieval moralists were generally right in arguing that ethical decisions must grow out of a total worldview. Their program was right; their error was a lack of knowledge and perhaps some of the additional stuff that must go into such a total world view. Unfortunately Christians suffer from pluralism as much as society. Hence there is no great evangelical Christian synthesis today. This is an embarrassment for the contemporary evangelical, for he is as tormented about medical ethics as others who investigate the subject.

3. I think that both Christian and non-Christian are slowly coming to the conviction that the supreme norm in ethics is the quality of life and not the sheer fact of life.

This issue comes out critically in the unnecessary prolongation of life. It is more and more felt that the notion that the patient is to be kept alive at all costs is less and less capable of defense.

It also comes to the surface over the question: "When does human life begin?" Supposing we consider that to be a false question or a misguided question. There is no agreement on the issue. For the first ten days or two weeks of pregnancy there is no way of knowing whether the woman actually has a fetus or a growth. But if we ask: "What is human life intended to be?" perhaps we can get around this highly emotional question. If the goal of life is a mature, rational integrated adult, then we may say that any human life that is way off course and can never reach that goal can never fulfil what it means to be a complete human person. When medical ethics becomes passionately concerned with what is headed way off target and deciding if such a monstrous or defective fetus ought to survive, then the endless question, which to this point has defied all moralists and biologists, "When does human life begin," is avoided.

Although the ethical content of the material on genetic engineering stresses the moral and humanitarian goals of such engineering as well as physical well-being, the emphasis comes down hard on the latter. Perhaps with scientists doing all the experimental work in this area, this emphasis on man's physical well-being is inevitable.

However it has been the contention of the Christian Church that people who suffer from illness, disease, and bodily defects may nonetheless reach spiritual maturity if not sainthood. Disease itself need not be seen as necessarily damaging spiritual self-fulfilment.

The greatest Christian drama of the twentieth century is judged to be T. S. Eliot's *The Cocktail Party*. It is a study of modern man's discontent, unhappiness and undiagnosed sense of emptiness. The solution to this spiritual disease is found by the heroine Celia. Celia finds herself and beatific happiness by the hard route of self-denial, cross-bearing, identification with the suffering of Christ and finally martyrdom. One's true humanity, identity and sense of fulfilment in life are found by the way of suffering and self-renunciation. Modern medicine unintentionally creates the illusion that a perfect genetic heritage and a healthy body are the achievement of the fulfilment of our humanity. T. S. Eliot's *The Cocktail Party* is a brilliant reminder that man treads not only a pathway of physical evolution, growth and improvement but he also treads a spiritual pathway which is governed by far different rules than the former.

Modern medicine unintentionally creates the illusion that a perfect genetic heritage and a healthy body are the achievement of the fulfilment of our humanity.

This intense concern with the physical side of man in which modern medical science (and again I believe unintentional) gives the impression that good health and the realization of our humanity are identical, is given a satirical commentary in Paul Ramsey's rephrasing of the twenty third Psalm. Ramsey wants to "blow the whistle" on those moderns who are so occupied with the problems of man's physical well-being as achieved through science as to be completely dense about man's spiritual journey. Hence this paraphrase will be understood only if the satirical element in it is grasped.

The Lord is my Genetics Counselor, I shall not want for risks.

He maketh me to lie down in genealogies; he nondirects me beside karyotypes.

He restoreth my inborn errors; he leads me in the paths of reproduction for my name's sake.

Yea, though I walk through the valley of amniocentesis or under the shadow of fetoscopy, I will fear no evils for thou, the Greatest Good of the Greatest Number, art with me; thy chromosome counts and thy enzyme assays they comfort me.

Thou preparest multiphasic screening before me in the presence of my illnesses; thou anointest my head with check-ups; my profile runneth over.

Surely mutations and heterozygosity shall follow me all the days of my life; and I shall dwell in the house of computerized biomedical information forever.[18]

FOOTNOTES

[1]Theodore Friedmann, "Prenatal Diagnosis of Genetic Disease," *Scientific American*, 225:34-51, November 1971

[2]George B. O'Toole, *The Case Against Evolution* (New York: The Macmillan Company, 1925), p. 42.

[3]For example McClearn has written a very thorough survey on the whole territory of genetics but not a line on the ethical implications of genetics. "Genetic Influences on Behavior Development." Paul H. Mussen, editor, *Carmichael's Manual of Child Psychology*, Vol. I. Third edition (New York: John Wiley and Sons, 1970), pp. 39-76).

[4]*Time*, 101:84, April 23, 1973.

[5]Westwood: Revell, 1953.

[6]Cf. V. Elving Anderson, "Genetic Control and Human Values" (Minneapolis: Dight Institute of Genetics, The University of Minnesota, unpublished paper, October 20-21, 1972).

[7]New York: Harper and Row, 1969.

[8]Grand Rapids: Wm. B. Eerdmans, 1972.

[9]Nashvilled: Broadman Press, 1971.

[10]Cf. R. J. Gerber, "Abortion: Parameters for Decision," *Ethics*, 82:137-154, January 1972.

[11]Cf. James De Borst, "'A New Constitutional Right,' The Supreme Court and Abortion," *The Reformed Journal*, 23:7-10, April 1973.

[12]Paul Ramsey is the most articulate developer of this viewpoint. Cf. his *The Patient as Person* (New Haven: Yale Press, 1970) and his opinions on cloning, etc. in *Fabricated Man* (New Haven: Yale University Press, 1970).

[13]Cf. Frazier and Fishbein, *ibid.*, pp. 83-98.

[14]One of the developments of this that is bothering the ethicist is that insurance companies have been able to get hold of these tests and feed them into their computer system. Hence the rates of patients with sickle cell anemia runs much higher. This is just more of the continuous erosion of the rights of privacy in our American democracy.

[15]A. J. Muller has written many articles on the subject. His article which stands as a kind of summary of all his articles is "Should We Weaken or Strengthen our Genetic Heritage?" *Daedalus*, 90:432-450, Summer 1961.

[16]Robert L. Sinsheimer, "The Prospect for Designed Genetic Change," *American Scientist*, 57:134-143, 1969, p. 141. One of the finest summaries of the issues of this paper will be found to be that of R. J. Berry, "Genetical Engineering," *Christian Graduate*, 26:3-8, March 1973. In it he cites Sir Macfarlane Brunett who strongly asserts that the possibility of knocking out a defective gene and inserting a healthy one is so remote that it will perhaps not happen "to the last syllable of recorded time." p. 5.

Furthermore the conference at San Diego indicated how tentative amniocentesis is at the present time. Some criminals have been found to have the XYY pattern at the sex chromosome which made them anti-social, hence criminal. But other men with the same XYY pattern are normal in their social relationships. In other cases a parent will have the same chromosome defect as the defective child yet the parent will be a normal person.

[17]This attitude is clearly stated in Gerald Leach, *The Biocrats: Ethics and the New Medicine* (New York: McGraw Hill, 1970), p. 14ff.

[18]Cited in the JAMA, March 13, 1972 and reproduced in *Bulletin of the Atomic Scientists*, p. 16, December 1972, Vol. 27.

As the reader will note my article is far more general than the specific topic of amniocentesis. The discussion at San Diego centered more on the issues amniocentesis raised than the general subject of medical ethics. Amniocentesis enables the doctor to know about the fourteenth week of pregnancy if the fetus is bearing one of the forty genetic defects which can be so detected at this time all of which may have serious effects upon the neurological system of the baby when born. Furthermore, at our present state of knowledge, predictability in amniocentesis is very low, i.e., we cannot always assume with certainty that a given chromosome pattern means that the child will actually be born with these defects. But granted all of that, the central ethical issue is whether such prenatal knowledge of serious physical defects is a new and justifiable basis for abortion. There is no meaning to doing amniocentesis unless it is already assumed that abortion of defective fetuses is morally justifiable.

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ADDENDUM

This article was originally presented as a lecture at the U. of California School of Medicine at San Diego in 1974 as part of a unique conference involving members of ASA and Christian nurses. Dr. Theodore Friedmann chaired the conference.

The Recombinant DNA Controversy
History of the Debate

Early in this decade, a few molecular biologists began to ask ethical questions about work to be carried out in the field of molecular recombination. The technology had reached the point at which it was then possible in principle to generate any combination of DNA molecules from sources as widely divergent as bacteria and man, to multiply these recombinant molecules in a suitable bacterial host, and then to study their properties in cell-free systems. The opportunities for the simplification of the study of complex mammalian genomes was thereby assured, and the future also promised the large-scale production of precious hormones and enzymes by introduction of genetic messages into bacterial genomes where they could be multiplied and translated.

The initial concern that was expressed about these procedures was focused upon the possibility of the accidental production of dangerous pathogenic bacteria by the introduction of tumor-virus genes into bacterial cells. These concerns were expressed at a 1973 Gordon Conference chaired by Dr. Maxine Singer at which it was voted to request the National Academy of Science to make a study.

That body appointed a study committee chaired by Dr. Paul Berg which took the extraordinary step of publishing a letter in *Science* and in *Nature* in July of 1974 calling for a temporary moratorium on certain molecular recombination experiments.[1] As a sequel to the announced moratorium, a conference was convened in Asilomar, California, in February of 1975, to plan a future course. Some 140 scientists doing molecular recombination research and a few lawyers and reporters met for several days. Most of the time was devoted to scientific presentation, but on the final day, the lawyers had occasion to present something of the legal liabilities of molecular recombination research.

That revelation, together with the reaction of several influential members of Congress and the Senate, placed the discussion of recombinant DNA research squarely in the public arena. Senator Edward Kennedy's critique of Asilomar was that its deliberations were "commendable but inadequate . . . because scientists alone decided to impose the moratorium, and scientists alone decided to lift it. Yet the factors under consideration extend far beyond their technical competence."[2] *Atlantic* writers, Bennett and Gurin, wrote of yet another scientific limitation. In their view, "The scientists came to Asilomar like the barons to Runnymede . . . running their laboratories as personal feifs . . . to forge an agreement they feared might affect them for decades to come. The clash of armored egos was noisy."[3]

If the reaction of scientists to the moratorium was quick, and understandably defensive, the responses of the public in the form of various citizen's action groups and of the government were even more immediate. The NIH had draft guidelines for the use of recombinant DNA techniques in print by December of that year,[4] and hearings in progress the following February. At these hearings,[5] various groups, including the Boston-based group, Science for the People, presented concerns for laboratory safety. Robert Sinsheimer, then chairman of Biology at California Institute of Technology, expressed a further concern that the techniques risk "compromising natural species barriers, particularly those between bacterial-type and higher cells", especially in view of the scale of the experiments and of their certain irreversibility. In contrast, the majority of molecular biologists at the hearing complained of the gradual escalation of the stringency of the guidelines, David Baltimore of M.I.T. pointing out that present controls virtually exclude tumor virus work. The guidelines were finally published in an operational form the following June.

The early part of 1977 witnessed a flurry of arguments by both opponents and proponents. In March Nobel laureate biologist George Wald, representing a group of 400 called "The Coalition for Responsible Genetic Research," called for an international moratorium on all experimentation producing unnatural genetic exchange, and shortly thereafter one of the Academy Forums—meetings periodically convened by the National Academy of Sciences—heard a broad spectrum of arguments on recombinant DNA. But over the succeeding months, the voices of dissent in the political and scientific communities, among ethicists and theologians were largely silenced by the forceful and well organized persuasion of the proponents.[6] Joining the molecular biologists were groups supporting civil liberties, pointing out the danger of government control of free inquiry. By July, action on regulative legislation was in abeyance and researchers had established that the major bacterial strain of recombinant DNA technology, *E. Coli* K-12, possessed no capability to dwell in the human intestine, so represented no pathogenic risk. Indeed, based upon this finding, the NIH guidelines are now being rewritten to exempt a large percentage of recombinant DNA experimentation from the controls[7] and many molecular biologists are now criticizing Berg and his colleagues for having raised the alarm of possible danger in the first place.

The Journal Symposium from which the following articles were taken was organized by Dr. Jerry Albert and published in June of 1978. They therefore suffer from the common malady of most scientific writing—almost immediate outdatedness. They were selected, however, to illustrate a spectrum of reasoned approaches to the recombinant DNA question with the understanding that the principles articulated have applicability to any question of human engineering.

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[2] B. J. Culleton, News & Comments, *Science*, 188, 1187-1189, 1976
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A Spectrum of Opinion

Examine the Dangers and Benefits Carefully

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During the twelve years I have taught a one semester course in Biochemistry I have seen a great outpouring of information particularly in the area of molecular biology involving nucleic acids and proteins. During this time the text in this course has increased in size from 393 pages in the first edition to 628 pages in the 4th edition. In spite of this increase in knowledge about the living cell the surface has barely been scratched and much remains to be done. One of the most controversial areas of research is the area of recombinant DNA. This basically involves splitting open a small usually circular DNA molecule from a host cell, splicing in foreign DNA from an entirely unrelated cell, recombining the open ends into circular DNA, and introducing this DNA back into the host cell. These new cells carrying recombinant pieces of DNA or plasmids may in some cases express the newly acquired genes in some way. It is this possibility upon which many of the benefits of this research are postulated but upon which the fears of others are based.

One of the most often voiced fears is that the recombinant technique may lead to the emergence of a new strain of virulent pathogen which will decimate the ranks of man. The fact that a large percentage of this research centers on the use of strains of *Escherichia coli* as host cell increases these fears since the parent *E. coli* exists in symbiotic relationship with the human intestine. Other concerns deal with the possible extension of this technique to the cells of man in genetic manipulation, with the possibility that the calls for regulation of this research may lead to overregulation and stifling of free scientific inquiry of all types, and with the possibility that a great deal of time, money, facilities, and scientific personnel will be wasted by a rush into this new and possibly faddish research area. Also, voices are heard asking if man even has the right to tamper with God's creation especially by crossing species barriers between procaryotes and eucaryotes.

The list of possible benefits of recombinant DNA is understandably a bit thin, since it is usually somewhat difficult to visualize how one will benefit from a discovery before it is made. However, I feel it is safe to conclude that no matter what new discoveries are made, some men will find good uses for them and other men will find evil uses for them. I have only to mention a few examples, such as the printing press, dynamite, drugs, and nuclear energy. At present the suggested but unproven benefits include the use of recombinant DNA to yield bacteria which could produce human hormones such as insulin, could synthesize antibiotics and vitamins, and be able to convert nitrogen into a form usable by plants. A more certain benefit would seem to be a better understanding of the genetic equipment of the cell.

How should a Christian scientist, cultural mandate in hand, approach the question of whether or not recombinant DNA is a permissable research area for man? I feel that as a Christian and a scientist I should have an open-minded attitude toward the question and examine carefully both the dangers and the benefits of this type of research.

Having examined as many of both as I could as summarized above, I have concluded that we will through the use of recombinant DNA research undoubtedly be able to uncover more and more of the pattern of creation, especially as it reveals itself in the DNA of the cell and genetic expression. By so doing, we can praise and glorify God all the more for His created order. This type of research will undoubtedly also provide benefits to mankind not even yet imagined.

On the obverse side must also be the balancing realization that the influence of sin will also lead some to exploit this new research into new ways to make a profit. Not that profit is bad in itself, but quite often a new market must be created for a potentially profitable but often unnecessary product whose mutagenic and carcinogenic effects have not been investigated, such as Red Dye No. 2, PBB, PCB, and more recently, the soil fumigant DBCP. Since the development of biological weapons has been actively pursued in the past, it would seem that the use of recombinant DNA would be a natural area for attempting to find a superpathogen or poison. Even though the use of DNA from venom-producing snakes and insects and bacteria producing botulinum toxins is presently banned from government-supported research, this may not deter foreign governments from carrying out this type of research using methods carefully developed and widely published by American scientists.

Recombinant DNA research is being carried out and I feel that it will be continued in the future. However, because of the possible risks involved and possible misuse of results, I feel careful regulation of this research may be necessary. This does not necessarily have to stifle research, as some claim. But regulatory groups must watch over it and should have the power to stop research proceeding in a direction dangerous to man and the world about him. Such a regulatory group should involve representatives from private industry, federal government, and education, including a number who have no vested interest in this type of research. I also think a similar organization at the United Nations level is necessary, since this problem is not only a national one, but one which will eventually be global in nature.

Avoid Simplistic Thinking

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One of the greatest pitfalls that Christians must avoid upon entering into advocacy on social issues is the temptation to simplistic thinking. This temptation is great, for simplistic thinking avoids agonizing appraisal, can be carried out without full understanding of the situation, and is well suited to receive public support. I realize that there is not the space to respond in depth on recombinant DNA—nor do I personally have the full technical competence that should be demanded—but I would like to enter a warning against certain types of prevalent simplistic thinking.

1. That it is possible to plan scientific research so that only good for the human race will result. Scientific research provides knowledge; all knowledge is dangerous. If God is not sovereign and we are *totally* on our own, then every endeavor aimed at increasing human knowledge requires a permanent moratorium. Every advance of knowledge in every field can be used or abused by human beings. The fact that it is contrary to the nature of the human being to proclaim a moratorium on new knowledge, however, cannot be escaped. Simple solutions that prescribe public condemnation of whole branches of scientific research cannot be sustained.

2. That recombinant DNA research represents a totally new and unique biological interference into nature. Genetic change is a process going on at all times. For centuries human beings have deliberately exercised the principles of selective breeding to change the properties of plants and animals. That we may with excellent reason believe that controlled selective breeding is not appropriate for application to human beings has not led us to reject the study and use of selective breeding *per se*.

3. That recombinant DNA research is primarily a means for altering the human population. A major application of this type of research is in the area of agriculture where developments may lead to a food supply to meet the burgeoning population in a world that finds it difficult to take population limiting seriously. Researchers in the area would welcome heartily increased research support from the Department of Agriculture, but find instead that they must seek support from the National Institute of Health, which in turn demands that they describe their research in terms of its applications to human genetics. Concern with human genetics is of course heightened by the realization that cancer research cannot proceed without recombinant DNA techniques. Still it appears that the emphasis on human genetics is as much a consequence of the distribution of government funding as it is of the actual intentions of the researchers involved.

4. That issues involving technical evaluations can be resolved by appeal to the public. I certainly favor every action that can lead to an informed public and therefore an informed public opinion of essential issues. Experience in the world indicates, however, that public opinion is a very volatile ingredient, quite at the mercy of those skilled in manipulating popular thought. I am pessimistic, therefore, of the ability to resolve questions of truth, or even of wisdom, by appeal to what is inevitably a political process. I realize the dangerous ground that this opinion may appear to involve, but not to recognize the weaknesses of the democratic process may simply be a way to hasten its demise.

Precautions in matters of safety are certainly demanded as long as they do not amount to nothing less than a complete restriction on all activities. Let's not minimize the problem. We are in a mess. The whole creation is groaning in travail, awaiting the day of redemption. But if there is danger in going forward, it is not ethically possible to go backwards. Only our trust in the sovereign God and Father of our Lord Jesus enables us to walk out into the darkness with him, seeking to be his responsible and obedient servants.

No Line Between Safe and Dangerous Knowledge

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To reach a Christian position on the issue of recombinant DNA, let us not lose our perspective on technology as a whole. Recombinant DNA is a technique being used by molecular biologists to study the organization, regulation, and expression of genetic material on a biochemical basis. It is a method of manipulating the DNA of organisms ranging from man to virus, and the controversy over its use centers in two areas. The first is that the risk of unexpected side effects from performing these manipulations may not be worth the benefit accrued through its use, and the second is whether society would misuse the capability of genetic engineering enough to warrant shutting off such research as attempting to attain dangerous knowledge.

The first area requires a technical assessment.[1] The benefits are more clear-cut than the risks, which are entirely hypothetical at this point.[2] Medical spin-offs are already feasible, such as the production of human insulin and human interferon (a naturally occurring antiviral protein) in large enough quantities to be used therapeutically. Examples of the feared risks are that an

unknown cancer gene could begin functioning if removed from its normal genetic environment or that a regulatory gene out of place could start regulating the wrong functions at the wrong times. Is it possible that a new combination of DNA molecules could function as described above or could provide an entirely new function to a bacterium? To date there is no evidence that this is possible, and indeed with our present knowledge it appears unlikely, but we cannot rule it out. However, we do have some information on whether such a bacterium could escape from the lab and cause havoc. If researchers follow the containment procedures outlined in the NIH guidelines, we know that the chances of such a bug escaping are very low, the chances of it surviving outside the lab are very low, and the chances of it spreading are very low. The probability of all three occurring is so low that it is considered only due to the consequences in the event that an unsuspectedly dangerous gene combination is formed.

However, we cannot pretend that this technology does not exist. It is easy and does not require more than common lab equipment (in contrast to nuclear physics), so we do not have the option of an effective way of preventing all research. The question is whether we compound the problem by openly continuing the work. I believe that by using the aforementioned safeguards, which is generally done now, the risks involved are simply those which are unavoidable in any field given our incomplete knowledge, and we have to live with this baseline of risk in all areas of life. Life does not give us the option of avoiding risk entirely. We cannot do nothing; if we chose not to do something new, we have chosen to continue as we are now, and that choice has its own risks.

Let us now look at the future impact of this research on society. We must realize that using the techniques of recombinant DNA does not make genetic engineering inevitable (or even imminent) nor does refraining from their use avoid the possibility of it. However, recombinant DNA certainly will increase our understanding of (and thus our ability to manipulate) genetics.[3]

Is this really an example of dangerous knowledge? We have already admitted that scientific knowledge is valid and that in at least some areas it is worth pursuing by practicing science and subscribing to the statement of faith of the ASA. I do not believe one can draw a line between safe and dangerous knowledge. The Navy can use information from research on porpoises to develop weapons and doctors use techniques spawned by nuclear physics to save lives. When God created us He gave us the responsibility of making choices, and we cannot avoid those choices by attempting to set aside our knowledge.

I do believe, however, that Christians have an important role, especially those of us who do know enough molecular biology and genetics to be able to anticipate what will be technically possible in the future. We as scientists must attempt to clarify for society exactly what its choices are by setting out the results and implications of those choices. And we, as Christians, must remind people of their responsibility for those choices as moral beings accountable to God.

[1]Further details can be found in:
B.D. Davis in "Recombinant DNA Research: A debate on the benefits and risks" *Chemical and Engineering News*, May 30, 1977, p. 27-31.
J. Abelson, "Recombinant DNA: Examples of Present-Day Research," *Science* 196: 159-160, (1977).

[2]I do not include here the willful avoidance of using the proper safeguards. This is not a new problem and it is just as possible with those working with Rabies virus as with those doing recombinant DNA work.

[3]The power of recombinant DNA technology in biological research has been demonstrated over the last several years, contributing to a number of the recent advances made in our understanding of the organization and function of genetic information. These include work on RNA processing in eucaryotes (especially splicing of mRNA), the arrangement of protein coding and non-coding sequences within a gene (with the immunoglobulin genes, such information gave us a great deal of insight into the sources of antibody diversity), the arrangement of genes on chromosomes, localization of specific genes and related sequences in the genome, localization of viral integration sites, information on the structure of gene control elements in bacteria, and the sequencing of a number of regions of DNA.

Worthy Goals and Genesis Mandate Outweigh Dangers

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Recombinant DNA research has worthy goals in keeping with the service of science to human welfare, and thus, it should be vigorously pursued with reasonable safeguards to protect the scientists and the public they serve. Some of the goals of this research include: (1) extension of basic knowledge of molecular genetics; (2) medical applications in elucidation of the nature and control of cancers, therapy of genetic diseases (e.g., diabetes may be treated by enabling a patient to make his own insulin, instead of being dependent on injections of preparations from animal sources), treatment of other molecular lesions, vital organ repair (kidney, heart, liver, lung), cheaper and more efficient syntheses of biomolecules (hormones, enzymes, antibiotics); (3) agricultural applications in feeding a hungry world full of humans by developing faster growing, disease resistant, more nutritious plants and animals, especially plants with more efficient photosynthetic systems and with nitrogen-fixation nodules grafted on their roots; (4) energy and environmental applications in production of faster growing forests, pastures and biomass for fuel and raw materials, and in development of microorganisms to dispose of pollutants and make methane and other fuels.

Christian and biblical perspectives: All of the above goals are directly in line with the Genesis mandate to bring the earth and all life under our control as God's representatives, for we are to be faithful managers of God's good world. Gen. 1:26-28 (TEV):

> Then God said, "And now we will make human beings; they will be like us and resemble us. They will have power over the fish, the birds, and all animals, domestic and wild, large and small." So God created human beings, making them to be like himself. He created them male and female, blessed them, and said, "Have many children, so that your descendants will live all over the earth and bring it under their control. I am putting you in charge of the fish, the birds, and all the wild animals."

This mandate was not lost as a result of our sin, but continues even after our Fall. Ps. 8:4-6 (TEV):

> What is man that you think of him; mere man, that you care for him? Yet you made him inferior only to yourself; you crowned him with glory and honor. You appointed him ruler over everything you made; you placed him over all creation: sheep and cattle, and the wild animals too; the birds and the fish and the creatures in the seas.

We have the responsibility to manage the earth and its resources for our good and to God's glory.

Of course, there are risks and dangers (both known and unknown) in every human endeavor because we are sinful, make mistakes, have limited knowledge and wisdom, and fail to trust continually in our Creator for guidance. Therefore, we need nation-wide (world-wide, if possible) application of the NIH guidelines to provide safety margins and containment of potential hazards, which should minimize the risks and circumvent real dangers. Imaginary dangers have been exaggerated, but enforcement of safety factors will be welcome as long as the research is not stifled and discouraged by local citizen groups. We need to recognize that the potential benefits outweigh dangers and to ensure that the safety and containment guidelines be flexible enough to meet any changing assessment of the hazards.

We should not allow fears of imaginary or exaggerated dangers to drive us to over-react against the possibilities to accomplish good for mankind. We who trust in and worship the Creator of all should take seriously our responsibilities as God's managers of the earth and be prepared to make use of this research for our good and His glory. All knowledge is from the Creator. If we refuse or otherwise fail to encourage recombinant DNA research, others who do not accept or acknowledge our Creator may boldly move ahead, for whatever motives, in another country if not in our own. As scientists who are Christians, we especially should lead in the encouragement and application of this gift from God.

Before making up your own minds on this issue, I strongly recommend that you also read the News Forum Debate on Recombinant DNA Research, *Chemical & Engineering News*, pp. 26-42, May 30, 1977, for detailed arguments by prominent scientists for and against this research.

2. Manipulation of the Brain

Some Recent Findings in the Neurosciences and their Relevance to Christianity

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The basic building block of the vertebrate nervous system is the nerve cell. Interactions among nerve cells are accomplished by several means, chief among which are electrical pulses sent along each cell's enclosing membrane. These pulses cause the release of chemicals, called neurotransmitters, which affect neighboring cells. These neurotransmitters can influence conscious experience, as shown by the close connection between antipsychotic drugs and the neurotransmitter dopamine. As knowledge of brain function and the accompanying powers to control people accumulate, many questions are underscored. Who will control the new powers? Can the human brain be considered a computer? The answer to the last question is unknown. The organization of the brain, with its array of 10^{10} interconnected nerve cells, is far too complex for complete analysis by present methods. Moreover, it appears that a random component exists in the pulse patterns generated by all known nerve cells. Although not conclusive, this randomness suggests that any deterministic model of the brain would, in principle, be inaccurate. Thus, scientists may never be able to describe fully the reasons why a particular brain behaves as it does.

Modern scientific study of the brain is raising issues that are being taken seriously by an increasing number of people. With recent successes in measuring and manipulating various brain processes and in devising mathematical and computer models for them, brain scientists are currently gaining much deeper insights into the structures and functions of the brain. A few workers in several different areas of brain research have even concluded that enough is known about the functioning of the brain to show that it is a completely

mechanistic machine.[1,2] As it is difficult to visualize how such a machine could have free will and dignity, characteristics which most Christians believe to be intrinsic attributes of a human personality, these conclusions have been strenuously resisted. Others, fearful of the growing power of scientists to manipulate the human brain, have given warnings about the possible abuse of these powers.[3,4] Thus, modern attempts to unravel the mysteries surrounding the nature of the human brain have become of considerable interest to Christianity. It is the purpose of this paper to describe a few of the newly discovered characteristics of brain function and to discuss some of their implications for Christian thought.

As in many fields of science, the study of brain mechanisms has tended to be concentrated according to various levels of complexity. Some scientists are investigating the behavior of single molecules or groups of molecules, while others investigate the structure and function of single nerve cells or of particular neural subsystems. Still others study the behavior of whole organisms. New findings in all of these areas are relevant to our purposes, but attention is focused here on the recently discovered properties of single nerve cells, particularly the mechanisms by which they communicate rapidly with each other.

BRAIN FUNCTION

The Neuron[5]

The basic building block of the vertebrate nervous system is the nerve cell, called a neuron. Neurons come in many shapes and sizes, but there are certain features common to all of them. As an example, a schematic drawing of a common neuron found in the cat's spinal cord is shown in Fig. 1. This neuron looks somewhat like a tree, with root-like dendrites, a long slender trunk callel the axon, and branch-like axon terminations. There is also a roughly spherical cell body which contains the cell nucleus and is concerned with maintaining the overall health of the cell. Attention should be drawn to the outline of the cell. The lines in Fig. 1 delineating it represent a very thin skin-like membrane which completely surrounds the neuron. This membrane, which is approximately 10^{-5} mm (10^{-8} meters) in thickness, is itself an active part of the neuron and separates the inside of the cell, with its unique properties, from its surroundings. An electrical voltage of roughly 60 mV (0.06 volts) exists across the membrane.

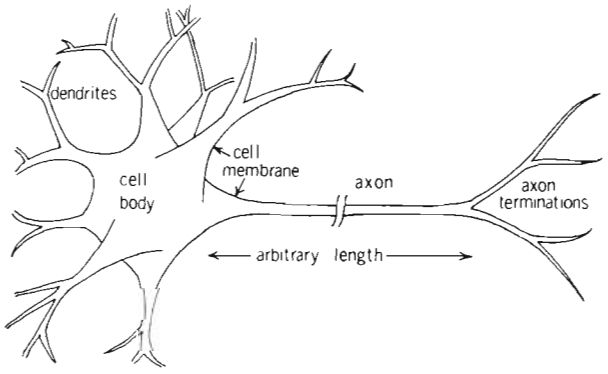

Figure 1. Schematic diagram of a representative neuron. The cell body of this type of neuron lies in the spinal cord, while the axon extends to one of the skeletal muscles, which it helps to control.

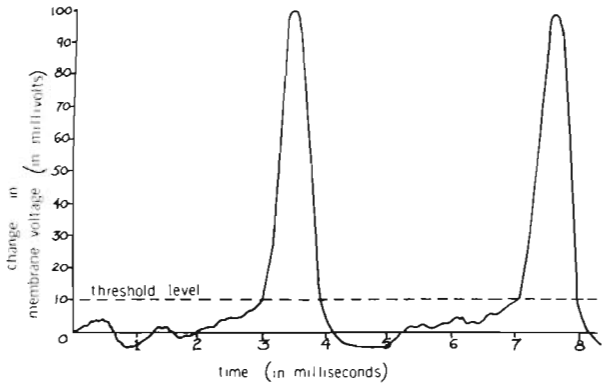

Figure 2. Sketch of the voltage across the cell membrane that might exist at the "trigger zone" of the neuron. Whenever the voltage crosses the threshold level a neuronal pulse is generated.

This may seem like a tiny voltage, but remember that it exists across a very thin membrane. At those submicroscopic dimensions, it produces quite a strong electrical effect, comparahle to those in existence in modern electronic devices.

Shown in Fig. 2 is a plot of how changes in this membrane voltage might look as a function of time. For the first 2 msec (0.002 seconds) of the graph, the voltage is observed to vary rather randomly about an average value of zero. At 2 msec, a slow increase in the voltage begins so that at 3 msec the voltage has risen to 10 mV. Once the cell voltage has passed that value, a remarkable event occurs. A short voltage pulse of almost 100 mV is generated. Moreover, once the membrane has had a chance to reset itself, it will generate a similar pulse again and again, whenever this critical voltage level, called the threshold level, is crossed (e.g., at 7 msec in Fig. 2). Notice that the height and shape of the two pulses shown in the figure are almost identical. The pulse height is determined by differences in ion concentrations within and without the cell. Because these concentrations are similar for all neurons, all neuronal pulses have about the same size.

The voltage trace shown in Fig. 2 represents the voltage across a patch of membrane located near the junction of the cell body and the axon. For the type of neuron shown, this particular region has the lowest threshold level, and neuronal pulses are generated there before anywhere alse. Once generated in the junction region, the neuronal pulse has a strong influence on neighboring regions of membrane. The positive nature of the pulse raises the voltage across the adjacent patch of membrane, causing that voltage to cross its own threshold level. A neuronal pulse is then generated by this second patch of membrane and causes, in turn, the third section of membrane to generate a pulse. The first section is meanwhile resetting itself and is not affected by the pulse on the second section. The process continues on down the axon, each section generating a pulse which causes a pulse in the succeeding section. The process is very much like the burning of a firecracker fuse, where the heat of the burning section of the fuse ignites the next section. In both cases, a signal is transmitted from one end to the other, a heat pulse in one casc and a voltage pulse in the other. Moreover, in both cases the length of the signal path does not matter. Once started, the pulse propagates at

a constant speed to the end of the line. Unlike the firecracker fuse which burns but once, the axon resets itself in a msec or so and is ready to conduct another pulse. It will conduct many millions of pulses over the course of its lifetime. The utility of such a mechanism is clear: pulses can be sent over arbitrarily long distances without any loss of signal. Thus, although only 10^{-2} mm in diameter, the axon of the neuron depicted in Fig. 1 conducts its pulses from the cell body which lies in the spinal cord to a muscle located, let us say, in the foot, a distance of approximately one meter. There is a price paid for this "lossless" transmission of pulses over long distances. Not only does it involve an expenditure of energy to keep the axon in readiness to generate pulses, but the only type of signals that can be sent along the axon are pulses. Sub-threshold voltages, such as characterize the first 3 msec of the membrane voltage shown in Fig. 2, fade away within a few mm.

Before the neuronal pulse reaches the end of the axon, we must pause and briefly consider just how the axons terminate. Work with the electron microscope has revealed that, even to its very tip, each axon is totally surrounded by the cell membrane, but that very close, specialized connections are made with a certain number of other cells.[6] In the brain, these connections are made to other neurons, but axons leaving the brain may also make connections with muscle fibers and other types of cells. Figure 3 shows schematically a neuron-to-neuron connection, which is known as a synapse. On the left or delivering side of the synapse in Fig. 3, the cell membrane is thickened a bit and there are a number of small spherical particles known as vesicles located in the immediate vicinity. Just opposite, the membrane on the right side, which may be a patch located on a dendrite or the cell body or even in rare cases on the axon of the receiving neuron, is also thickened and presumably specially adapted for its synaptic role. Although only one synapse is shown in Fig. 3, a single axon usually makes many synaptic connections along the course of its termination.

Let us return now to the neuronal pulse as it reaches the end of the axon terminations. Just as the purpose of igniting a firecracker fuse is to deliver heat to the firecracker itself, so the purpose of the neuronal pulse is to deliver a voltage change to the membrane of the synaptic region at the end of the axon. That purpose accomplished, the neuronal pulse vanishes, without having any direct effect on the receiving neuron.

The next stage in the process is a chemical one.[7] Upon arrival of the voltage change in the synaptic region, minute packets of a chemical compound are emitted from the axon into the gap between the two neurons. Although not absolutely certain, there is strong evidence that the total contents of one of the spherical vesicles clustered in the synaptic region make up one packet. Upon arrival in the narrow synaptic cleft, the molecules of the chemical compound are bounced around by other molecules and quickly arrive at the membrane of the receiving neuron. There, the emitted molecules form linkages with special sites on the receiving membrane that are very precisely constructed for the reception of that type of molecule. After a brief linkage, the emitted molecules break free and most of them, by various processes, are absorbed back into the emitting neuron for recycling.

During its brief existence, the linkage between the

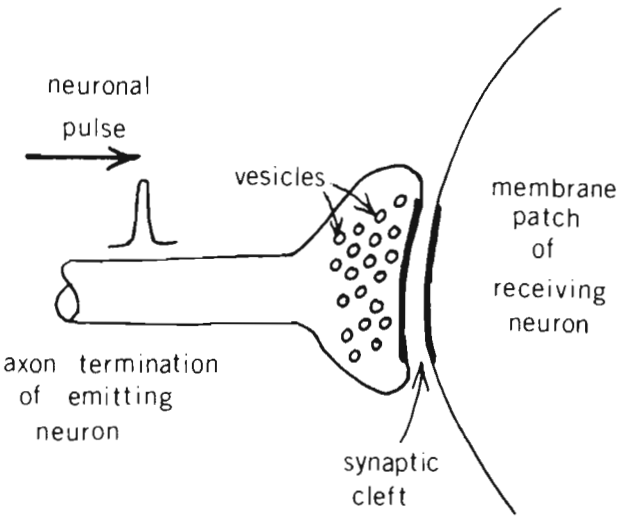

Figure 3. Schematic diagram of a synapse. The arrival of the neuronal pulse at the axon termination causes the release of chemicals thought to be stored in the vesicles. The synaptic cleft is about 2×10^{-5} millimeters wide.

receptor site and the emitted molecule causes a change to occur in the properties of the receiving neuron's membrane. This structural change in turn causes a small voltage change to appear in the receiving neuron. If enough emitted molecules link up with the receiving membrane in a short time, the sum of all their voltage changes might be enough to carry the voltage of the trigger zone of the receiving cell past the threshold level, and a neuronal pulse would be generated on the axon of the receiving cell.[8] Thus, through the use of a chemical intermediate, a voltage change is produced in the receiving neuron by the neuronal pulse on the emitting axon. As a recognition of its message-carrying nature, the chemical used as the intermediate is known as a neurotransmitter.

Not all of the interactions between neurons are carried on by means of nerve pulses, the only known method of rapid interneuron communication over long distances. Other modes are used when neurons lie near each other. For example, dendrites of neighboring neurons may form close contacts having all of the signs of chemical transmission: vesicles localized in one dendrite and thickened cell membranes existing on both sides of the synaptic cleft.[9] Thus, the transmission of information between these dendrites appears to be by means of neurotransmitters. In this case, however, the release of the chemical is not necessarily triggered by a neural impulse, but may be released by the smaller sub-threshold voltages that exist across the cell membrane in that region. It has been estimated that up to 50% of the brain may be composed of locally interacting circuits,[10] where transmitter release is governed by these sub-threshold cell potentials and by neural pulses conducted on very short axons. There is evidence that some of these neighborhood interactions may even be by direct electrical means, without the use of chemical transmitters.[11]

A Neurotransmitter

Some of the most exciting recent discoveries in the neural sciences have been concerned with neurotransmitters.[7] The use of the plural form of the word is deliberate, for it is well established that not all

neurons use the same neurotransmitter chemical. Two compounds, acetylcholine and noradrenaline, have been positively identified as neurotransmitters. That is, both compounds possess the complete set of specific characteristics that neurochemists have established as essential for a neurotransmitter. Nine other compounds present in the brain have been identified as possible neurotransmitters, but as yet they have not been shown to possess all of the needed properties. Although each of these compounds merits extensive discussion, we will consider only dopamine, one of the nine partially proven neurotransmitters. Effects attributed to its presence are very impressive and are closely tied into conscious human experience.

Dopamine seems to serve several purposes in the brain. Its clearest role is in connection with the proper functioning of the muscular nervous system. Not long ago, it was discovered that the brains of some patients who had died of Parkinsonism, a disease which produces uncontrollable shaking in its victims, had an abnormal dopamine content. In these brains, a particular region that is normally rich in dopamine, due to dopamine-containing axons which terminate there, was found to have virtually no dopamine. In attempts to supply the missing dopamine, it was further discovered that injecting a closely related compound, dopa, into the blood of Parkinson's disease patients, dramatically helped to relieve their symptoms. Apparently, the dopa molecules had been able to cross into the brain, and there they had been changed into the needed dopamine by a brain enzyme known to promote this transformation. Thus, although the precise roles of dopamine-releasing axons in the neural circuits involving muscular control are unknown at present, it seems clear that these roles are of major importance.

The excellent correlation of the data is indeed strong evidence that the powerful therapeutic effect of the antipsychotic drugs is related to the reduction of the flow of dopamine between neurons.

Another role for dopamine is in the process of being established. Since their initial appearance in the 1950's, there have been a number of drugs developed for the treatment of schizophrenia. Many of these drugs are quite different from each other, but all have antipsy-

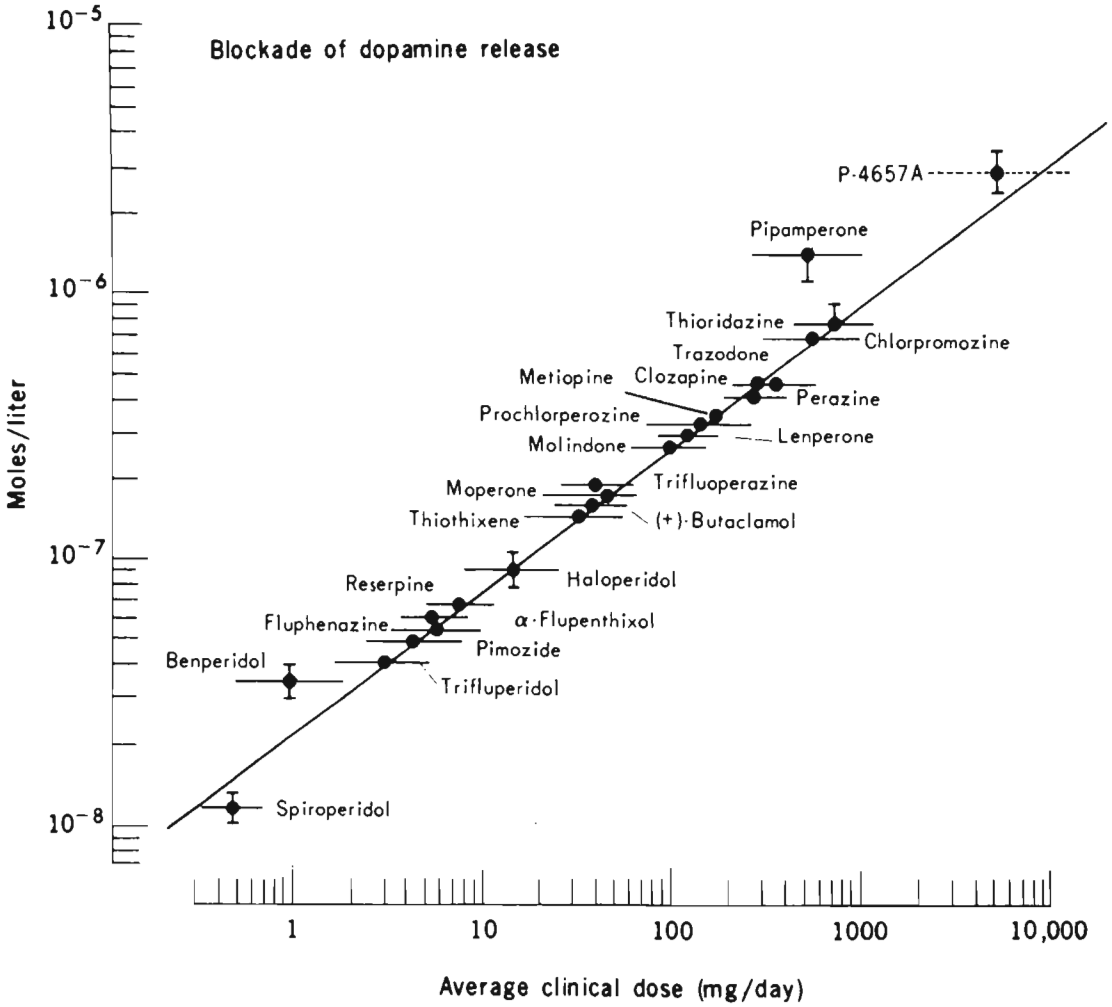

Figure 4. Each antipsychotic drug is represented by a single dot on the graph. The vertical position of the dot indicates the concentration of the drug needed to inhibit by 50% the release of dopamine from electrically excited brain tissue. The dot's horizontal position shows the average clinical dose. The horizontal bars indicate the range of clinical values. The straight line represents an equation describing the relationship between the dopamine-inhibiting doses and the clinical doses. Reprinted with permission of the authors and *Science* from Ref. 13, copyright 1975 by the American Association for the Advancement of Science.

chotic effects. Research involving these drugs has shown that they also have in common the ability to block the transmission of dopamine between neurons. Although the precise mechanisms of this blockage are still in debate,[12,13] there is evidence which suggests that the drugs inhibit the release of the dopamine from the ends of the emitting axons. Figure 4, a drawing taken directly from a recent report, [13] shows the doses of the different antipsychotic drugs needed to reduce by 50% the amount of dopamine released by electrical stimulation of excised brain slices, compared to the average clinical doses used for controlling schizophrenia. The correlation between the two measures is really remarkable. Although the different clinical doses vary by more than 10,0000-to-1, they can be used to predict with extreme accuracy the dopamine-inhibiting effect. It can be seen, for example, that quite high doses of chlorpromazine are prescribed for controlling schizophrenia, and that quite high doses of that drug are also needed to inhibit the release of dopamine from brain slices. Only the few points at the extreme top and bottom of the figure deviate significantly from the relationship shown by the straight line. Although the brains of rats, from which the electrically excited samples were obtained, are obviously very different from human brains, they have many biochemical similarities. Thus, the excellent correlation of the data in Fig. 4 is indeed strong evidence that the powerful therapeutic effect of the antipsychotic drugs is related to the reduction of the flow of dopamine between neurons. However, even if this particular relationship were to be confirmed, much would remain mysterious. For example, it is not even clear which of the several kinds of dopamine-containing neurons are involved in the tranquilizing reactions evoked by the antipsychotic drugs. More fundamentally, the relationships which exist between neural activity and conscious experience of any kind are almost completely unknown.

Neuronal Pulses

For the last two decades, neuronal pulses have been directly observable by means of microelectrodes. These devices, which in principle amount to small wires sharpened to a very fine point, have minute tips that can be positioned either just inside or just outside a single neuron. With that positioning, each pulse generated by that neuron causes a very small electrical signal to flow through the microelectrode. Electronic amplifiers increase the size of the signals up to the level needed by the pulse analyzing equipment used, principally the computer. This combination of the microelectrode to record neuronal signals and the computer to analyze them has been a very productive one. Using them, brain scientists have been able to investigate pulse patterns generated by neurons in many different regions of the brain. As an example of the kind of information being gathered, let us consider the pattern of pulses which has been recorded from neurons of the ear. These patterns are among the simplest in the vertebrate nervous system, and extensive studies have revealed the main outlines of their behavior.[14]

There are approximately 50,000 neurons that send information from each ear into the brain of the cat, a common experimental animal. These neurons have cell bodies and single dendrites situated in the bony parts of the ear, and their axons extend to just inside the brain of the animal. The obvious purpose of these neurons is to carry information into the brain concerning the sound signals striking the ear. Figure 5 shows an example of how these neurons respond when a pure tone, say middle C, is sounded in the ear. The top line of the figure shows the waveform of the air pressure changes caused by the tone, and the middle line shows the neuronal pulse pattern that would typically be observed on a single one of the axons leading into the brain. At first glance, the pattern is not impressive. There are relatively few pulses and they seem to occur rather randomly. Sometimes a long interval separates two adjacent pulses and sometimes they occur in quick succession. On further investigation, however, it is found that there is a great deal of orderliness in the pattern. Either a single pulse or none at all is generated during any one cycle of the sound stimulus. Moreover, if a pulse does occur during a particular cycle, its time of occurrence is restricted to that part of the cycle near the pressure peak. A study of the intervals between pulses would reveal that although the sequence of long and short intervals is unpredictable, the probable numbers of short ones and long ones that will occur in the future can be estimated from the corresponding numbers in these data.

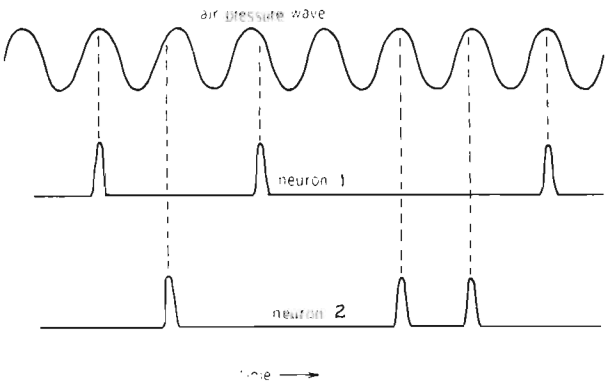

Figure 5. Sketch of the waveform of the air pressure caused by a musical tone as well as the neuronal pulse trains that might exist on two of the thousands of axons extending from the ear into the brain. The statistical properties of the two pulse trains are identical.

It might be wondered at this stage just how the brain could make sense of such a signal. If the pulse patterns of neuron 1 were the only information that the brain received about the sound signal, its interpretation would indeed be difficult. Remember, however, that thousands of these axons exist. Many of them are known to produce pulse patterns that, although not identical to the pattern of neuron 1, have nearly the same general description. Thus, the second pulse pattern shown in Fig. 5 shares all of the characteristics given for the pattern of pulses generated by neuron 1, but the two patterns are not identical. Imagine summing 100 such pulse patterns. On any one particular pressure peak, some neurons, say 20 on the average, would generate a pulse; few neurons would generate a pulse in any of the pressure valleys. Thus, every time about 20 pulses occurred within a short time period, a pressure peak would most probably have occurred. If only one or two pulses occurred in that period, a pres-

sure valley most likely occurred then. Simply observing how the total number of pulses occurring on those 100 axons varied with time would give the observer a rather accurate indication of the pressure waveform.

The uncertainty concerning just when a neuron is going to generate the next pulse is not confined to the neurons leading from the ear. All neurons which respond to tones, even those located in the brain's farthest reaches[15], do so by generating pulse patterns which contain a considerable measure of uncertainty. It seems clear from this neuronal variability that the same tone will be represented differently in the brain at different times. Data showing unpredictable aspects could also be presented for the responses produced by other types of sensory stimuli. Neurons in the brain responding to flashes of light generate different pulse trains in response to identical repetitions of the same flash.[16] Moreover, uncertainties are not confined to the sensory systems of the brain. Neurons such as that depicted in Fig. 1, which send pulses out of the spinal cord to control the muscles of the body also display variability in their discharge patterns, although those pulse patterns are much more nearly predictable than the ones shown in Fig. 5. In general, it appears that all neurons have some degree of unpredictability connected with the generation of their axon pulses.

The Neuron as a Computing Element

Some of the information-transferring functions of the single neuron are now fairly well understood, at least in general principles. Although the details of the generation of the nerve pulses and the release of chemical transmitters by the different kinds of neurons are not yet known, there is no longer any real disagreement about the reality of these basic neuronal processes themselves. One neuron does not, however, make a brain. It takes many of them working together to make up the simplest kind of brain. It is this very area of interconnections and interactions between neurons that brain scientists are now just beginning to investigate.[9] Unfortunately, the research is so new and the complexities of the brain so great that not much can be said yet of a positive nature. Although a considerable amount is known about where the axons of individual neurons begin and end and about which parts of the brain are related to which functions, the particular interactions between neurons by which the brain processes and stores the vast amount of information it receives are almost wholly unknown. In view of this ignorance, it is clearly impossible to state whether or not the brain is constructed like a digital computer, or anything else for that matter. However, because of the similarities in their overall information processing abilities, the brain and the digital computer have been considered by some to be the same type of mechanism.[2] To appreciate just how computer processes might be considered models of brain processes, it will be useful at this point to compare certain aspects of the two systems.

The basic building blocks of the digital computer are called logic elements. Each of these elements is an electronic device that has a single output terminal which can have only one of two possible voltage levels on it. If the sum of the input voltage is more positive than a certain threshold level, say for convenience 10 mV, the output is set to one level, say 100 mV. When the input voltage is below the threshold level, the output voltage assumes its other level, say zero volts. Thus, the output level of the device is either zero or 100 mV, and the particular level which exists at any one time depends on whether or not the input voltage exceeds the threshold level, 10 mV. Aside from the fact that its output voltage level does not automatically reset itself to zero upon reaching the 100 mV level, a property which could be easily added, the behavior of the logic element is strikingly reminiscent of the neuron membrane (cf. Fig. 2). This resemblance is no accident, for the first logic element was in fact developed as a model for a patch of neuron membrane.[17] The communication of one element with another is also similar to the communication between neurons. Although no chemical intermediates are involved, the output of one logic element is conveyed via wires to the inputs of other elements, where it causes voltage changes to appear.

The wonder is that the brain is able to achieve such highly reliable results with basic building blocks whose characteristics are describable only in probabilistic terms.

There are differences, however, which do exist between the neuron and the logic element. For one, the particular way in which these input voltage levels are handled by a modern digital computer's logic elements is different from the way in which neurons handle incoming pulses. To put it simply, a logic element generates pulses on its output lines in response to single input pulses, whereas the neuron generally needs many pulses before it can produce a pulse. But this difference should not be considered an essential one, for it is possible to build computers from a different type of logic element, one which, like a neuron, requires the summation of many input pulses before an output pulse is generated. In fact this summing type of logic element is a more powerful computing element than the type operating by means of single pulses.[18]

There is a second and apparently more fundamental difference that exists between the neuron and any type of logic element now in use. On the one hand, the logic element is a completely deterministic device that, if working properly, always generates an output pulse when the proper input pulse or pulses have been received. Any uncertainty in the timing or size of the pulses is considered a cause for concern and steps are taken to make these uncertainties as small as possible. On the other hand, uncertainty seems to be a basic property of a neuron. Consider, for example, the situation shown in Fig. 5. It is impossible to predict, by any known methods, whether neuron 1 will emit an output pulse during any particular cycle of the sound wave. It cannot be argued that this uncertainty is simply a matter of particularly unfavorable conditions. For no matter how loud or soft the sound is made, the pattern of output pulses can still be described only in probabilities and not certainties. Furthermore, as was already pointed out, these uncertainties are not con-

Present scientific evidence does not prove or disprove the existence of the soul nor prove or disprove that humans are only biological machines.

fined to neurons handling sound information, but are characteristic, to some extent, of all neurons studied. It should therefore come as no surprise to learn that most of the mathematical descriptions of neural pulse trains use statistical and probabilistic methods.[19]

As so little is known about detailed interneuronal functioning, it is exceedingly difficult to try to contrast the operation of the brain at any level of organization other than that of the basic building blocks. It would appear, however, based on the differing characteristics of their basic building blocks, that the brain and the computer will prove to be very different. The modern digital computer is a completely deterministic machine, dependent for proper functioning on the unfailing operation of every single electronic component. By contrast, the brain can apparently tolerate considerable variability in the response characteristics of all of its neurons. Moreover, experiments have failed to show that the brain is dependent in its operations on any one neuron.[20] The wonder is that the brain is able to achieve such highly reliable results with basic building blocks whose characteristics are describable only in probabilistic terms.

IMPLICATIONS FOR CHRISTIANS

Lessons describing the characteristics of single neurons or chemical transmitters are not scheduled for inclusion in the educational curricula of the Christian Church. Yet modern scientific study of the brain is of importance to Christians because of the intimate relationship which exists between the brain and the mind. ("Brain" is here used to mean the physical organ. "Mind" is used in the psychological sense to mean "the totality of conscious and unconscious mental processes and activities"[21] of a person.) For it cannot be denied that altering and controlling the human brain has proven capable of altering the most intimate and personal aspects of human experience.[7] The use of antipsychotic drugs to control schizophrenia is but one example of the many ways in which drugs can be used to change fundamental aspects of human personality. There are also electrical[22] and surgical[23] means of altering the brain which greatly change human experience. In short, in its rapid development of ways in which to exert direct control over the brain, the neurosciences are also learning to control the human mind.

Ethical Implications

Many of the practical implications for Christians, and for other ethically minded people, of the new types of biomedical control have been clearly stated by others and do not need to be completely restated here.[24] However, it would be well to consider briefly one area of ethical concern which has particular relevance to brain research. This area concerns questions on the use and abuse of power.

Perhaps the most important point to be raised regarding the exercise of the new powers that neuroscience is creating is the one raised many years ago by C. S. Lewis.[3,4] In eloquent language, he pointed out that the powers created by science are never wielded by humanity as a whole, but by the small minority of people who happen to be in control at the time. It must be granted that so far, in this country, the powers of brain control have been used mostly for beneficial purposes, such as controlling schizophrenia and relieving the symptoms of Parkinson's disease. Indeed, it is with the long range hope of learning how to prevent and alleviate diseases and malfunctions of the brain that the large amount of federal support for brain research is granted. Yet, regardless of original motives, new powers of control are being created, and once created, these powers will be available to future controllers, whoever they may be.

As an example of the possible mischief that could be accomplished, consider the method recently suggested by two brain scientists for the control of violent crimes. Under this method, parolees, high risk ex-convicts, and people on bail would be required to wear physiological monitoring equipment connected by tiny two-way radios to a computer.[25] The computer's programs would continually monitor the signals telemetered to it by each radio. Whenever the programs detected an excited physiological state in a subject located in a suspicious place, an impending crime would be diagnosed. Police would be dispatched to the scene or an electrical shock would be applied to certain of the subject's brain centers, causing him to forget or abandon the project. Such a system is technically feasible now, but would be of little or no value, because only the crudest of estimates of the state of mind of a person can currently be constructed from physiological data, including brain signals. Even so, the subject, with constant surveillance of both his external and internal worlds and with the continual threat of instantaneous outside intervention, would suffer a much more profound loss of privacy and free will than in prison. These potential losses will no doubt become greater as the years go by, for brain scientists will be able to make increasingly accurate judgments about a subject's mental state and be able to influence it more exactly. Some may argue that though regrettable, such effects would be tolerable, for they would be confined to a small criminal segment of the population. However, criminals are still human. Moreover, history teaches us that anyone, irrespective of his actual offenses, can be declared a lawbreaker by the powerful. Moreover, many governments have demonstrated that the number of oppressed need not be a small number nor only a small segment of the population. Science is forging unique tools of great power. To believe that these tools may not someday be used ruthlessly against powerless people is to ignore the lessons of history. It is also to ignore the Biblical lesson that the kingdom of God is not yet established on the earth,[26] and that evil still exists.

There are several other ethical aspects of brain research that have been raised[24] that must be at least mentioned here. On the one hand, it is possible that some people without outside coercion will voluntarily use the fruits of brain research for self-degradation and dehumanization. The contemporary drug culture has graphically pointed out just how far this process can

go. On the other hand, much of the truly beneficial knowledge that is being developed will, for a long time to come, be readily available only to those limited segments of our country's and the world's populations that are able to obtain adequate medical care. Like all inequities, this distribution presents serious ethical problems. Taken together, all of these concerns indicate that further brain studies should be approached with great caution. It will require great wisdom to plan future research so as to obtain the maximum of beneficial results and at the same time to develop adequate safeguards against the misuse of the resulting powers. Christians, with the fear of the Lord which is the beginning of wisdom,[27] have important roles to play in this planning.

Theological Implications

The increasing ability of brain scientists to understand and manipulate the human brain and mind by using the techniques of the physical sciences has goaded some people to the belief that the brain must operate totally according to the same basic physical and chemical priciples that govern inanimate objects.[1,2] Implicit in this belief is a conviction that the mind is some aspect of the brain's functioning, with no existence apart from the brain. For it is without question that the brain controls the muscles of speaking and acting (cf. Fig. 1). If the brain's activities, and hence the person's words and deeds, were to be totally explainable by physical and chemical principles, then neither the brain itself nor anything acting on it would be exempt from following these principles. In short, the mind would have to be a manifestation of the activity of the brain, totally explainable by scientific principles, or it would have to be a totally passive spectator.

Although mechanistic interpretations of human behavior are not new,[28] there now seems to be fresh evidence to support these positions. What should we think of such hypotheses? Is a belief that the brain and the mind are just parts of a biological machine compatible with Christian beliefs?

Most Christians through the centuries have answered the last question with a resounding, "No". They believed that the essence of every person is a non-material immortal soul. Most Christians still believe that the soul goes immediately to its reward upon the death of the body. There, they believe, the soul will remain, independent of a body, until it is joined to a new and different kind of body at the final resurrection.[29]

It should be clear by this point in the paper that scientific evidence is not capable of deciding this basic disagreement between most Christians and the mechanists. The human brain's array of more than 10^{10} neurons, interconnected by means of neuronal pulses and other mechanisms, is of a complexity far beyond the ability of modern science to analyze and describe completely. The point was well summed up by Dr. H. Davis, a distinguished senior neurophysiologist. At a recent meeting of the Society for Neuroscience, he referred to the relationship between the brain and the mind as the neurosciences' toughest unsolved problem.[30] He further states that neuroscientists have learned not even to use physiological and psychological terms in the same sentence, because of the mysterious gap that exists between them. Some scientists even go so far as to say that the scientific tools needed to tackle that gap have not even been developed yet.[20] In short, understanding of the neural principles governing the brain's "higher" functions, with which the soul and the mind are associated, is much too rudimentary in nature either to support or to attack the traditional Christian position at this time. The first conclusion to be reached, therefore, is that present scientific evidence does not prove or disprove the existence of the soul nor prove or disprove that humans are only biological machines.

As brain research continues, however, knowledge of the workings of the brain will undoubtedly continue to grow. Increasingly complex models of neurons and neuronal interactions will be developed and some would see no barriers to eventually achieving arbitrarily detailed explanations of the brain. If that happened, there would be no need to talk about the soul, for all human actions would be predictable by scientific principles. It appears, however, that there may be naturally imposed limits to the ability of science to describe brain behavior. As we have seen, the present study of neurons has indicated that the uncertainties connected with the times of occurrence of the neuronal pulses are beyond current deterministic explanation. Thus, even if future scientific advances would make it possible to construct mechanistic models of each neuron in a particular brain and of all of their interconnections, it would seem unlikely that the actions of the brain model would be exactly those of the brain itself. For, as far as we can see now, the model of each neuron and perhaps each neural conection would have to include elements of uncertainty. Some models of the neurons represent these uncertainties by means of random variations in the threshold voltage level.[31] Others include uncertainties in the times at which the packets of chemical transmitters are discharged into the synaptic cleft.[32] By these and other means, most neuron models now incorporate an element of random behavior.[19]

Ever since the inception of quantum theory, scientists have suggested that the uncertainties of position and movement assigned by the theory to elementary particles might be important in the functioning of the brain.[33] As these uncertainties on the atomic scale are very small, various schemes have been suggested for amplifying their size[33] so as to produce effects at higher levels of organization. It would appear that the neuron is just such an amplification device. For, if the neuron models are accurate, uncertainties in the threshold level or in the times of transmitter release are events caused by uncertainties in the motion of a relatively few atoms and molecules. The unpredictabilities of these few particles would thus be reflected in the uncertain timing of the neuronal pulse, an event which controls the flow of many thousands of atoms and molecules. In any case, uncertainties, originally thought to hold only for atomic and molecular events, appear to be a fundamental characteristic of pulse events occurring in the neuron. And as the neuron is the basic building block of the brain, uncertainty is thereby introduced into the highest levels of its organization.

Science may never be able to decide whether or not human beings have free will or a soul.

A word of caution must be inserted here. The uncertainties observed in neural behavior might possibly be removed by future studies. One possibility is that investigations pushed to molecular levels of organization might yield deterministic descriptions of the emission of neurotransmitters by the vesicles. This particular eventuality seems very unlikely, for current investigations show that the times of neurotransmitter packet release do indeed seem to have random distributions.[34] Another possibility is that groups of neurons may be found which together have deterministic behavior. A logic element is an example of such a device. Its deterministic electrical output is made up of many electrons and other charge carriers, each of which can be described only in probabilistic terms. So far, however, there is no evidence of any groupings of neurons which produce completely deterministic outputs. Thus it would appear that some degree of uncertainty is indeed a fundamental characteristic of the triggering of neuronal pulses.

The theological implications of uncertainties in the functioning of individual neurons are unclear. Some have argued that unpredictable events in the brain would reduce the control that an individual has over his own thoughts and actions.[35] Others feel that uncertainty connected with brain events would provide a mechanism for free will to act that would not disturb the predictability of physical events.[33] Under this scheme, the will would be able to alter the individual brain events which happened at particular instants without changing the statistical properties of the events, which would be under the control of physical principles. Whatever the merits of these speculations, the existence of fundamental uncertainties in the timing of neuronal events would mean, subject to the qualifications given in the preceding paragraph, that science would never be able to construct a completely deterministic explanation of the functioning of the brain. The uncertainties in this explanation could very well be large enough to produce uncertainties in the basic decision-making processes of the brain, processes commonly associated with the will and the soul. Thus, a second conclusion can be drawn: science may never be able to decide whether or not human beings have free will or, by implication, a soul. In any case, the decision is a very long way off.

It would be irreverent to end this section and this paper without reporting the feeling of awe and wonder that steals over some neuroscientists as we contemplate the workings of the brain. Everything is so complex, yet, when understood, all of the parts prove to be beautifully fitted for the functions that they fulfill. Surely we are fearfully and wonderfully made.[36]

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3. Behavior Modification

A Psychologist's Perspective

The Manipulation of Human Behavior*

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While attempts to manipulate human behavior are very old, it is only recently that scientists have begun to study ways in which successful manipulation occurs. Research in the control of behavior through sensory deprivation, conditioning, and psychotherapy is typical of what is being done by psychologists who are interested in behavior manipulation. In view of the research findings, scientists—especially those who are Christians—must face several pertinent questions. Can behavior really be manipulated? What are the dangers in man's ability to control and manipulate? How do we prevent unethical people from using this knowledge for their own personal gain? Should we use these techniques of manipulation in the church? This paper gives some tentative answers to these questions.

Modern man is a manipulated man. While boasting of individual freedom, his behavior and thinking is controlled—sometimes subtly—by advertisers, political candidates, government officials, military leaders, counselors, employers, preachers, news media, social norms, and economic developments in the society. Publishing houses and research funding organizations manipulate the writer and researcher in his work. Parents manipulate their children, and children soon become skilled in manipulating adults. Teachers and students are involved in similar mutual manipulation. Even husbands and wives attempt, at times, to control the behavior of each other.

The attempt of one person to control the behavior of another is very old. It began with Eve and has continued throughout history. For the most part, the early methods of behavior control were discovered by chance. Some techniques worked and were retained. Others failed to work and were discarded to be replaced by some new method which, hopefully, would be more successful.

While non-scientific attempts to control behavior are old, the scientific study of behavior manipulation is, in contrast, relatively new. In psychology, experimentalists have investigated ways in which external and internal stimulation can change human and animal behavior. Clinical and other applied psychologists have sought to understand behavior with a view to removing, modifying or retarding neurotic symptoms; promoting adjustment and personality growth; resolving internal conflicts; stimulating learning; increasing efficiency of employees; and changing behavior in numerous other ways. It is not surprising that psychology has come to be defined as a science which seeks to understand, predict, and *control* behavior.

But the scientific investigation of behavior manipulation has not been limited to psychology. Biologists, geneticists, pharmacologists, economists, physiologists, sociologists, communication experts, and others have studied the problem empirically and have shown that human behavior can be altered and controlled with a high degree of efficiency. Space does not permit a survey of recent research developments concerning the control of behavior by shock or other physical stimulation, surgery and electrical stimulation of the brain, manipulation of genes, drugs, group pressure, mass media, hypnosis, persuasion, education, or the arousal of fear.[1]

For many people, the words "manipulation" and "control" of human behavior have a bad connotation. Popular novels such as Orwell's *1984*, Huxley's *Brave New World*, or *Walden Two*—written by B. F. Skinner, a prominent research psychologist—have led us to fear the implications of one person having the power to control and manipulate another. In our lifetime we have seen men like Hitler, Stalin, and Mao Tse-Tung control the behavior of millions and we are concerned lest such manipulation power again get into the hands

*Earlier drafts of this paper were presented at regional meetings of the North Central and New York Metropolitan Sections of the ASA.

of ruthless despots. Until recently, however, most scientists have been reluctant to consider the moral implications of this knowledge. We have worked on the hopeful assumption that an issue which is ignored will eventually disappear and perhaps even solve itself. It is now time for science to face the fact that we have uncovered some powerful and potentially dangerous manipulation devices.

Following a definition of behavioral manipulation, the remainder of this paper will summarize experimental evidence from three selected areas in psychology, and discuss some of the ethical implications of man's ability to control and manipulate behavior.

DEFINITION

Although there may be some technical differences between "control" and "manipulation", in this paper the terms will be used interchangeably. Following the lead of Ulrich and his colleagues (1966), behavior control or manipulation can be defined as *the changing of environmental conditions to which an organism is exposed so as to bring about a definite behavioral result.* The result may be a production of new behavior, a maintenance of existing behavior, and or an elimination of undesirable behavior.

EXPERIMENTAL EVIDENCE

1. *Reduced environmental stimulation* (more commonly referred to as "sensory deprivation") became a topic for careful psychological study after a number of solitary explorers, shipwrecked sailors, and isolated prisoners of war had published autobiographical descriptions of their reactions to being alone. Admiral Richard Byrd (1938), for example, voluntarily spent 4½ months alone in the antarctic. He recorded his experiences in a diary and later described his reactions in a book. Originally, Byrd had hoped to "taste peace and quiet and solitude long enough to find out how good they really are." Instead, in the dark polar night, snowed in, confined to the monotonous unchanging surrounding of a small space, and with little or no sound from the outside, his life became a nightmare. He experienced absent-mindedness, hallucinations, severe depression, loss of motivation, fears, and strange ideas that he was floating like some disembodied spirit in timeless space. In his own words, he "felt the tremendous need for stimuli from the outside world and yearned for sounds, smells, voices and touch." During the Korean war psychological and physical isolation was one technique used by Communist Chinese brainwashers to control the thinking and behavior of prisoners.

We have worked on the hopeful assumption that an issue which is ignored will eventually disappear and perhaps even solve itself. It is now time for science to face the fact that we have uncovered some powerful and potentially dangerous manipulation devices.

In the early 1950's a group of psychologists at McGill University conducted the first of several experimental studies to determine the influence on behavior of reduced environmental stimulation (Bexton, Heron and Scott, 1954). Undergraduate volunteers were paid $20 a day to come to the psychology department and essentially do nothing. Both the rate of pay and the job description must have sounded attractive. A number of people volunteered and were requested to lie on a comfortable bed in a semi soundproof room for as long as they wished to stay. They wore translucent goggles and long cardboard cuffs which extended beyond their finger tips. This prevented them from looking around and reduced tactile stimulation. Eating and going to the toilet were the only deviations from this inactive routine.

At first, the subjects passed the time by thinking about their studies, their friends, their personal problems, and other matters. Then most fell asleep. When they woke up the trouble began. They became bored, restless, irritable, and hostile towards the experimenters. They engaged in fantasy and appeared so eager for stimulation that they would talk to themselves, whistle, sing, or recite poetry. Some experienced auditory or visual hallucinations and when they were tested with intelligence, perceptual-motor, learning, and thinking tests, most showed a marked impairment in their functioning.

The original work at McGill gave impetus to several related studies. In one of the most dramatic of these, subjects were equipped with a breathing apparatus and then were submerged to hang suspended in a tank of water (Shurley, 1960). In this and similar studies the results of the McGill research were supported (Zubeck, 1969).

On the basis of this work, we know that human behavior can be altered by reducing the input of stimulation. Some of the practical implications are obvious! If a person is kept in solitary confinement his intellectual and perceptual functioning will be impaired, he will become more open to the suggestions of others, and his behavior will become more easily controlled and manipulated. Children who are raised in isolated environments develop at a slower rate, have more disease, and often develop psychological abnormalities which cause them to be misfits in society (Goldfarb, 1945).

But the studies of reduced environmental stimulation also have more positive implications. One study has shown that a reduction in stimulation interferes with efficient functioning in pilots. With this knowledge, the people who are responsible for military and space programs can be aware of the need for changing environmental influences as pilots and space captains guide their vehicles on long journeys. On the ground, policemen, highway department officials, and researchers studying accident prevention, should be alert to the impact on drivers of long monotonous trips and unchanging stretches of road. Physicians are recognizing that some of the disorientation and inefficient thinking of people who are in respirators or casts, and some of the disorientation of older people who live in lonely rooms may be due to the lack of changing stimulation. In addition, we all know that if someone gives a talk which is boring (i. e., not very stimulating) the listener's mind wanders. He thinks about other things in an attempt to provide

himself with an adequate level of stimulation. This presents a challenge to any speaker who wants to manipulate the behavior or thinking of his audience.

All of this is complicated by the recognition that there are individual differences in the way people respond to reduced stimulation. Nevertheless, an appreciation for the importance of adequate stimulation and an understanding of the disruptive influence of reduced environmental stimulation enables us to control and manipulate behavior more effectively.

2. *Conditioning* and the whole field of behavioral modifications through learning techniques is another area of special interest to psychologists. Here the work of Ivan Pavlov and of B. F. Skinner are primary in a monumental body of research.

Ivan Pavlov was a Russian physiologist and Nobel prize winner, interested in the study of digestion. As every beginning psychology student soon learns, Pavlov discovered that the flow of saliva in a dog's mouth was influenced not only by the taste of the food, but also by the sight and anticipation of food. This observation led Pavlov to perform some experiments in which he discovered that if a buzzer was sounded immediately prior to presentation of the food, salivation would begin in response to the buzzer. Pavlov called the buzzer a conditioned stimulus. It was a stimulus which had originally brought no response from the dog but which the animal learned to associate with food. The saliva which flowed in response to the buzzer was called the conditioned response.

In the early 1920's, two psychologists described a study in which they had applied Pavlovian Conditioning techniques to the learning of emotional behavior in children (Watson and Rayner, 1920). A nine-month-old child named Albert was observed as he played with some little animals including a white rat, a rabbit, and a dog. At no time did the child show fear of this situation. Then the conditioning began. Whenever the child touched an animal a loud noise sounded behind him. (One of the experimenters hit a suspended steel bar with a hammer to make the sound). This sound scared Albert and caused him to cry. Quickly he learned to associate the animal with the noise, just as Pavlov's dogs had associated a buzzer with food. Whereas the dogs salivated at the sound of the buzzer, Albert began to cry at the sight of the animal.

On the basis of their work, these researchers suggested that many of our fears and phobias are really emotional reactions that we have learned by conditioning. If this is so we should be able to get rid of them by conditioning procedures. Other experimenters used conditioning techniques to take away a child's fear of animals and they succeeded in restoring him to his normal pre-experimental state.

This and similar research stimulated a number of attempts to use conditioning procedures for the control and elimination of such undesirable problems as bed wedding, asthma attacks, and excessive drinking.

One interesting study treated drinkers with Pavlovian conditioning procedures. First, the subjects were given a drug which normally produced vomiting. Immediately prior to the vomiting they drank an alcoholic beverage. It was hypothesized that the alcohol would become a conditioned stimulus which would be associated with vomiting. The procedure was somewhat humorously described as follows:

> Each patient was responsible for bringing a towel, blanket and a bucket to the treatment room (these patients soon became known as the "bucket brigade"). While in the treatment room, conversation was restricted and attention was focused only on the alcoholic beverage. Each man was obliged to fill his own water glass from his individual pitcher. It is necessary that the patients consume fairly large quantities of tepid water, occasionally in the amount of two liters during the treatment session, as it seems to potentiate emesis and also obviates "dry heaves."
>
> On entrance into the room, patients are requested to take places around the table. They are cautioned to refrain from conversation and to concentrate intensively upon the alcoholic beverages before them. Each patient drinks two glasses of tepid water and then receives an injection of emetine mixture. Each therapist is provided with a data sheet upon which he records the amount of medication given his patients, the time of onset of emesis, and general behavioral observations.
>
> Shortly after the injection is given the members of the group are requested to uncap the liquor bottles, open the beer, and pour themselves a 2-oz. glassful of the beverage of their choice. At frequent intervals each man sniffs at his glass, and only when gagging begins, or when it seems likely that the individual is about to vomit, is it suggested that he drink the liquor. Between bouts of emesis the patients are encouraged to drink copious amounts of water and as many different beverages as possible are included in the pour-sniff-drink routine.
>
> Sessions usually last from 30 to 45 minutes. The group is not released until all doubt is dispelled from the mind of each participant that he cannot tolerate any of the alcoholic beverages on the table (Miller, Dvorak, and Turner, 1964).

Well over a hundred attempts have been made to treat alcoholism with conditioning procedures, such as this. The success of these attempts has been varied, but in the study described about half of the subjects stopped drinking altogether and the others cut back in their alcoholic consumption, at least temporarily.

Psychotherapy is a procedure wherein a professionally trained person, known as a therapist, seeks to manipulate, control and modify the behavior of another person, known variously as a patient, client, or counselee.

While Pavlov's work has led to some interesting attempts to control human behavior, the research of B. F. Skinner at Harvard has been the stimulus for most of the recent conditioning studies. The greatest part of Skinner's work has been done with pigeons who are trained to peck at a round disc in return for food. This food is called "reinforcement" because it strengthens or reinforces the pecking behavior and increases the likelihood that the pigeon will peck again. Skinner found that the pigeon's behavior could be effectively manipulated and controlled by the presentation of appropriate reinforcement.

But could the same principles be applied to human behavior? There are now several hundred studies which suggest that the answer to this question is "yes". Human behavior can be manipulated and controlled by reinforcement. Some researchers on the west coast, for example, have shown that the content and speech

duration of a person in an interview can be directly controlled by the utterances, head nods, and "Mm-hmm's" of the interviewer (Matarazzo, 1965). A job seeker or distressed patient is usually anxious to please the interviewer. For this reason even a slight smile or head nod from the man behind the desk is reinforcing to the person being interviewed and encourages him to continue the behavior or topic of discussion which was reinforced.

By administering desirable reinforcement following acceptable behavior, and withholding reinforcement following undesirable behavior, psychologists have been able to change the behavior of uncooperative children so that they cooperate; modify the behavior of mute psychotic patients so that they talk; control the actions of schizophrenics; eliminate thumbsucking, stealing, crying, tantrums, stuttering, excessive vomiting, hyperactivity, and social withdrawal in children; control overeating; eliminate phobias; train retarded children; treat neurotics; and eliminate undesirable sex behavior.[2] I have even heard of studies in which the behavior of speakers has been controlled by the members of the audience—sometimes with neither the speaker nor the audience being aware of what is happening. Apparently, the research behavior of scientists is manipulated by the giving of research grant reinforcements for performances of one type of research behavior and the withholding of reinforcements for proposals to study something else. Dr. Skinner, the man who started most of this, has himself shown how teaching machines can provide reinforcement at the most desirable time and bring about more efficient learning (1968).

Of course there are critics of these conditioning procedures both within the field of psychology and without. Some have pointed out that conditioning doesn't always work. But more often it does work, and I suspect that the terms "reinforcement" and "conditioning" describe many of the manipulation techniques which we use to control the behavior of our children and of each other.

3. *Psychotherapy* has been defined as:

> A form of treatment for problems of an emotional nature in which a trained person deliberately establishes a professional relationship with a patient with the object of removing, modifying or retarding existing symptoms, of mediating disturbed patterns of behavior, and of promoting positive personality growth and development (Wolberg, 1954, p. 3).

To me this is another way of saying that psychotherapy is a procedure wherein a professionally trained person, known as a therapist, seeks to manipulate, control, and modify the behavior of another person, known variously as a patient, client, or counselee.

Of course psychotherapy is not exclusively a function of psychologists. Psychiatrists, social workers, pastoral counselors, and many others spend their lives attempting to help distraught, confused and unhappy people to change their behavior in ways that will make their lives happier.

Psychotherapists use different techniques and have different goals, depending somewhat on the patient's problem and on the therapist's personality, abilities, and theoretical position. Some therapists attempt to change behavior by encouragement, support, and reassurance; some try to promote patient insight into problems; some try to teach new methods of behavior; some encourage patient expression and ventilation of pent-up feelings; some give advice and suggestions; some make interpretive statements about patient behavior; some work with individuals; some work with groups; and most therapists use a combination of these techniques.

It has been estimated that at least 200,000 Americans are paying anywhere from $5 to $50 an hour to get help from psychotherapists. Since people are willing to pay to have their behavior changed in this way, the implication is that psychotherapy works. At present, however, nobody has empirically demonstrated this. H. J. Eysenck (1952), a British psychologist, who has devoted considerable effort to research in the effectiveness of psychotherapy has concluded that psychotherapy, psychoanalysis, and other such treatment techniques are ineffective and valueless. Eysenck and a number of professionals who agree with him would surely applaud one critic's definition of psychotherapy as "an undefined technique applied to unspecified problems with unpredictable outcomes."

Few psychologists are willing to throw out psychotherapy, however. In the first place, it is one of the best techniques thus far devised for treating distraught behavior. Secondly, present research concerning therapeutic effectiveness or lack of effectiveness, is far from convincing. To a large extent this is because research on therapy is very difficult. The therapists (especially the insecure ones) often are reluctant to be investigated; it is important to insure that research does not interfere with a patient's treatment; it is difficult to arrive at satisfactory criteria of "improvement"; concepts like "insight," "catharsis," or "degree of rapport" are almost impossible to measure; and since it is unethical to withhold treatment from people who want it, we have difficulty getting control groups.

I do not believe that we can trick or psychologically manipulate a person into become a Christian.

Perhaps Rosen and Gregory in their text on abnormal psychology give the best answer to the problem of therapy's effectiveness. "Since no research so far performed has succeeded in the difficult, and perhaps impossible, task of controlling all the relevant patient and therapist variables while conducting a study of adequate size, there is to date no definitive proof or disproof of the effectiveness of psychotherapy" (1965, p. 219). Undoubtedly psychotherapists do control and modify behavior, although the evidence in support of this is still incomplete.

CONCLUSIONS

Man's increasing ability to control, manipulate, and modify the behavior of other men, raises a number of ethical issues which scientists and Christians cannot ignore. From my perspective as a psychologist it would appear that we must face at least four pertinent questions.

1. **Can we control and manipulate human behavior?** I am reminded of Dr. Elving Anderson's address to the A.S.A. a few years ago (1966). In dis-

cussing genetic control he suggested that it is not a question of can we or should we control—we are already doing it! In the case of psychological manipulation, some of the techniques are exceptionally subtle. Not only do we control behavior now, but as research continues—and I doubt that it would be possible or desirable to stop such studies—our abilities to control and manipulate behavior will be even greater.

2. **What are the dangers in our ability to control and manipulate behavior?** The danger is not in the research findings but in their potential misuse. A few years ago, a physicist, Dr. A. R. Oppenheimer, in addressing members of the American Psychological Association, gave a similar warning. "The psychologist can hardly do anything without realizing that for him the acquisition of knowledge opens up the most terrifying prospects of controlling what people do and how they think and how they behave and how they feel" (1956, p. 128).

As was suggested at the beginning of this paper, sometimes we avoid using the words "control" and "manipulation" because we don't want to face the moral, ethical, and legal implications of the fact that our techniques could be used to enslave people, depersonalize them, and control them by a means so subtle that they would never realize that they were being manipulated.

When faced with this possibility we must remember two things. First, in our complex society some control of human behavior is inevitable. The government, the economy, and the mores of the culture all exert a control which is essential to our survival as a civilization. Secondly, we must realize that the techniques which can enslave people are also able to free men in order that they might be more happy and productive. The same reinforcement techniques which could make us into robots, could also change our educational procedures so that we are able to learn with greatly increased efficiency. The same sensory deprivation studies which bring about psychotic symptoms can also help us to understand old people or to prevent automobile and airplane accidents.

3. **How can we prevent unethical people from using these devices to serve their own selfish ends?** I suspect that the answer to this question lies in an increased awareness of ourselves and of the world in which we live. There are at least five ways by which this awareness can be increased.

a. We can conduct research into the nature of behavioral control and manipulation. The attempts to study the effectiveness of psychotherapy are steps in this direction and so are a whole series of studies designed to show how to resist persuasion.

b. We can increase communication between the general public and research investigators. If the public knows what we are doing, they are less likely to be manipulated against their will and they are less likely to be influenced by sensationalist writers. It has already been empirically demonstrated that awareness of the manipulator's goals and techniques is a good way to resist manipulation.

c. We can learn more about ourselves—our needs, our values, our emotions. We cannot be easily manipulated if we know more about ourselves than does the would-be manipulator.

d. We can learn to see each other as persons, rather than manipulable objects. According to Elton Trueblood, we must "make a real effort to see persons as *persons*—and not as our servants or masters or teachers or students or steppingstones for our own progress" (1961, p. 110). We are less likely to manipulate others when we remember that each of us has feelings, aspirations, frustrations, and hopes.

e. We must realize that if the nature of man can be changed so that he is under the control of the Holy Spirit, he will not be involved in manipulating other people for selfish motives. Such a change in nature comes only when an individual realizes his sin and need for a savior and invites Christ to be Lord of his life.

A few years ago, B. F. Skinner (1955-56) suggested that there is another way to prevent the misuse of controlling power. We must continue to work out laws and systems of government which prevent the strong man from using his power to enslave others. "Control itself must be controlled" by group pressures, and by governmental and religious measures.

4. **Should we use techniques of behavior manipulation in the church?** This question is of special concern to evangelical Christians. Pastors, Christian education directors, missionaries, Sunday school teachers, and other church leaders are actively involved in the work of manipulating other people's behavior. We want, for example, to bring men who are unsaved to a saving knowledge of Jesus Christ. We want to assist the believer to grow in his faith and to live a purposeful spiritual life. We also want to train Christians so they can study the Word of God on their own and spread the Gospel through effective witnessing. Since so much is known about behavior manipulation, should we be using psychological techniques in order to bring about these changes in behavior? Should we be using these manipulation techniques in world evangelism?

Difficult problems rarely have simple solutions and so I leave these questions without an answer. Let me conclude with one personal opinion, however. I do not believe that we can trick or psychologically manipulate a person into becoming a Christian. It is the Holy Spirit, and not any psychological techniques, who works in men's lives to convict them of sin and of their need for Christ. In a recent address the president of Moody Bible Institute dealt briefly with this issue:

> I shall respect each man's right to his faith or even lack of it. But that does not mean that I shall not attempt to convert him. I'll oppose any attempt to coerce him, or force him by physical or other means to a decision against his will. For I believe God wants only the glad-hearted, willing surrender of a heart to Himself.[3]

Nevertheless, pastors, evangelists, and other Christians are currently using psychological techniques—sometimes in ignorance—in an attempt to change behavior. As a result of this preaching people are sometimes "won" as "converts." But the man who is persuaded by gimmicks is not really converted. No wonder he "falls away." Psychological techniques of manipulation can be misused in the church. Whether they can or should be used as a vehicle through which the Holy Spirit works, is a question which I leave for some theologian or Bible Scholar to answer.

FOOTNOTES

[1]There are several concise surveys of research in the field of behavior manipulation. The interested reader might check the work of Biderman and Zimmer (1961), Brown (1963), Farber and Wilson (1961), Neuringer and Michael (1970), Sonneborn (1965), Uhr and Miller (1960), Ulrich, Stachnik and Mabry (1966) and Zubeck (1969).

[2]Most of this research is described in Ulrich, R., Stachnik, T., and Mabry (1966), and in Neuringer and Michael (1970).

[3]From a sermon delivered during the 1967 Founders Week Conference by William Culbertson, Moody Bible Institute, Chicago, Illinois.

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PART II - HUMAN MEDICINE

Christianity and Medical Frontiers

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Utopian Outlooks

All utopian outlooks have a curious similarity. Whether they approach the human predicament in terms of scientism, communism or Consciousness III, they tend to assume that the given order of things – if indeed they recognize an "established" order – places no restrictive limits on human proposals to radically alter and master man and society. They assign no governing role to God in the external sphere of nature and history; they suppose that man's future is open to wholly new possibilities; and they consider man himself free to chart the future of the human species. Human nature is regarded as evolving and as open to a superman or superrace (which Nietzsche mapped one way and the Nazis another). Man is considered the Kingdom-maker and his condition is thought to be unflawed by original sin.

When scientism shares this utopian mood, as for example in the writings of the Cambridge anthropologist Edmund Leach, the empirical spirit approaches nature and man on premises not unlike those with which revolutionary theologians approach history. No divinely-given plan or purpose, no created order or structure, need get in the way; the road to a promising future is that of dramatic surgery or revolutionary change. More moderate and mediating alternatives are regarded as concessive and reactionary. As in history so also in the laboratory, eschatological transformation becomes a near-term ambition, and every next major breakthrough hopefully holds millennial possibilities.

The Biblical View

I mention this utopian mentality at the outset simply to bring the biblical view into early focus. The Bible too holds out the prospect of a future of man open to radically new possibilities. But it does so in the governing context not of human ingenuity and power but rather in terms of divine redemption from sin and the moral revival of man. God's new man, his new humanity, is conformed to the moral image of Jesus Christ, and will be "cloned" at last in a resurrection body beyond sin and death. In the biblical view God's revealed will and operative providence in the creation define the limits of human freedom; without God, man the creature would not and cannot be truly free, cannot be

good, and in fact would not even be.

In the obstacles that nature erects to unlimited scientific manipulation God is in fact saying something both about nature and about himself, even as he does in the restrictions that human history imposes upon utopian revolutionaries and their millennial programs. The scientist is constantly brought to terms with the given in nature. This is not the case only when evolutionists discover that primates they consider to be as closely related as the gorilla and man differ so much genetically that they cannot crossbreed. It is the case also at other frontiers, frontiers that the brilliant medical technology of our times is now bringing prominently into view.

Conquest of Suffering and Death

A key test of the scientific spirit is what modern man proposes to do with suffering and death. Contemporary medical technology seems increasingly devoted to its human conquest. In the Judeo-Christian view suffering and death, whatever may and ought to be done to relieve and postpone them, are part of the givenness of present human existence, inevitabilities complicated by sin, yet retaining for the person of faith both moral and spiritual lessons that contribute to the enrichment of life. Death is not for the Christian either a finality to be accepted with acquiesence or a foe that can be humanly destroyed; the only real dignity with which it can now be faced stems from God's gift of grace. Death has become an enemy whose sting is sin; only where grace wrests the moral victory from the foe does death become the transition to a greater good.[1]

Modern technology seems increasingly disposed to all-out war against suffering and dying as if these universal experiences were a needless human concession to a malign or indifferent cosmic order. It projects its assault upon them as if no limits exist to man's conquest of these hostile powers. Even the surgeon or family physician is now tempted to consider himself a failure if his patient dies. The secular modern is not ready to accept death either intellectually, volitionally or emotionally, except as a few stony intellectuals consider man to be a meaningless fragment of animated dust with no more future than the beasts of the field. The modern perspective in turn leaves secular man both unprepared to die and unprepared to live as he ought, that is, fully aware of the implications of finite and sinful existence and in view of the ministry of divine grace and the moral lessons that life holds for the spiritual man.

Only in the biblical view can suffering be purposive; in a non-Christian view it is only an enemy. In the biblical view the Suffering Servant is indispensable to human redemption, and the suffering of the righteous man is sanctified by his suffering, death and resurrection. To commit one's self to the biblical understanding of life and death and of the world to come carries for the secular spirit too high a price in the way of spiritual decision. Hence he expects the medical practitioner to bestow not only the gift of health and a welcome deliverance from affliction but something hopefully more than what the Christian recognizes as at best only a temporary delay of death. In this transferal of hope, death ceases also to be a delay of what the New Testament declares to be not only "better" but "far better" for the believer, that is, "to be with Christ" (Phil. 1:23).

The loss of spiritual frontiers in the modern probing of medical frontiers therefore risks the tantalizing but misleading implication that science holds potential for shaping a new creation. Finite man through a misdirected hope meanwhile loses his share in the new creation that God offers, and expects from his present state — for all that science can do to improve it — more than the limits of his being allow.

By no means, however, are these reflections to be taken as a questioning of the profound usefulness of scientific learning. Few people today would want to turn back the clock on the scientific revolution; even its counter-cultural critics today hitchhike on a technological civilization while airing their grievances. Technology in some respects is as ancient as civilization; without access to water, disposal of sewage, and ready transportation, human communities soon wither. The widespread relief of human suffering, the fostering of health and preservation of life, has yielded worldwide benefits.

Yet the tentative nature of all scientific hypotheses is becoming evident in ever costlier ways. The more sophisticated our solutions, the more devastating is their destructive potential. Not only the field of medicine, but all scientific endeavor, engages in a balancing of risks. The scientific method is unable to identify finalities and absolutes; its role is rather a gradual elimination of long-revered myths and the reduction of inferior alternatives. When he openly acknowledges these limitations the scientist is to be commended; if the theologian must say "now we know in part," much more must the empirically-dependent technician acknowledge the restrictions his methodology imposes.

Isolation of Knowledge from Ethical Use

The isolation of scientific knowledge, medical knowledge included, from the question of its ethical use is a crucial concern for contemporary civilization. The utility of science is primarily connected with human comfort and convenience, and these often become synonyms in contemporary culture for human betterment. The earlier vision of science as an instrument serviceable to the glory of God, by its extension of his moral purposes in the world and by the social implementation of the good, has faded away in recent generations. As secularism encroaches upon modern life, fewer and fewer influential spokesmen press the question: "What *ought* scientific knowledge to be used *for*?" Even the conviction that the medical profession has its goal solely in the preservation of human life is challenged. Abortion, euthanasia, and recombinant genetic research also in frontier modes that anticipate a deliberately altered human species, frame the role of medical science in a notably different way. The mere mention of such modern developments as nuclear warfare and ecological pollution reflect the correlation of scientific learning with technical advances that threaten human survival itself. As ethical connotation terms are secularized, moreover, concepts like "quality of life" are formulated in an amoral way: 44% of Americans think life's quality has worsened in the past decade, according to a Harris poll. What do they mean by *quality* of life? They point specially to air and water pollution, energy costs, inferior

product serviceability and safety, in short, to predominantly physical concerns and consequences, although a number do hold that a deterioration of education has contributed also to the depreciation of life quality. Of no less importance is the fact that the detachment of scientific utility from the question of moral norms strips the scientist himself of any firm basis for relating his scientific contribution to the good. Indeed, it leaves him without any firm basis for defending the value of science itself.

Because the scientist uses a restricted professional methodology, one that is ideally appropriate to identifying certain empirically observed sequences, has he no responsibility for distinguishing between moral and immoral uses of scientific knowledge? Anyone familiar with American Association for the Advancement of Science conventions in recent years, and with publications like *Science* magazine, cannot but be aware that many scientists now raise ethical issues with a zeal seemingly intended to compensate for long decades of neglect. This accelerating moral concern is to be fully commended, even if its tardy pursuit tends to grapple with many issues at the level only of mid-course correction.

Adam's eating of the Edenic tree of knowledge without moral sanction and ethical commitment cost him spiritual life. The temptation is now commonplace to devour the fruit of the tree of knowledge in order to become like gods. But knowledge pursued in moral alienation and indifferently to the good while it reaches for omniscience invites demonic manipulation and deployment of what we know. Our generation has passed beyond the end of the age of technological innocence, and antichrist seems ever eager to monopolize the results of scientific learning.

Because the scientist is a man like other men, he like others is answerable to the express will of God for his creation. That answerability extends to the purposes for which the scientist seeks knowledge, and the use for which he commends and approves it.

I am not here arguing that it is better not to have knowledge than to run the risk of its misuse. God himself does not conceal the revelation of himself because humans may distort and revolt against spiritual knowledge. By declaring all men to be sinners, the religion of the Bible emphasizes not only that humans are ignorant of much that they can know about God, but that humans in fact also possess revealed knowledge about God which rebellious man deploys. If man is divinely made for the knowledge of God, he need not balk at knowledge of God's universe. Ignorance may also be a sin, especially if one might have had knowledge that could have been used serviceably to the good. If, however, that knowledge is sought in rivalry with knowledge of God, or indifferently to God's claim upon man and the cosmos, we have a very different situation. Nor is our primary problem that of sharing scientific knowledge with developing countries that might misuse it; if the developed countries will moralize the use of knowledge, the developing countries will not be a major problem.

Knowledge and Its Use

Against those who insist that "knowledge is good (period)" the question needs to be pressed whether we can excusably draw an absolute line between knowledge and appropriation in this way. We are here faced again with the crisis of Eden: we want to touch the tree of knowledge quite indifferently to God's consent and purpose. To perpetuate a divorce of scientific learning from the knowledge of the good is a costly development, the more so as scientific learning multiplies and concern about the good deteriorates. It may precipitate the destruction of the very civilization and culture that some spokesmen for science had only a few generations ago hoped to lift to the brink of utopia.

The more sophisticated our solutions, the more devastating is their destructive potential.

In this judgment I wish to avoid blaming science for decisions that are taken individually by human beings and in which nonscientists no less than scientists are involved. Yet the fact is that scientific learning all too readily accommodates a game of roulette in which moral questions are postponed until it is too late to moralize the choices. Can one wholly escape culpability if he operates an escort service that enables one, in observing new frontiers, to walk so invitingly near the brink of perilous enjoyment that hazardous participation becomes well-nigh irresistible?

The breakup of the American home doubtless has many contributory causes, and there is no reason to think that even apart from certain recent scientific developments the society of the West might not have notably declined through alternative ways of expressing its spiritual vagabondage. But before the production of the birth control pill premarital intercourse by almost a third of all teenage girls between 15 and 19 years of age in the United States was unthinkable. The fact that as many teenage mothers now undergo abortions in the more risky second term of pregnancy, rather than in the first term, indicates that other than prudential considerations control their appropriation of modern technical information, and that scientific techniques are welcomed because they accommodate sexual permissiveness hopefully with impunity. We have felt only the first shock wave of social upheaval in a society that postpones moral judgment to a sunset interaction and gives to the questions "Is it physically safe?" or "Is it useful?" a priority over the question "Is it good?" When Jesus said "Ye shall know the truth and the truth shall make you free" (John 8:32) he did not mean "free of an unwanted fetus" or free of ethical answerability.

Nor am I saying that the Christian theologian has undiluted advance wisdom about every decision to be made in the application of scientific possibilities. The Bible does not give us quick answers to all questions. But it does provide clear divine information about some matters. It insistently raises the question of *why* we propose to do what we do. Over all that humans think and do it inscribes the words *what for?* It nowhere encourages us to postpone the moralizing of our interests while we touch the tree of knowledge inquisitively. The Bible does not speak directly concerning some proposals, yet it is not therefore without relevantly applicable principles. It strips away any justification for human decision solely on the basis of prag-

matic considerations. The Bible rejects human fear and pride as adequate motivations and declares the fear of God to be the beginning of wisdom in every human enterprise.

Atomic Power

The moral question confronts us with special urgency in respect to recombinant genetic research even as it has already confronted us in respect to atomic power. It is beyond the capacity of human wisdom to calculate and balance potential benefits and liabilities in these developments. The Bible underwrites no rationale for producing the atomic bomb because Nazi scientists might otherwise achieve it first, or for pursuing recombinant genetic research because Soviet scientists might beat us to a breakthrough.

Not simply by concentrating on physical consequences while minimizing questions of ethical appropriation, but also by reading its experimental verdicts in a maximally optimistic way scientism betrays its fascination with gnosis. The crisis in atomic energy today mirrors the terrible dilemma of a generation that detaches moral imperatives from its investigative genius. Atomic fission was heralded as carrying the prospect of an end to war and the promise of a new age of inexpensive energy. The outcome has been very different. And many now ask whether scientists who hailed their creation of the bomb as signaling the dawn of a luminous atomic age should not have known and said also that there is no known way to handle atomic waste. Touching this branch of the tree of knowledge has thrust us into an age in which atomic waste can be reprocessed into destructive nuclear bombs; and it has not significantly carried us forward toward a solution of the global energy crisis. If two things are to be added about the French government's recent announcement of the discovery of a new way to enrich uranium for power plants that eliminates the risk that the material could be used for nuclear weapons, the second is that, even if the process proves practical, it will also prove to have unforeseen side-effects.

Recombinant DNA Research

Can we presume that technological genius operating neutrally in a context of moral ambiguity and spiritual revolt decisively advances civilization? The problem now begins to face us urgently in the sphere of genetic experimentation, where all the motivations that underlay atomic experimentation are once again asserted. Some social critics affirm that recombinant genetic engineering could create more affliction than it relieves, that it may fashion a monster that will destroy us all; others claim it could cure cancer and other crippling diseases and lift the human species to new potentialities.

Recombinant genetic research cannot as such be considered an intrusion into nature, since the principles of mutation and species variation are already operative throughout the plant and animal kingdom. Yet the range of genetic exchange among living forms in most instances are very narrow. While the genetic code is universal, nature significantly restricts the exchange of genetic information between widely divergent species so that, heretofore at least, it has not been possible to cross major species barrier.

With the advent in the 1970s of recombinant molecular technology, however, geneticists engaged in the further manipulation of life. The test tube recombination of DNA molecules from organisms that do not usually exchange genetic information creates a new situation, one that is stirring wide debate over the ethics of genetic engineering, over the safety of such experimentation, and over the regulation and legislation appropriate to such research.

Atomic fission was heralded as carrying the prospect of an end to war and the promise of a new age of inexpensive energy. The outcome has been very different.

Yet the recombinations presently described have also already in principle occurred in nature, in the phenomenon of so-called "jumping genes" or transpositions of fragments of DNA from one organism to another. In 1974 the microbe that produces meningitis in infants acquired from an unknown source a plasmid carrying the gene that resists the antibiotic ampicillin. In 1976 it was noted that the organism responsible for gonorrhea acquired a plasmid also encoding for resistance to ampicillin. More recently plasmids have been recognized in *streptococci,* the organism productive of "strep sore throat," and this could hold profound medical significance, perhaps reverting us to the pre-antibiotic era.

Revealed religion offers technological civilization its only persuasive means for overcoming the isolation of knowledge from ethical applications.

The dilemma now confronting us concerning the exchange of genetic information transcending normal species barriers is that of adequacy of containment and appropriateness of research. It should be noted that medical science has faced biohazards whenever it has investigated and treated infectious diseases; precisely in the face of such risks, the polio vaccine and other scientific advances were achieved. It may well be that criticisms of genetic engineering and scenarios of disaster are greatly exaggerated. Yet prudence calls for caution in the area of the unknown, and a few observations on what presently seems to some of us to be the wisest course may at least provoke counter-suggestion in the area where theologians and scientist alike must settle for some political compromise.

Most of us are almost as reluctant to see legislative controls on freedom of scientific research as we are on freedom of religion. The record of political omniscience is hardly more impressive than pretensions of scientific omniscience. Where research has a therapeutic objective, legislative controls should be avoided. Governmental licensing of researchers would multiply bureaucracy and introduce possibilities of political influence and intervention that a free society should resist. Guidelines issued by the National Institute of Health

to safeguard public life and health already include both physical and biological containments that reduce biohazards from recombinant genetics to a minimum, and should be extended to include all recombinant molecular research regardless of the source of funding for such projects. Such guidelines, moreover, should be periodically revised as new information becomes available.

Scientists should be pressed to distinguish experimentation that probes new forms of life from experimentation that is ventured for therapeutic ends. Informed public debate should be invited on legal controls touching the former type of experimentation, so risks will be minimized by more stringent measures than the mere issuance of governmental guidelines. Any legislation should however be reviewed from time to time so it will be neither unnecessarily restrictive nor excessively tolerant.

We should doubtless clearly distinguish experiments that amplify or increase genes in the same organism, or in closely related organisms that naturally exchange genetic information, from experiments that propose an exchange of genetic information between unrelated bacteria and between more complex organisms with an organized nucleus. The latter kinds of experiment involve hazards beyond the risks attending current genetic procedures and should therefore be answerable to legislative regulation. Such regulation should guarantee at very least the existence of competent local review agencies. Whatever restrictions are placed on innovative research need not at all completely thwart such research, provided only that the sponsoring institutions are certified and held publicly responsible, and the nature and limits of liability are established.

Spiritual Reality

Legislative restriction or not, the scientist is answerable to God no less than to society, and here the biblical theologian pleads for conscious attention to that larger realm of spiritual realities that escapes sense perception and turns on God-in-his-revelation. Yet it is not to the scientist alone, but to contemporary man now widely given over to radically secular perspectives, that this call must be directed. The people doubtless have a right through the legislative process to set limits on the proposals of scientists no less than on those of the rest of us in respect to what they perceive to be life-and-death issues. Yet even scientists who earnestly raise the question of moral norms now find themselves dealing with large remnants of society not deeply interested in these issues, so widely does the dissociation of technical information from questions of morality pervade our culture. All the more imperative, therefore, is the forging of an intellectual front in which concerns of theology, ethics, science, and human history are once again focused in a comprehensively unified way.

Revealed religion does not directly answer questions that modern science addresses to the universe, but it nonetheless bears on the whole of that inquiry. Moreover, it answers some questions with finality (and that is more than empirical science can do), and it has fully as much to say to our technological age — and of no less importance — than does contemporary science.

Revealed religion can identify the good in terms of God's expressly disclosed will and moral commandments which scientific man neglects at great peril to himself and to all mankind. Revealed religion identifies the chief end of life ("to glorify God and to enjoy him forever"); a disregard of this imperative impoverishes human existence, and invites the decline of civilization even amid illustrious scientific genius.

Revealed religion proffers ethical renewal that renovates the fallen will of man to do the right, instead of condemning 20th century mankind to its deadly nuclear arms race in unending pursuit of superior retaliatory or destructive capability. It invites our scientific age East and West to share the regenerative and restorative grace of God that can subdue both the secular communist and secular capitalist spirit to participation in the eternal world.

Revealed religion offers ethical guidance precisely at those frontiers where medical technology has been exploited in the service of moral permissiveness to the great detriment of social stability. Some moral prescriptions are no more welcome than some medical prescriptions. But they are not on that account misguided. The Bible declares that intercourse before and outside of marriage is wrong in God's sight, even if all the world should practice it and do so with gleeful delight. Adultery within marriage is wrong even when it becomes the social norm, and even if that should become the case in the most powerful nation in the world. To defend the weak and helpless is right, and to take fetal life is wrong (moral exceptions being to spare the mother's life, offspring to victims of rape, and instances of exceptional deformity.) Abortion is not a biblically sanctioned means of birth control, even if destruction of the life of unwanted girl infants in ancient Rome or destruction of the life of unwanted fetuses in modern America should become the social custom.

Revealed religion offers technological civilization its only persuasive means for overcoming the isolation of knowledge from ethical applications. Where evangelical religion is forfeited moral relativism soon takes its place. The Bible holds before us Jesus Christ the ideal man, neighbor love and social justice as moral imperatives, and the extension of God's ethical purposes throughout the cosmos as God's divinely-intended vocation for man. It promotes the moral use of knowledge in the service of man under God, rather than merely in the service of nature under man, or in the service of some political or scientific elite. The pursuit of knowledge in this context can do us no harm but can do us only a world of good. For all the technological brilliance and scientific innovativeness of our times, present-day civilization is doomed without a decisive alteration of the prevalent secular philosophy of life and of the norms of human behavior.

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The Coming Revolution in Health Care

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We are in the midst of a revolution in the assumptions, goals, and methods of health care. Assumptions seriously being questioned include: (1) that scientific medicine is largely responsible for our current level of health, (2) that scientific medicine will markedly extend our life expectancy beyond current levels, (3) that the biomedical model is a satisfactory guide to medical practice and research, (4) and that most health care is provided by professionals. There is increasing concern that the current approach to health care is causing physical, social, and cultural harm and that the current directions cannot continue for cost reasons alone.

The Scriptures inform our current dilemma by emphasizing (1) that health is the result of a way of life and not a product that can be purchased from healers, (2) that we must be as concerned with improving the quality of life as with extending its length, and (3) that health care is best when provided in the context of the family and immediate community.

In 1962 Thomas Kuhn published his now famous book, *The Structure of Scientific Revolutions*, in which he debated the logical positivist idea that science progresses gradually from one stage to the next strictly on the basis of reason.[1] Kuhn argued that science progresses from one stage to another through intellectually and emotionally turbulent periods of conceptual revolution, and these revolutions are followed by extended eras of relative quiet, during which the scientific field seeks to reexamine its subject matter from the new perspectives and assumptions acquired during the revolution. Kuhn called the new synthesis a "paradigm." One quiet period continues until the assumptions and methods of the reigning paradigm prove insufficient to answer the new questions that appear. Thus, according to Kuhn, the progress of a science is more like climbing uneven stairs than riding up a smooth ramp.

It is my thesis that we are now entering a period of conceptual revolution in the area of health care which bears similarity to those described by Kuhn. The assumptions and methods of current medical research and care are increasingly being subjected to intense debate, which will lead to a different synthesis or "paradigm," probably within the next decade. However, the current biomedical paradigm's assumptions and methods are deeply entrenched at every level of our society, and the forces fighting for this paradigm are extremely powerful in terms of scientific, economic, and political influence. Moreover, the health care system is now the nation's largest employer, with representatives in almost every community in the country, which means that there is a large constituency available to fight for the status quo.

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The Past and Present Contributions of Medicine

The current medical paradigm is not as sharply delineated as, for example, were the geocentric view of the universe or Newtonian physics. Nevertheless, many of its assumptions may be summarized. First, it assumes that our current level of health is due mainly to our public health/medical care system, which began with the discovery of the germ theory in the late 1800's. It is a popular idea (even among medical professionals) that the control of communicable disease is largely the achievement of medical science (through immunization, antibiotics, etc.) However, historians have increasingly come to understand that medicine as it has been practiced during the past century has had *little* impact in producing the level of health we enjoy today. The sanitary revolution in Europe, particularly in England, was well under way, and its impact in reducing infant mortality, was already being seen before the development of the germ theory. The sanitary revolution came about from the personal convictions of many people, which were partly biblical in origin, that it was better for society's health and morals to live in cleanliness rather than in filth. The germ theory reinforced that movement, of course, and strengthened its theoretical foundations, but it was not its cause. Yet it was the sanitary revolution which, as much as any other thing, has restored society to today's levels of health. The term "restored" is probably correct here, because many of the infectious diseases, including the leading killers, tuberculosis and infant diarrhea, were made the severe problems they became by the processes of urbanization and industrialization. Their resolution over the past century has been primarily a process of learning to live in industrial cities without opening the floodgate to disease.

Tuberculosis, for example, was the leading killer in the industrial West in the mid-1800's, with death rates that sometimes exceeded 500/100,000 per year. The death rates of tuberculosis have been declining steadily since about 1850, and by 1949 it had become only a shadow of its former self. However, medicine had no effective cure (none that could significantly affect the death rate) before 1949, when streptomycin was discovered. Tuberculosis had declined, not because of scientific medicine, but because of a number of related social and technical changes that were largely outside the purview of medicine: improvement in society's (1) nutrition, (2) socioeconomic status, and (3) living and working conditions (especially the reduction of crowding), and (4) the elimination of the spread of tuberculosis through milk by Pasteurization and by the elimination of infected herds, and (5) increased genetic resistance of the population to the disease. Most of the epidemic infectious diseases were also declining rapidly during the late 1800's and early 1900's, before medicine had either immunization (except for smallpox) or antibiotics. Today, few evaluative studies of the effectiveness of modern medicine show striking results, and most of the current screening programs are considered to be of dubious value. The world-renowned bacteriologist from the Rockefeller Foundation, Rene Dubos, has put it this way:

> Clearly, modern medical science has helped to clean up the mess created by urban and industrial civilization. However, by the time laboratory medicine came effectively into the picture the job had been carried far toward completion by the humanitarians and social reformers of the nineteenth century. Their romantic doctrine that nature is holy and healthful was scientifically naive but proved highly effective in dealing with the most important health problems of their age. When the tide is receding from the beach it is easy to have the illusion that one can empty the ocean by removing water with a pail. The tide of infectious and nutritional diseases was rapidly receding when the laboratory scientist moved into action at the end of the past century.[2]

Medicine as it has been practiced during the past century has had little *impact in producing the level of health we enjoy today.*

The past President of the Blue Cross Association, Walter J. McNerney, listed as the first health myth to be debunked the idea that "Most health services make a big difference in the health of a population, thus, with enough money, health can be purchased."[3] Even an apologist for modern biomedical technology, Dr. Lewis Thomas, put it his way:

> In any case, we do not really owe much of today's population problems to the technology of medicine. . . . Modern medical science is a recent arrival, and the world population had already been set on what seems to be its irreversible course by the civilizing technologies of agriculture, engineering, and sanitation,—most especially the latter.[4]

Life Expectancy

A second incorrect assumption of many persons is the promise of medical science for the future. Since our life expectancy *at birth* has increased approximately 30 years over the past century, it is assumed that biomedical technology will continue this progress into the future, so that in another century or so, our life expectancy may be 100 or so. This overlooks the fact that during the same past century, the life expectancy of white males at *retirement age* (65) has increased but 2 to 3 years! Life expectancy at birth has improved greatly due to the reduction of infant mortality, childhood diseases, tuberculosis, etc.; what it means is that most infants can now expect to reach retirement age. What has *not* happened is a major change in the *maximum* length of life, since modern medical science has little capacity to alter significantly the course of the chronic degenerative diseases. Indeed, it is as true now as when Moses wrote the 90th Psalm (approximately 1400 years B.C.) that ". . . the days of our years are threescore years and ten; and if by reason of strength they be fourscore . . ."[5] Again, as Dr. Thomas says:

> If we are not struck down prematurely by one or another of today's diseases, we live a certain length of time and then we die, and I doubt that medicine will ever gain a capacity to do anything much to modify this. I can see no reason for trying and no hope of success anyway. At a certain age, it is in our nature to wear out, to come unhinged and to die, and that is that.[6]

He does add a very salutary emphasis on the quality, rather than the quantity, of life, which is certainly

consistent with the biblical perspective:

> My point here is that I very much doubt that the age at which this happens will be very drastically changed, for most of us, when we have learned more about how to control disease. The main difference will be that many of us will die in relatively good health. . . .[7]

The Bible, as well as the more astute of medical scientists, cautions us not to look to scientific medicine to bring us eternal life.

The Biomedical Model

Another problematic assumption of modern medicine and health care is what many have called the "biomedical model." This model assumes that our lack of health is primarily due to *disease*, that most of our diseases produce anatomic and physiologic changes, and that diseases can be cured if these alterations are restored to their normal state.[8] Disease is seen fundamentally as alterations in body biochemistry, usually in predictable patterns. The task of the scientist and physician are to identify the abnormalities associated with the disease and discover methods of restoring these to "normal", which is seen as being equivalent to a "cure."

The largest institution built in honor of this assumption is the National Institutes of Health, which was started in 1948 and which has guided the direction of American medical research and (hence) medical education and practice since the early 1950's. There have been great achievements in some dimensions of our knowledge of disease, but great problems have also been produced. Medicine has rapidly become more complex and dependent upon expensive diagnostic and therapeutic technology. This has, in turn, forced specialization and other expensive changes. Legal and ethical problems are created faster than they are solved. The human dimension is being lost from the medical care process.[9] Medical education has almost lost sight of the increasingly well documented fact that the origins of most of our diseases lie predominantly in our nutrition, our environment, and our behavior. As Engel has put it:

> . . . in modern Western society biomedicine not only has provided a basis for the scientific study of disease, it has also become our own culturally specific perspective about disease, that is, *our folk model* (italics mine). Indeed, the biochemical model is now the dominant folk model of disease in the Western World.[10]

Engel suggests the new paradigm should be based on a "biopsychosocial model", in which the role of social and psychological factors is adequately emphasized. I would like to add the spiritual dimension to his list, for I believe that we will sooner or later discover that we cannot adequately deal with the subject of health without considering the issue of the meaning and purpose of life, and man's relationship to his Creator. One modern area of interest where this is gradually being appreciated is the field of thanatology.

One of the glaring weaknesses of the biomedical model is its lack of understanding of, or ability to deal with, *health*. There are more than one hundred schools of *disease* in this country, but, to my knowledge, not one school of health. Medical schools notoriously focus most of their effort on teaching about disease, including its diagnosis and treatment. Schools of public health emphasize the origin of disease and the organization of care, rather than how to promote health. But, as the World Health Organization's preamble states: "Health is . . . not merely the absence of disease or infirmity." We must face realistically the fact that we do not have a "health care system. . . ." We have a "disease care system," and very little that its does is done to promote health in a positive sense.

The Definition of Health

One of the difficulties we have in setting national health goals and measuring our progress (or lack of it) is our inability to define health. The WHO statement just quoted defines health as ". . . a state of complete physical, mental, and social well being . . .", which, in addition to being unattainable in this life, is not very helpful. Dubos has clearly pointed to one weakness of the biomedical model:

> . . . health and disease cannot be defined merely in terms of anatomical, physiological, or mental attributes. Their real measure is the ability of the individual to function in a manner acceptable to himself and to the group of which he is a part.[11]

Thus, social functioning, not biochemical state, may be closer to a useful concept of health, and it also may be easier to measure. It is not as widely accepted to date, partly because it also has ambiguities and partly because to agree on such a definition would be to open the flood gates to a reallocation of resources away from what are now considered health activities. Dubos and others have also emphasized that health is not so much freedom from stress (which is unattainable in our sinful world) as it is the ability to adapt to the stresses to which we are subject:

> . . . the states of health or disease are the expressions of the success or failure experienced by the organism in its efforts to respond adaptively to environmental challenges.[12]

Rates of death and illness are clearly insufficient to measure health; at most they measure some of the deviations from it. In the last analysis, one must agree with Duncan Clark that: "As for health . . ., no fully acceptable concept exists".[13] Here is certainly a fruitful field of research for those with a biblical perspective.

Iatrogenesis

In my first contact with our Professor of Surgery, Carl Mover, he began the lecture with the Latin phrase: *primum non nocere*, which, I understand, can be translated: "first, do no harm." It is a principle that made sense at that time (1958) and makes even more sense today. The first obligation of a physician should be not to harm the patient. If that is so, it would seem reasonable that the first obligation of the health care *system* also should be to do no harm. Yet there is evidence that the medical care system does a great deal of harm to individuals through unnecessary surgery, inappropriate or unnecessary medications, and pointing to pharmacologic or surgical solutions when changes in environment, life style, or human relationships are the only remedies that offer hope for real improvement. Much of the unnecessary surgery that is done comes

from economic pressures in cities where we have more surgeons than are needed, and it is reinforced by the population's tendency to look to surgeons as modern miracle workers. Overmedication may arise from a sense of despair on the physician's part ("I don't know what else to do") or from the need to get on to the next patient (one study showed that physicians often write prescriptions for medication as a ritualistic way of terminating a patient visit, even in the absence of a clear indication for the medication.)

Less studied, but perhaps more important sources of harm from our medical care approach are the social and cultural effects of a strongly institutionalized biomedical model of health and healing. Illich calls these "social and cultural iatrogenesis," and these consist in the social and cultural distortions that occur by strict adherence to the biomedical model of disease.[14] Zola also points to the social dangers inherent in the increasing medicalization of life.[15] We are turning less to religion or law for the final decision to social problems and more to medicine. Therefore, behavior (e.g., murder) which centuries ago might have been dealt with as a problem of sin, and more recently as lawlessness, is now first subjected to a medical test: if the perpetrator was somehow "ill" at the time of the act, he becomes "not guilty by reason of insanity." The point here is not to argue whether this is good or bad, but to emphasize that the final tribunal and the first agent of attempted change, in this, as in countless other areas of life, is coming to be medical authority.

The medicalization of life also increases the *social control* which a small group of persons (health "professionals") exercise over others. Thus we have, as a society, given to the physician the ultimate right to decide who does and does not have the right to large amounts of society's resources. A decision to give someone a heart transplant, or to put someone on renal dialysis, may cost society $50,000 or more. The decision to give one person these resources means that others will not have access to them, because our resources as a society are limited. Second, society has given the physician the power to give to some, and to exclude from others, the right to a socially acceptable form of deviance known as sickness. Talcott Parsons first clearly defined the social contract of Western Society known as the "sick role," in which the society gives certain benefits to the person who is defined by a "competent professional" to be ill, and in turn requires certain behavior from that person. Society *offers:* (1) lack of blame for his/her condition and (2) to excuse him/her from normal role obligations during this period, in return for which society *requires* the individual (1) to want to recover and to seek out competent medical help and (2) to cooperate with those who are prescribing the therapy. Sociologists are increasingly concerned over the power given to the medical profession.

Costs

It is the *costs* of our current direction in medical care, however, which will ultimately force major changes in the way we approach health care. The society will no longer tolerate an inflation in the cost of medical care that is twice the national average when we

What has not *happened is a major change in the* maximum *length of life, since modern medical science has little capacity to alter significantly the course of the chronic degenerative diseases.*

are already spending about 9% of the gross national product on medical care. We hear stories such as that General Motors now pays more to Blue Cross and Blue Shield than to U.S. Steel in a given year. That might be all right if we were getting a proportional benefit, but increasingly the population is becoming restless and is questioning whether it is receiving its money's worth. Certainly, the marvels continue for many forms of acute medical problem and accident. But as the population now is mostly living past retirement age, a higher and higher proportion of all care is for chronic problems, where the biomedical approach has the least effect. Dr. Thomas admits that the application of inadequate technology is costly:

> Offhand, I cannot think of any important human disease for which medicine possesses the capacity to prevent or cure outright where the cost of the technology is itself a major problem. The price is never as high as the cost of managing the same diseases during the earlier stages of ineffective technology.[16]

He admits that "halfway technology" is inordinately costly, and the central question is whether biomedical technology will ever be able to become cost-effective technology in the chronic degenerative diseases, or will we become saddled with increasingly costly (but ineffective) halfway technology that also compounds ethical and legal questions? For example, will biomedical technology ever be able to restore a smashed brain—caused by highway carelessness? Or a cirrhotic liver, almost destroyed by alcoholism and malnutrition? Or an emphysematous lung that has been destroyed by decades of smoking and infection? Most, if not all, of the examples of "effective technology" relate either to infectious disease or to acute medical and surgical emergencies. We should not deny the individual contributions of modern medicine in these areas; indeed we should be grateful. What concerns me is that modern medicine, which can be so effective in restoring individuals with certain kinds of problems to productive life, is now becoming so saddled with ineffective technology in other areas that its real contributions are becoming less available to the average peson. It is even less likely that our expensive western medical technology, complete with its folk model of disease, can benefit the developing nations, even though we are exporting it at this time.

A new approach to health and health care is clearly needed. What insights do the Scriptures provide as to what changes should be made in our assumptions, concepts, and approaches?

Prevention as the Way to Health

There are many biblical insights which could be brought to a consideration of health; foremost among them is that health is the result of a way of life and

not the product of nostrums. The broad commands of Scripture portray God's will for His people: "Ye shall be holy, for I the Lord your God am holy." (Lev. 19:2). The holy walk with God emphasized not defiling oneself (Lev. 11:44); this required, among other things, that man distinguish "between holy and unholy, and between unclean and clean." (Lev. 10:10) The Scriptures provided the guidelines for the Israelites to keep a holy walk with God, and obedience had the promise of physical blessings (health) as well as spiritual blessings:

> If you will diligently hearken to the voice of the Lord your God, and will do that which is right in his sight, and will listen to his commandments, and keep all his statutes, I will not put any of the diseases upon you which I brought upon the Egyptians, for I am the Lord who heals you. (Ex. 15:26)

At the pool of Bethesda, Jesus healed the man who had been ill for 38 years and told him "Sin no more so that nothing worse befall you." In Leviticus 18:5, God tells His people through Moses, "Therefore keep my statutes and judgments, which, if a man does, he shall live by means of them." Other Scriptures could be quoted, but the main point is that the biblical view of health is something that was a result of one's entire way of life, *not a commodity that could be purchased from healers.* Health was something that included the idea of wholeness, soundness, safety, and peace. Our world desperately needs to get away from the idea of health as a commodity, a product, and see it as an organic part of one's way of life.

The specific elements that are most clearly related to good health can be identified by means of epidemiology, the science of determining why disease (or health) occur when they do and in whom they do. Fundamental to good health is nutrition.

Nutrition. Malnutrition can be either undernutrition or overnutrition. By and large, undernutrition is the plight of the poor wherever they are in the world, and overnutrition is the companion of the well-to-do. Undernutrition not only robs one of the vigor to be creative and productive; protein undernutrition, in particular, also combines synergistically with the infectious diseases to produce high mortality rates among children, particularly following the period of weaning. Measles is a serious but seldom fatal illness among unimmunized but well nourished children, but it has case-fatality rates as high as 20 to 25% among malnourished children, a death rate hundreds of times as high as among well nourished children.[17] On the other hand, overnutrition, particularly when combined with a sedentary life style, contributes to a variety of degenerative disorders in adults, such as coronary artery disease, strokes, and diabetes. For example, the dietary intake of refined sugar (sucrose) in this country in 1850 was about 40 pounds per person per year; now it is over 100 pounds per person per year.

The Environment. A second foundation of health is a clean environment. This includes cleanliness from the many microbes capable of causing severe disease in man (although it does not imply a sterile existence.) The importance of this was demonstrated during the sanitary revolution. It includes clean water, food, and living environment. More recently we have become more aware of the problem of toxic substances in water, food, and the air, but at present we have only hints as to how this pollution may affect human health.

Behavior. Central to a way of life is one's behavior. Every aspect of our behavior has health implications, although we often do not realize this. Most Americans who smoke are aware of the potential risks that smoking brings for cancer of the bronchus, throat, nose, and mouth. Less well known is that cigarette smoking also increases the risk for heart attacks. Still less well known to those involved is that the Islamic custom of "purdah", by reducing the amount of sunlight acting on ergosterol in the skin (and hence reducing the available vitamin D) leads to osteomalacia in adolescent women. This, in turn, frequently produces deformed pelvises and difficult labor and delivery causing infant and maternal mortality.

In many of the developing nations, women seek to wean the children early and convert to bottle feeding, in order to imitate the wealthy. Because of the lack of refrigeration, the milk is likely to be swarming with bacteria, and due to the low purchasing power of many who do this, the "milk" may be only water colored with a small amount of powdered milk.[17] It is not known how much malnutrition among young children is due to early weaning from the breast to the bottle, but the toll is undoubtedly heavy. Moreover, by shortening the nursing period, women reach peak fecundity sooner following the delivery of a child than they would if they nursed over a longer time, and thus this behavior pattern also contributes to increased worldwide fertility.[18]

One of the commonest types of infectious disease in the West are the venereal diseases. Estimates of the number of new cases of gonorrhea last year go over two million. Syphilis, although not rampant, remains steady at approximately 100,000 per year in the United States. A newly appreciated venereal threat is from herpes viruses, especially HVH II. Antiobiotics have proved *impotent* to eradicate these diseases; control of behavior could!

The above three factors, nutrition, environment, and behavior, are the primary factors influencing the level of health any population enjoys. Medical care is at most the "fine tuning" of our health level; it is these factors that determine the "channel." It is instructive to review the biblical concern for human nutrition, sanitation, and behavior. The concern for proper and pure food is seen in many biblical references (Table I). The concern for personal cleanliness, for pure water, for sewage disposal, for rapid burial of the dead, and for isolation from contamination by discharges, are quite specific. Behavior was carefully prescribed both as to justice and as to cleanliness, and venereal disease was effectively prevented by the code of sexual morality (Ex. 20:14, Lev. 18:20, etc.). Moreover, the priest served as the health officer, to oversee that the community was holy and clean, to diagnose and treat problems, and to pronounce healed persons clean.[19]

In summary, the biblical insight that health derives from a holy and clean way of life, and not from pur-

chasing the services of healers, is a perspective that must be recovered by our society if we are to achieve the measure of health we desire at a price we can afford. But who can influence human behavior? Suffice it to say that how we behave derives from what we ultimately believe is of greatest value, and it is here, in determining the priorities of individuals, families, and communities, that religion has its most crucial impact on health.

Quantity or Quality of Life?

It is only in recent years that any serious challenge has been raised to the priorities of medical care; heretofore the first priority has been to save (or prolong) life, regardless of the cost in money and suffering. Death rates are the best developed and most used measure of the success or failure of our medical care system. The development of the technology of medicine to include organ transplants, artificial life support systems, etc. has forced reconsideration of the limits of medicine with respect to prolonging life. For a while there was a lot of talk of "cryogenics", in which it was the hope to freeze bodies immediately upon the point of death and keep the body in deep freeze, along with all of the medical records, until medical science discovered a way to thaw the body and revive it and simultaneously, cure that disease.

Increasingly there is an appreciation for the fact that saving lives is an appropriate first priority in acute disease, but that improving the *quality* of life is a more appropriate and realistic goal than extreme efforts to prolong life when it comes to the chronic, degenerative diseases. Even a leading proponent of biomedical technology seems to be saying the same thing.[7] The problem is that although there is increasing lip service paid to the idea of retooling the delivery of care to emphasize the quality of life, these priorities are seldom reflected in the objectives of current medical research and education. Just as nutrition is a neglected subject in our schools of medicine and public health so is the subject of rehabilitation; "cure" is taught much better than "care". But for economic reasons, among others, new kinds of primary care professionals are being trained (e.g., nurse-practitioners and physicians' assistants) who often have a better grasp of the meaning of "care" than do many physicians. The cost of hospital care is forcing the expansion of home care programs. People are finding that alternatives such as Hospice are better for persons dying of cancer than the typical acute hospital.[20] The coming revolution in medical care will move the "quality of life" to a new place

One of the glaring weaknesses of the biomedical model is its lack of understanding of, or ability to deal with, health.

Table I

Representative Selections from the Old Testament Sanitary Code

Key texts: Leviticus 19:2; 10:10

1. *Personal Cleanliness*
   a. Hand washing, esp. before meals—Mark 7:1-3
   b. Whole body after contamination—Lev. 15:5
   c. Wash clothes after contamination—Lev. 11:28; 15:5
2. *Pure Water Supply*
   a. Avoid water contaminated by dead animal—Lev. 11:32-36
3. *Sewage Disposal*
   a. Bury it outside the camp—Deut. 23:12-14
4. *Bury Dead Soon*
   a. Before nightfall—Deut. 21:23; Acts 5:6
5. *Pure Foods*
   a. Fruits & vegetables not prohibited
   b. Meats—Lev. 11:1-8; 29-31
   c. Fish—Lev. 11:9-12
   d. Don't eat dead animals—Deut. 14:21
   e. Don't eat old food—Lev. 19:5-8
6. *Isolation*
   a. If one touches the dead—Lev. 5:2; 22:4
   b. If one touches unclean discharges—Lev. 5:3
   c. For those who have a discharge—Lev. 15:1-13
   d. For those who have skin diseases—Lev. 13
   e. Of a woman following childbirth—Lev. 12:1-8 (prevents epidemic "childbed fever")
   f. Terminal disinfection—Lev. 15:1-13; 14:34-48
7. *Control of Venereal Disease*
   a. Morality—Ex. 20:14; Lev. 18:20
8. *Priest is the Health Officer*
   Leviticus 13, 14

Nutrition, environment and behavior are the primary factors influencing the level of health any population enjoys. Medical care is at most the "fine tuning" of our health level.

of prominence in the priorities of medical care.

The biblical message is concerned for both the quantity and quality of human life, but these are not primary goals. Rather they are the result of obedience to God as revealed in the Scriptures. The biblical concern for faith, obedience, holiness, and justice clearly place those who stand in the Hebrew-Christian tradition in the position of supporting a balance between the two, and we should vigorously support efforts to restore concern for the quality of life to its rightful position in medical care. Moreover, as one considers the nature of "health", it is important to see that the healthy person is one for whom life, and all of its activities, has deep personal meaning. At the level of tactics, Viktor Frankel has demonstrated how important it is for life to have meaning.[21] He gives one example of how an elderly man was restored to mental health when he saw that his widowhood and its resultant loneliness meant that his beloved wife did not have to suffer the same; his suffering then had meaning for him and became a last sacrifice for her. Only then was it tolerable, because it had meaning. Going further, it yet remains for someone to demonstrate that human wholeness, health if you will, must include our ability to stand before God as justified sinners; there are suggestions that those who wholeheartedly embrace the full theological meaning of the Bible are better able to live, and to die, in health. The area needs far more demonstration as well as research.

Care Must be in the Context of the Family

One of the current myths about medical care is that most medical care is given by health professionals. Levin and others have emphasized that, in fact, perhaps 75% of all health care in this country is given by individuals to themselves or to members of their families.[22] It is just as foolish to see this as bad as it is to consider all professional care good. There is currently a powerful movement, often called the "self-care" movement, to increase the competence of nonprofessionals to care for themselves and others. This is not to imply that "kitchen surgery" will return, but rather that all efforts should be made to give the individual person and family as much responsibility over their own lives and health as possible. This implies that the role of the physician will increasingly become (1) to do the highly technical advanced diagnosis and treatment, and (2) to serve as consultants—yes, consultants—to those giving most of the health care: families and non-physician primary care persons. We cannot afford to restore physicians to their past prominent role as givers of primary care; they are too costly, and they are not trained well for that task, anyway.

Norman Cousins gave a dazzling account of his determination to treat himself for a condition considered medically hopeless, and of his success.[23] The prominent sociologist Lois Pratt points out that "the more numerous and vital the functions the family performs successfully for its members, the stronger is the family system; the fewer the important functions performed, the weaker the system."[24] From this she goes on to conclude:

> The family is a social unit with considerable potential for performing health care, since families are held legally responsible for sustaining their members' health, they maintain a physical plant which is suitable for health care practice, and the members live together in relationships of mutual care and support.[24]

In contrast to the potential of the family to perform health care, she reminds us of the current trends, and in this she is absolutely correct:

> The emerging medical care system is based on specialization of work, centralization of activity in large complex units, bureaucraticization of the work unit, control by management over work and personnel, corporate involvement in and exploitation of all aspects of the health market, and extension of profit-making to all sectors of health care.[24]

One of the byproducts of these large health institutions we are creating is a tendency to impersonality of care.[25] How can costs be reduced and care be as personal as possible? By restoring it to the context of a loving family. The medical care system should be, in the last analysis, a family support system, or so it seems to me. However, at the present, families do a better job of supporting the health system (most persons in health care are doing well economically) than the system is doing of supporting the family (office and clinic hours are for the convenience of the provider rather than the patient, as are appointments, etc.)! The emergency room has gained immense popularity not because it is the best place to receive care, but because it is the only place people know will be open 24 hours per day with someone there to see them.

Whether self-care as a movement will be sustained, its existence has shown that there are options available to the family. Whether the family will play an increased role in the future in "selecting, coordinating, and supervising professional care; determining the forms and conditions of medical intervention; evaluating the outcomes of all these interventions; maintaining health records on the family; and planning a healthy lifestyle, including the choice of community residency, employment, leisure activity, diet, and other health maintenance practices"[24] remains to be seen. Certainly not all families or individuals now either want this role or are capable of it. But in this direction may lie our best hope for both economy and effectiveness of health care.

The Bible does not appear, at first glance, to inject itself into this debate, but on further consideration it would seem to suggest that healing is, in fact, the proper role for the family, including the larger family composed by a religious congregation. The Fifth Commandment (Honor thy father and thy mother) is often interpreted only in terms of young children and their parents. However, Jesus interpreted it in terms of caring for one's aged parents (Mark 7:10-13). If interpreted also, or primarily, in this way, the promise (long life) has special meaning. In Acts 6 and James 1 there

are evidences that the early church received and acted upon the command to care for each other, and James 5:14 shows that this includes a healing ministry. The oil in this passage should probably be seen as giving a medication that was conceived as having medicinal value, rather than primarily spiritual significance (for example, note the use of oil in Luke 10:34). The pattern of individuals giving health care to each other in a family context would appear to have solid scriptural support.

Haggerty is one of many whose studies have shown that persons under stress have a higher risk of disease. He suggests that clinicians may become more effective in preventing the harmful potentials of stress by involving supportive institutions beyond the primary family: the extended family, peer groups, religious groups. The assumption behind such a proposal is that man is a social creature who needs complex and supportive interaction with groups. Without it, he gets sick, just as an infant deprived of love tends to die.[26]

I would like to conclude with two quotations from Canon Max Warren's book entitled *The Christian Imperative*:[27]

> The fundamental sicknesses of men have always been sicknesses of the spirit and the mind. Never, perhaps, was this more obviously so than today. . . . Only a healing which makes a man whole and integrates him with his fellows in a true community, living in a right relationship with God and with the good earth which God has given man, only such a healing is adequate to the imperative 'go heal.' For this reason the Church must not imagine that it can relegate the responsibilities of its healing mission to a representative company of physicians and nurses, surgeons and anesthetists, pathologists and dispensers. . . .
>
> The . . . hospital must be seen as an integral part of a common task in which Church and school and farm are seen, not as the possibly attractive agencies for the employment of those with no skill in healing, but as the actual points at which most of the healing is done, the front line of the attack on human need. To these, the real centers of healing, the hospital will be related as a source of inspiration, a school of technical knowledge, a resort for such cases as demand specialized skill, but not as being itself the center of healing.

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ADDENDUM

A significant expansion of the ideas in this paper were presented at the International Conference on Whole Person Medicine, February 1, 1979, Tulsa, Oklahoma, and is published in the proceedings of that Conference. "Whole Person Medicine: An International Symposium" (D. Allen, L. Bird and R. Herrmann, editors) InterVarsity Press, Downers Grove, IL, in press.

Psychotherapy, Ethics and Faith

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Psychotherapy is potentially a strong force, intimate and demanding, capable of influencing the beliefs and actions of other persons. Therefore, the use of psychotherapy must be examined from the same ethical, evaluative stance as other forms of behavioral control—physical, mental or spiritual. Standards of ethics and religious beliefs are significantly involved in the use and ends of psychotherapeutic techniques.

Psychotherapy can result in the freeing of a person from the unrealistic neurotic or psychotic internalized demands of his conditioning experiences, allowing him freer choice for future behavior. On the other hand, it can be used as a tool by which the therapist subtly forces the client into new patterns of behavior acceptable to society or the therapist's own frame of reference. The latter procedure may substitute one type of bondage for another.

Confidentiality

Foremost, ethics of psychotherapy involves the rights of the individual, but it also includes the rights of society for protection from the person who directs aggression against himself, against another, or against social institutions. For example, recent Court decisions indicate that if the therapist knows of a client's plans to harm another, the therapist has an obligation to inform the "other" of that threat. This sharing of information violates the long-standing concept of confidentiality of the therapeutic session material—a concept which is gradually undergoing a metamorphosis in terms of professional behavior but which has important ethical implications. The American Psychological Association's statement of the ethics of confidentiality suggest revelation, "when there is clear and imminent danger to an individual and society." Further, it states, "The client should be *informed* of the limits of confidentiality." Ordinarily, with the above-noted exception, *confidentiality* of *shared information* is *paramount*.

Client Manipulation

There are several other ethical conditions that can be briefly described. For example, when a client has revealed himself intimately, there may be a tendency for him or her to want to become more involved in a physical relationship with the therapist, who appears to possess many of the desirable traits of the "true" human often lacking in others. During this period, the vulnerability of the client must be protected by the therapist.

The ethics of *giving advice* must also be recognized. What right does the therapist have to intervene directly in the belief system of the client, changing or even destroying it? What right does he have to intervene in the life-style of the client, drastically altering patterns of action, even if the client at the moment wants that direction?

The *beliefs* of the psychotherapist are very much present in therapy. To try to hide them would be foolish. Making one's *beliefs clear enough* to allow the client to make his own independent choice of allowing those beliefs to affect a behavioral change or not is important. The only statement from the Ethical Standards of the American Psychological Association that seems to bear on this point is, "Psychologists clarify the nature and direction of their loyalties and responsibilities and keep all parties aware of their commitments." This aspect is crucial for the Christian therapist. What place does "witnessing" have in therapy? Is it ethical? If so, what are the limits? Does the therapist force his views on the client without allowing free choice?

A most important aspect of the ethics of psychotherapy is the *use* or *ends* of that therapy. What is the purpose? How will that purpose be served? What will the end result be?

In brief, any purpose of psychotherapy which is manipulative, i.e., serving someone else's or purely societal ends, may be considered unethical. On the other hand, that therapy which clarifies the choice

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points and the potential effect that choices may have on the individual and society, allowing the individual to make more rational decisions, may be considered to be ethical.

The above statement may be clear and acceptable. In practice, the way clarification takes place and the procedures used are full of ethical implications. Can the psychotherapist be a dispassionate clarifier who never influences the decision-making?

Obviously the answer is, "No!" Therefore, a partial answer to the ethical question is related to how clear and honest the therapist is in recognizing how his own viewpoints and biases may affect choice. It also relates to how well he communicates these influences, thereby allowing the client to take these factors into consideration as he evaluates his choice of specific behavior patterns, and weighs the future implications and results of that decision.

The Client's Stance

There are, in addition, several factors which relate to the client's stance in entering the therapeutic relationship. Four classes of situations may be considered: 1) Does the client come willingly for help with his problem? 2) Does he come under the duress of the pain of his anxiety or depression, or is he motivated by disagreeable pain of his anxiety or depression, or is he motivated by disagreeable effects of his past maladaptive behavioral patterns? 3) Is he coerced by another—spouse, parent, lover or business associate? 4) Is he forced to come by Court or other social institutions?

In each case, the ethical implications are somewhat different. Long-term psychotherapeutic treatment, because it works slowly, may give the client more time to contemplate and conceptualize any proposed change, and thus evaluate such changes more carefully than with the more sudden intervention of chemotherapy or psychosurgery. However, behavior modification techniques also allow more rapid behavior change. If these skills can be utilized to help, they can conceivably be used to implant other behavior changes as well.

With this discussion as a background, we can now look at the four situations where treatment is indicated.

The Willing Client

The first condition is that in which the person consents to receive or even seeks out the help. While in some ways this category of clients presents the least problem, in other ways this condition may present the most subtle and complex ethical questions.

Alleviation of immediate psychological distress (short-range goal) may compromise the ultimate end (long-range goal). This statement assumes the functional value of a presenting problem or symptom.

The classical example is illustrated by the parable of the ugly duckling who was therapized, accepted himself as an ugly duckling and never became aware that he had become a beautiful swan. His solution for a short-range goal resulted in the loss of his long-range potential.

Treating the depressed client with mood elevating drugs without discovering the etiology of the depression, or use of drugs in anxiety states to help the client tolerate difficult situations, may be thought of as similar problems. In each case, there is less likelihood that the person involved will be motivated to change his problem presenting behavior constructively. Therefore, the ethical question facing the psychotherapist is to determine how alleviating the *immediate symptom* will affect the client's *long-term motivation* to change behaviors which may need changing. If the therapist reduces or alleviates the effects of those signals of depression or anxiety, he may neutralize the client's attempt to work out a more comprehensive change in his behavior. Another example is the client who has "sinned." He is aware of that sin, feels guilty about it and is impelled to make the necessary changes in his life. Psychotherapy can alleviate the guilt feelings, which may reduce the motivation to change and the client may continue in the "sinful condition." The ethical issue relates to making the client aware of the *significance* or implication of his symptoms.

Any purpose of psychotherapy which is manipulative, i.e., serving someone else's or purely societal ends, may be considered unethical.

Another ethical factor relates to the potential imposition of the therapist's value judgments on the client. When the client accepts the therapist's value judgments, he is relieved from becoming the responsible person he needs to become (Glasser 2, p. 300-1). When the therapist does the client's work, he may erode that client's acceptance of responsibility, not just for the immediate situation, but for other situations as well.

The psychotherapist aids the client to evaluate his *own set of values* to discover the effects that holding those values have on his decision making, how he perceives himself, and his attitudes toward his own past. When this is clarified, the client can then take appropriate action, supported by the psychotherapist, to assume personal responsibility. If the client is unable to do so, due to his emotional problems, the therapist continues to strengthen him until he is ready to do so. Helping the client gain information about himself in every aspect of life including his religious goals can give him the tools by which he then can responsibly and effectively act on his problems.

The general principle has been stated by Halleck (5 p. 385), "I am convinced that the usefulness and reasonableness of the patient's choice will be positively correlated with the amount of accurate information he has about himself and about the stressful factors in his environment."

The Willing "Hurting" Client

When the client, under the duress of pain, anxiety, depression or feelings of failure, comes into the psychotherapeutic relationship, his freedom of choice is restricted. He looks to the therapist as a healer, and expects him to act as such, implying, "I have pain. You know how to help me. Do so as quickly as possible."

Often, due to the pressures of the moment, such clients are not willing to explore the meanings of their reasons for coming to therapy. They want relief, and anything that postpones that relief is looked upon with disfavor,

regardless of the short or long-range effects. Most people, at this stage, are not particularly interested in learning lessons from the immediate situation which could influence the future. They want relief, and want it now.

The therapist may be seduced into doing what the active client wants. He also may yield to the subtle temptation of trying to alleviate suffering, of playing benefactor, of trying to be the powerful, healing person the client wants and short-circuit the treatment plan. This situation is difficult to cope with ethically. Should one immediately rush in with the band-aid of symptom reduction, or should one withhold treatment (if it is available) because it is better in the long run to do so?

There can creep in an element of sadistic pleasure in withholding treatment, when it is "for the client's ultimate good." Most psychotherapists cannot give medication or provide surgical intervention, so to them, this aspect is not a question. However, all of us can provide sympathy, allow ventilation of feelings, and offer reassurance which can give immediate, partial relief to the client. While we cannot forgive "sin," we can effectively remove the distress of the guilt feelings created by the sin. Should we or should we not?

One solution is analogous to that of providing a crutch to the person with a broken leg. The crutch allows mobility, and helps the person to do what needs to be done. The crutch gives immediate relief, but also aids in the *continuing growth* of the person by helping him accept responsibility to help himself, so that he may eventually abandon the crutch when it is no longer necessary.

Similarly, in psychotherapy one can ethically help the person remove the immediate crippling effects of the problem, so that he can deal with the long-range implications more effectively. The pain continues to motivate the client to do something about rearranging his life style and behavioral pattern so that such pain will not continue to occur or recur.

In the theological sense, confession of the sin and acceptance of forgiveness allows the person to deal with the causes of the sin, and to make restitution for the sin if it involves another person. If the treatment encourages or allows the client to withdraw or become overly dependent, or if it removes the effects of the maladaptive behavior without constructive direction, the therapist may be considered in an unethical position. Each treatment procedure should be aimed at making the client as self directing and problem solving as possible.

The Coerced Client

The coerced client is motivated to come to the therapist by someone external to himself. Separation of the differing clinical situations does not imply that the categories are discrete. Each category has most of the elements of the previous ones, plus some additional, which add a different dimension to be considered.

The ethical question in this case becomes one of deciding whether you should work with the person at all, or how do you do so without becoming the "cat's paw" for the one who sent him to you? Obviously, there has to be some motivation on the part of the coerced client to come for help. The most common incentive is to maintain a relationship with the person who originally persuaded the client to come into therapy. Therefore, there can be value in the therapeutic relationship, provided this feeling of coercion is replaced or reinforced with his own desire to grow.

The first step is to explore how he feels about being there—the negative aspects. Usually, ventilation of feeling allows the client to look at his anger at being coerced, his relationship with the significant "other" and why it may be important to change in some way to improve that relationship.

Another step is to look at the nature of the external pressure on the client. Threats of loss of love or the relationship itself are common. If the client feels that his main hope in life is the continuation of the relationship of the one who coerced him, he may fear the potential loss and be forced into unacceptable adjustments as a result.

Coercion may come from a referring source, physician, minister, or friend. The fear that, "If you don't do something about the problem now, you will get worse and eventually lose control totally," may be the threat used.

In any case, ethical considerations require that the client be informed of the procedures of counseling as is noted in the APA Code of Ethics. For psychotherapy, the statement of the methods and goals should be adequate. The potential effects of psychotherapy should be described, along with alternative methods that can be used if the practitioner is skilled in them.

The "Forced" Client

The "forced" client differs from the "coerced" client in that he is not necessarily motivated to maintain a relationship with the one who has persuaded him into therapy, but comes under the threat of severe consequences if he does not cooperate. Usually it is a judge who applies these pressures with jail as the only alternative. For the mental patient, whose "jail" is less tangible but nonetheless threatening, the alternative is continuing in his negative state, being chided by other patients and staff for not cooperating.

Halleck (5, p. 382) suggests some other conditions which might call for forcible intervention: 1) The client is judged *dangerous* to himself or others—usually sufficient reason for commitment. 2) The treatment is of *potential benefit*. 3) The client is *incompetent* to evaluate the treatment.

Decisions about each criterion relate to societal and personal values, and are often arbitrary. In the first case, the diagnostician is limited in determining the dangerousness of the client. In a relatively recent case the Court decision, based on expert testimony, freed a person who then went out and killed seven additional persons. One must face his limitations honestly.

The second consideration, "potential benefit," may center only on making the client calmer or more tractable for the home or hospital without taking into account that client's own long-range goals. Ethical consideration in such cases, emphasizes that the goals and ends of therapy should be as similar as possible to those the client would have chosen had he made the decision himself. The ones who disapproved of his

initial behavior must not be the only people whose desires are considered.

When one assesses the third condition of incompetency, one faces a tendency on the part of all psychotherapists to overdiagnose. The "doctor knows best" idea is pervasive, becoming a subtle pressure on both the therapist himself and the client.

When all three conditions are present, psychotherapeutic treatment would appear to be ethically acceptable regardless of the client's permission. However, a peer therapist group may be the most effective ethical decision-maker for treating the "forced" client when fewer than the three criteria are met.

Summary

A brief review of some of the ethical implications in psychotherapy indicate the complexity of the subject. The Christian psychotherapist is involved in unusual ethical considerations, viewed from the framework of responsibility to himself and his client, possible manipulation of the client through machinations of therapeutic devices, and his dedication to a cause, a belief and a way of life. There are no easy answers. Each decision and procedure can be evaluated by our professions' ethics, our own internalized frame of reference and by God's Spirit dwelling in us.

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Concluding Remarks

A significant expansion of the ideas in this paper were presented at the International Conference on Whole Person Medicine, February 1, 1979, Tulsa, Oklahoma, and is published in the proceedings of that Conference. "Whole Person Medicine: An International Symposium" (D. Allen, L. Bird and R. Herrmann, editors) InterVarsity Press, Downers Grove, IL, in press.

If these papers have whetted your appetite for bioethics and medical ethics, we of the ASA are deeply grateful. As you can see, we see great relevance in a Christian world view in dealing with the results of biomedicine.

We would hope you may wish to read further, and suggest two volumes, one already published and a second in the press; both are the products of international conferences of scientists and physicians who are seriously examining the spiritual implications of their endeavors.

1. "Modifying Man: Implications & Ethics" (Craig W. Ellison, editor) University Press of America. Washington, D.C. 1977.

2. "Whole-Person Medicine: An International Symposium" (D. Allen, L. Bird & R. Herrmann, editors) InterVarsity Press, Downers Grove, IL, in press.

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Available from Office of American Scientific Affiliation

1. "Whole-Person Medicine: An International Symposium," ed., by David Allen, Lewis Bird & Robert Herrmann, InterVarsity Press, Downers Grove, IL, 1980.
2. "Beyond Science", Denis Alexander, A. J. Holman Company, Philadelphia & New York, 1972. $3.95.
3. "Issues of Life & Death", Norman Anderson, InterVarsity Press, Downers Grove, IL, 1976. $2.95.
4. "Modifying Man: Implications and Ethics", ed. by Craig Ellison, University Press of America, Washington, D.C., 1978. $11.25.
5. "Abortion: The Personal Dilemma", R. F. R. Gardner, William B. Eerdmans Publishing Company, Grand Rapids, MI, 1972. $1.95.
6. "Horizons of Science", ed. by Carl F. H. Henry, Harper & Row, San Francisco, CA, 1978. $6.95.
7. "The Clockwork Image", Donald M. Mackay, InterVarsity Press, Downers Grove, IL, 1974. $2.25.
8. "Human Science & Human Dignity", Donald M. Mackay, InterVarsity Press, Downers Grove, IL, 1979. $3.50.

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CONTENTS