WE CAN—WE MUST: REFLECTIONS ON THE TECHNOLOGICAL IMPERATIVE

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FOR CENTURIES physicians have been guided in their medical ethics by the rationale of the Hippocratic oath. The total thrust of this pledge is the physician's obligation to alleviate human suffering and pain caused by biological disorders and disease wherever his skills permit. The physician's role, then, participates in the divine concern as he tries to *remedy* the malfunctions of the human organism, to *restore* the health and normality God intended man to enjoy.

Today's medicine, however, is no longer limited to remedying the faults and malfunctions of the human body. We are on the verge of using microbial and viral medicine to manipulate and modify the bedrock foundation of the human organism, our heredity. In this we face the possibility of so altering our human constitution that a *new* creature may be born which, despite its human origin and gestation, we may not consider a legitimate member of the human species because of its differences.

In another vein, our reproductive technology has long passed the stage where Macbeth's enemy Macduff could be considered somehow not human because he was "not born of woman" but taken prematurely from his dying mother's womb in a Caesarean section. "Not born of woman" or of the natural union of man and woman today can mean a child conceived by artificial insemination, with frozen semen, conception *in vitro*, or even transplantation of an embryo from one woman to another. Tomorrow "not born of woman" may well mean a nine-month gestation in an artificial womb, or in a subhuman surrogate mother, or the product of asexual cloning which bypasses egg, sperm, genital intercourse, fertilization, and pregnancy.

Today genetic engineering and our reproductive technology have catapulted the physician far beyond remedial medicine into the domain of creative designing and positive genetic planning.

The scientist, on the other hand, has traditionally remained aloof from humanitarian concerns. In our scientific adoration, we have allotted to the scientist an objective pursuit of reality, an unbiased search for the truths of nature. Thankful for the blessings of science and technology, we have endowed the scientist with a superhuman dedication, totally undistracted by emotion, unswayed by prejudice. In the scientific ivory tower, human values, social repercussions, the uses and abuses of scientific and technological knowledge were viewed as

the concern and responsibility of the layman. The scientist simply provided a knowledge of the universe and tools for its control and manipulation. Society and mankind would have to decide how to use this *good* knowledge and the tools properly. This image was further reinforced by the secular utopian translation of Christian eschatology by science in the eighteenth and nineteenth centuries.[1] But society and the scientific community awoke with a rude shock to the delusion both had accepted. The atomic mushroom and the specter of cloned humans, specially engineered to roll off some assembly line, have forced us all to acknowledge our personal individual responsibility for our common future.

MAN'S NATURE AS CREATOR

Both as a scientist and as a student of human history and theological thought, I am compelled to question our current panic and emotional concern over our power to manipulate our future. In one sense I agree it is a frightening and awesome power, perhaps even paralyzing. But it seems to me also that in our panic we have deliberately avoided one of the most basic premises of our Judeo-Christian tradition. We have always said, often without real belief, that we were and are created by God in His own image and likeness. "Let us make man in our image, after our likeness" logically means that man is by nature a creator, like his Creator. Or at least a cocreator in a very real, awesome manner. Not mere collaborator, nor administrator, nor caretaker. By divine command we are creators. Why, then, should we be shocked today to learn that we can now or soon will be able to create the man of the future? Why should we be horrified and denounce the scientist or physician for daring to "play God"?[2] Is it because we have forgotten the Semitic (biblical) conception of creation as God's ongoing collaboration with man? Creation is our God-given role, and our task is the ongoing creation of the yet unfinished, still evolving nature of man.

Man has played God in the past, creating a whole new artificial world for his comfort and enjoyment. Obviously we have not always displayed the necessary wisdom and foresight in that creation; so it seems to me a waste of time and energy for scientists, ethicists, and laymen alike to beat their breasts today, continually pleading the

[1] René Dubos, *The Dreams of Reason: Science and Utopias* (New York: Columbia Univ. Press, 1961).

[2] This self-deprecation is evident among many scientists, two prime examples being the negative tone of Leroy Augenstein's excellent exposition of ethical issues in genetic engineering *Come, Let Us Play God* (New York: Harper & Row, 1969) and Willard Gaylin's subtly shock-oriented article "The Frankenstein Myth Becomes a Reality," *New York Times Magazine*, March 5, 1972, pp. 12–13 and 41 ff.

question of whether or not we have the wisdom to play God with human nature and our future. It is obvious we do not, and never will, have all the foresight and prudence we need for our task. But I am also convinced that a good deal of the wisdom we lack could have been in our hands if we had taken seriously our human vocation as transcendent creatures, creatures oriented toward the future (here and hereafter), a future in which we are cocreators.

Eight years ago, early in the birth-control controversy, Louis Dupré warned us: "To talk about human nature as if it were an immutable entity, given in its entirety (on the sixth day), is to ignore the most essential characteristic of *human* nature."[3] In the *Weltanschauung* of the Greek philosophers and classic theologians, as well as in the average layman's mind, human nature is a fixed, unchanging datum, an immutable entity present in each human from a certain moment in time on into eternity. Sufficient evidence has now accumulated in the natural sciences and our potential for modifying and hybridizing human genotypes to convince many that this fixed philosophy of nature, and the ethics based on it, is both impractical and untenable today.[4] It must be replaced by an evolutionary or process *Weltanschauung* such as those proposed by the philosopher-mathematician Alfred North Whitehead, the paleontologist-mystic Teilhard de Chardin, the embryologist-system theory expert Ludwig von Bertalanffy, and the Hindu mystic-philosopher Sri Aurobindo.[5] Beyond this still developing process philosophy of nature, we need a process ethics which takes seriously man's technological and scientific capacities in the context of an ongoing cocreation of our evolving human nature.

THE HUMAN IMPERATIVE

Thanks to our exploding reproductive and genetic capacities, the image of the scientist is rapidly shifting from that of the beneficent shaman to that of some mad Frankenstein driven by a gross megomaniac sorcerer's delight in the power to grind out monstrous muta-

[3] Louis Dupré, *Contraception and Catholics: A New Appraisal* (Baltimore: Helicon, 1964) p. 45.

[4] Robert Francoeur, *Evolving World, Converging Man* (New York: Holt, Rinehart and Winston, 1970) pp. 79–123; and R. Francoeur, "Medical Ethics and Changing Concepts of Death in Bio-Medical Research," *IDOC International*, North American Edition, no. 14 (Nov. 28, 1970) pp. 79–95.

[5] Ewert Cousins, ed., *Process Theology: Basic Writings* (New York: Newman, 1971); Ludwig von Bertalanffy, *Problems of Life* (New York: Harper & Row, 1952), and *Modern Theories of Development* (New York: Harper & Row, 1962); Beatrice Bruteau, *Worthy Is the World: The Hindu Philosophy of Sri Aurobindo* (Rutherford, N.J.: Fairleigh Dickinson Univ. Press, 1972).

tions.[6] Some historical perspective would counter this emotional reaction.

Two mainsprings underlie our reproductive and genetic technologies: man's age-old desire to improve the quality of his domesticated animals and crops as a means to reducing hunger and starvation, and our desire to relieve the human suffering which comes from sterility, premature delivery, miscarriages, and mental retardation. Three historical vignettes will illustrate these motivations and restore some balance to our picture.

1) Artificial insemination became a reality in 1776, when an Italian priest-biologist, Lazzaro Spallanzani, began to wonder about the whole question of reproduction. At the time, animals were universally thought to reproduce in three modes: by spontaneous generation if they were flies or worms; by eggs produced by the female alone if they were birds or reptiles; and by male seed, semen, incubated in the female if they were human or among the higher animals. Spallanzani believed that reproduction required the union of both egg and sperm, and he set out to prove his theory. His first step involved putting oil-skin breeches on some male frogs engaged in mating. After the males broke off amplexus and the female had deposited her eggs, he allowed some eggs to develop without semen. These soon decayed. On other batches of eggs he poured the milky contents of the breeches. These developed into normal tadpoles. Four years later Spallanzani successfully inseminated some dogs in his rectory with a modified technique.

In 1799 a British physician, Dr. Home, alleviated the anguish of a childless couple by performing the first artificial insemination of a woman. Despite this early venture and others during the American Civil War, human artificial insemination remained a very rare occurrence. In animal husbandry, however, it found wide usage, particularly since 1930. Today, with extensive use of frozen semen, 95% of all the cattle in the United States are the product of artificial insemination: 60 million cows each year. 50 million ewes, over a million sows, well over 125,000 mares, 60,000 goats, and 4 million turkey hens reproduce each year in the United States with an assist from artificial insemination and man's helping hand.

With this kind of success in both numbers and quality of the offspring, it was inevitable that artificial insemination would be picked up by physicians as a very promising and safe way to relieve the anguish of childless couples. Today, close to 1% of the children born in America are the product of artificial insemination, most of these using an anonymous donor's semen. With 15% of all married couples sterile

[6] Willard Gaylin, *art. cit.*

and half of these traceable to the husband's sterility, human artificial insemination is likely to become a common mode of reproduction. Five years ago, less than 3% of our population knew about this technique, and practically all the examples were limited to large university medical centers. The mass media have changed this situation, and the growing popularity of male sterilization by vasectomy will likely increase the use of frozen semen stored by the husband. By February of 1972, human sperm banks were serving half a dozen large metropolitan areas, and a dozen more banks were in the planning stage. Compounding these factors is our growing understanding of hereditary diseases in man and the awareness that artificial insemination can be used as an alternate to adoption when a couple learn that the husband is a genetic carrier for hemophilia, cystic fibrosis, Huntington's chorea, Duchenne's form of muscular dystrophy, and other serious diseases increasing in the human gene pool because of our medical advances.[7]

Artificial insemination can relieve the anguish of a childless couple, but it can also be used in a wide variety of creative eugenic ways.

2) The demise of colonialism has led to the formation of dozens of new independent nations. These new nations have had to call on the latest and most experimental techniques to develop their economic and life-support systems as rapidly as possible.

Sheep and cows normally produce one or two offspring a year. Considering the scarcity of prize rams and ewes, cows and bulls, natural reproduction is a very inefficient process when you want to build large flocks and herds of the best quality in the shortest time possible. If one prize cow could be induced chemically to superovulate a dozen or a hundred eggs at a time, if these could then be fertilized *in vitro* with the frozen semen of a prize bull, and (as a fitting science-fiction conclusion to this tour de force) if the resulting embryos could be transplanted to a dozen or hundred pseudopregnant healthy but genetically nondescript surrogate mother cows. . . .

Superovulation experiments began forty years ago. Experiments with embryo transplantation (artificial inovulation) were first successful in 1953. By the early sixties, veterinarians and animal breeders around the world were using pseudopregnant rabbits as temporary incubators for the centuplet offspring of superovulated prize cows and ewes, shipping the handy bunny incubators with their precious cargo to developing nations where teams of animal breeders transferred the embryos to surrogate mothers for normal pregnancies.

Superovulation followed by artificial inovulation is now a common

[7] Robert Francoeur, *Utopian Motherhood: New Trends in Human Reproduction* (New York: Doubleday, 1970).

practice in animal husbandry, with a success rate of about 75%. Why not use this technique, then, to alleviate the anguish of a childless couple when the wife is prone to miscarriage and her sister is eager, in Christian charity, to carry her child as a prenatal wet nurse? Why not use embryo transplantation to aid a woman with blocked Fallopian tubes? In 1971 Dr. Landrum B. Shettles, head of obstetrics and gynecology at New York City's Columbia Presbyterian Hospital, announced the first successful transfer of a human embryo from one woman to another. At the same time Drs. R. G. Edwards and P. Steptoe were working with over fifty women at their laboratory in Cambridge, England, to bypass blocked oviducts with embryo transplants.

3) For millions of years, ever since the human animal's ancestors shifted to bipedal locomotion in the process of evolving a complex brain capable of rational creative thought, we have suffered a plague of miscarriages, spontaneous abortions, premature births, and very painful deliveries. These are the price we paid for our brain; but what if our brain can devise a mode of reproduction which bypasses the risks of miscarriage, of mental retardation, and eliminates completely the risks and pains of labor?

At the National Heart and Lung Institutes's Laboratory of Technical Development in Bethesda, Maryland, an artificial placentation system is being developed in an attempt to save the lives of premature babies. Drs. T. Kolobow and W. Zapol are developing a type of artificial womb, a large plexiglass aquarium in which premature babies can be maintained in a liquid environment while nutrients and oxygen flow to them through a plastic umbilical cord attached to two pint-sized spiral-coil membrane oxygenators, a (heart) pump and a dialyzer (kidney). The hope is to provide a substitute womb in which the premature baby's lungs and nervous system can continue to develop until they can support life in our world. Dozens of other laboratories are involved in similar research, motivated by a desire to learn more about the causes of premature delivery, miscarriage, and normal labor, hopefully to develop a means of saving premature babies and reducing mental retardation and miscarriages.

Most of the experimentation thus far has been done with lamb fetuses obtained by premature Caesarean section, but some premature human fetuses have been used in a final attempt to save their lives. Some scientists, working from the conception end of gestation, have been using *in vitro* fertilized human eggs as well. When this research is pieced together and complete, we should have an effective artificial placentation system available for a full-term human gestation in perhaps ten or fifteen years. One painful cost of the human brain could then be eliminated by man's creativity.

THE AMBIVALENCE OF "THE NEXT STEP"

These historical insights highlight some important characteristics of all medical and scientific research which we cannot forget in our present dilemma.

First, there is the obvious but often ignored *ambivalence of all human knowledge.* In the past we tended to view knowledge with an unalloyed aura of the good and true. We still retain this heritage, though the warning of the atom and current trends in biology and medicine are tempting many to swing to the exact opposite and view scientific knowledge, research, and technology as evil. Science and technology, like all human knowledge, means power, and power can be used or abused.

Secondly, we face the *unpredictableness of future applications.* Repeatedly we encounter the good *and* bad spin-off of basic research projects which at first appraisal seemed to be totally innocent of values or practical human applications. Spallanzani could not have conceived of the social and moral complications inherent in his experiments with artificial insemination and freezing of semen. It took over 150 years before we really began to appreciate what his technique meant in separating sexual intercourse from procreation. Twenty years ago, when veterinarians began to superovulate and artificially inovulate cows and ewes, no one thought of any possible application on the human plane. Given the mentality of the time, such human applications were simply unthinkable. Search for a medical remedy for female infertility ended up in a wide variety of conception-preventing pills.

Finally, there is always the question posed when man ventures forth to learn, inquire, or experiment: *where do we draw the line?* Roger Shinn has pointed out that in the sequence or progression from aspirin to insulin to artificial kidneys to brain surgery to genetic engineering there is no point at which we can "change from a clear yes to an absolute no," even though each new step raises more and more complex ethical issues.[8] Do we then plunge ahead, even when we do not know the consequences? Scientific and human research of all kinds is based largely on the faith that we will be able to somehow handle what we discover. And though some suggest that we should simply halt all research in sensitive areas because we cannot foresee all the consequences, Lord Brain has rightly pointed out the fallacy of this supposed solution: we cannot foresee the consequences of not continuing our research either.[9] It is the age-old dilemma of being damned if you do, and

[8] Roger Shinn, "The Ethics of Genetic Engineering," *North Dakota State University Bulletin,* April 22, 1967, pp. 13–21.

[9] Cited without source by Gordon R. Taylor, *The Biological Time Bomb* (New York: New American Library, 1968) p. 225.

damned equally or more so if you don't. Man has only one choice: to remain faithful to his nature as an inquirer and creator, but always with the responsibility of constantly evaluating and questioning the advisability of each new step and application.

I fully agree with Joseph Fletcher's careful distinction and view of two fallacies common in scientific and ethical discussions. The capacity fallacy maintains that because we can do something—genetic engineering, artificial wombs, embryo transplants—we should. This does not follow, and I take serious exception to the argument on human grounds. Equally fatalistic is the necessity fallacy: the assumption that because we can do something, we will do it, or someone somewhere will do it.[10]

SOLUTIONS

A growing number of laymen and scientists have responded to the complexities and implications of modern medical advances by suggesting a retreat in one form or other.

There is a fair amount of advocacy today for a *selected legal moratorium* on research and applications.[11] This approach, I believe, faces insurmountable obstacles to any effectiveness. First, some sort of consensus must be reached as to what areas will be placed off bounds. Laws must be formulated and passed, and policed universally and without bias. Every scientist would have his Big Brother. Furthermore, such a selected moratorium would prove harmful and inefficient: harmful because many unknown beneficial applications and spin-offs of the prohibited research would be eliminated; inefficient because the unforeseen spin-off of legal research could easily force us to continually expand the off-bounds area. However circumscribed, a moratorium would inevitably drive the forbidden research underground. More effective control is likely in a society where communications and information feedback are encouraged and facilitated between the scientific and lay communities on all levels.

A second solution would involve *a deep-freeze information bank*, a sort of delay mechanism whereby all research data and techniques are deposited with a central supervisory committee, who would then release the information for public consumption when they judged society ready and capable of handling new developments and applications. The inherent limitations and faults of this solution are patent to anyone experienced with "blue-ribbon" commissions. Who decides? What values do they use? And most important, what percentage of the

[10] Joseph Fletcher, "Ethical Aspects of Genetic Controls," *New England Journal of Medicine*, Sept. 30, 1971.

[11] G. R. Taylor, *op. cit.*, pp. 222–26.

population should be judged ready to handle a new development before it is released?[12]

Each year since 1968, Senator Mondale has tried to persuade Congress to establish a cross-disciplinary broad-based National Commission on Health, Science and Society, which would thoughtfully review all aspects and implications of biomedical pioneering and set up public policies, goals, priorities, ethical guidelines, and educational programs rather than plunge into hasty interference and unconsidered legislation. The lobbying of special-interest groups has repeatedly frozen his bills in committee, but such a national commission is essential to a much broader world-wide cross-cultural commission.

The only viable and effective solution, I believe, involves a recognition of our innate drive to inquire and create coupled with an effective mass-media education and communications network with *extended feedbacks from all areas of our global society*. This approach would promote, on a necessarily international level, a continual testing of all the likely and possible implications and repercussions of biomedical technology before each new step is taken. Mistakes would be inevitable, but constant checking and feedback would reduce these to a minimum. Such an approach would also effectively dilute the risk of manipulation and abuse of any technology for the advantage of the few.

Basically I am optimistic about our potential for handling the ethical and human issues posed by biomedical advances, though some like to compare these problems in a pessimistic way with the development and abuse of atomic power. In the crisis war mentality of the early 1940's, a handful of politicians and scientists could and did decide to develop the bomb and use it without consulting or even informing the vast majority of the people they were supposedly serving. Today, possibly ten or more years before cloning and artificial wombs become a reality, decades before genetic engineering reaches its potential, members of the scientific community are informing the public of what is possible and what may happen unless the human race decides to limit or delay human applications of certain technologies. Society is being asked to *share* the responsibility for decision-making and goal selection.[13]

We have already committed ourselves to creation. Our medical technology has progressively reduced the role of natural selection, which in the past kept defective genes at a minimum level. Diabetes,

[12] *Ibid.*; Albert Rosenfeld, *The Second Genesis* (Englewood Cliffs, N.J.: Prentice-Hall, 1969) pp. 181–95.

[13] Robert G. Edwards and David J. Sharpe, "Social Values and Research in Human Embryology," *Nature* (London), May 14, 1971, pp. 87–91.

hemophilia, phenylketonuria, cystic fibrosis, muscular dystrophy no longer kill. Children with these diseases can live fairly normal lives, marry, and often reproduce. Natural selection by an early death no longer restrains the frequency of these genes. Today's medicine has opened the door to a pollution of the human gene pool which may well be a death warrant for mankind. Having reduced natural selection, we are now forced into the unwelcome role of somehow selecting or restricting the heretofore assumed inalienable right of every human being to reproduce. Our knowledge is forcing us to face a totally new question, more serious than the assumed right of the adult to reproduce at will or the equally assumed right of a woman to terminate a pregnancy anytime for any reason. Now that we know in many cases how to avoid, prevent, or remedy the effects of defective genes during pregnancy or by not conceiving, are we not also forced to recognize and accept the inalienable right of every potential human to be born with a normal heredity? Does every potential human possess an inalienable right to normalcy, even when this would restrict the right of certain adults to reproduce or when this would require genetic engineering or reproductive technology? The practical ramifications of this basic new human right will, I believe, pose many serious ethical questions for us.[14]

THE SCIENTIFIC IMPERATIVE

Modern science and medicine are based on the radical conception of all organisms as individuals and as species in process. Contrary to the traditional theologies and philosophies, modern science cannot accept the nature of man as a fixed, unchanging datum. Whether or not most scientists and doctors are conscious of this process philosophy of nature can be questioned, but this philosophical foundation supports their scientific research and its conceptualization. Human nature and the individual person are continua in process.

Leon Kass, a renowned biochemist, has claimed that "the laboratory reproduction of human beings is no longer human reproduction."[15] Kenneth Vaux, Director of the Institute of Religion at the Texas Medical Center, has asked whether cloned individuals would be human or not. Paul Ramsey, a Protestant moralist at Princeton, and Jesuit Richard McCormick agree that artificial insemination with a donor's semen, artificial inovulation, cloning, and all forms of reproductive technology are totally and irrevocably immoral because God and na-

[14] Robert Francoeur, "Medical Progress and the Inalienable Right to Reproduce," *The Relevant Scientist* 1:2 (1972)—in press.

[15] Leon Kass, "Making Babies—The New Biology and the 'Old' Morality," *Public Interest*, no. 26 (1972) 18–56.

ture have decreed that the only morally licit mode of human reproduction must be through heterosexual intercourse within the monogamous marital union.[16] These moral positions assume that only God can make a tree or a man. They ignore the fact that God has shared with us His creative power so that we may contribute to the ongoing task of creating man and nature.

I find it helpful and provocative to ponder Joseph Fletcher's comment on the philosophy of nature and ethics which views man and human nature as a fixed, unchanging datum. Fletcher argues:

> Man is a maker and a selecter and a designer, and the more rationally contrived and deliberate anything is, the more human it is. Any attempt to set up an antinomy between natural and biologic reproduction on the one hand, and artificial or designed reproduction on the other, is absurd. The real difference is between accidental or random reproduction and rationally willed or chosen reproduction.... If it [the latter] is "unnatural" it can be so only in the sense that all medicine is. It seems to me that laboratory reproduction is radically human compared to conception by ordinary heterosexual intercourse. It is willed, chosen, purposed and controlled, and surely these are among the traits that distinguish *Homo sapiens* from others in the animal genus, from the primates down. Coital reproduction is, therefore, less human than laboratory reproduction—more fun, to be sure, but with our separation of baby making from love making, both become more human because they are matters of choice, and not chance.[17]

I have said the same many times, but not quite as succinctly or pungently.

There is, however, a vital complementarity to Fletcher's position which cannot be ignored or left in the shadows. Evolution occurs only because of the "creative instability," the spontaneous disorder, of some individuals. If everything is designed, ordered, goaled, purposed, and willed, we will eliminate the beauty of the unpredicted and spontaneous. Thus, while accepting Fletcher's thesis, I would argue that it is one-sided and that we need to somehow incorporate spontaneity and the creatively accidental into our growing control over human reproduction.

If human nature is not an unchangeable datum and if we are by divine decree destined to the prime role of directing and choosing the path of our ongoing creation, then the varied and complex possibilities of our reproductive technology and genetic engineering will have to be

[16] Paul Ramsey, *Fabricated Man: The Ethics of Genetic Control* (New Haven: Yale Univ. Press, 1970), and Richard McCormick, S.J., "Notes on Moral Theology," THEOLOGICAL STUDIES 30 (1969) 680–92.

[17] J. Fletcher, *art. cit.*, pp. 5–6.

examined, evaluated, and decided on in terms of the ever-changing consequences rather than on some a priori judgment that this or that technique violates some assumed God-given nature.

There is a *via media* between unlimited, unrestricted, undirected, socially aloof research whose only goal is the pursuit of "truth" and knowledge or the short-term alleviation of human suffering, and a total retreat from our technological capacities and our God-given powers to create. That *via media* may be elusive and always just beyond our reach. And the time may be terribly short. But do we have any real choice other than to start now to find that *via media*?