

THE TENTH MEETING

The Future Evolution of Man

- A) Recombinant DNA Research
- B) Genetic Engineering

Dean Smalley

Tonight we come to our second meeting on the sixth day of creation and our discussion will be on the future evolution of man. Many scientists think that man will soon be able to take his future evolution into his own hands by means of genetic engineering or eugenics using the recently discovered tool of recombinant DNA. Let me begin our meeting as usual by reading the Scriptural account of the sixth day:

And God said: "Let the earth bring forth living creatures according to their kinds; cattle and creeping things and beasts of the earth according to their kinds." And it was so. And God made the beasts of the earth according to their kinds, and everything that creeps upon the ground according to its kind. And God saw that it was good. Then God said, "Let us make man in our image, and after our likeness: and let him have dominion over all the earth." So God created man in his own image, in the image of God he created him; male and female he created them. And God blessed them, and God said to them, "Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth." And God said, "Behold, I have given you every plant yielding seed which is upon the face of all the earth, and every tree with its seed in its fruit: you shall have for food. And to every beast of the earth, and to everything that creeps on the earth, everything that has the breath of life. I have given every green plant for food." And it was so. And God saw that everything that he had made, and behold it was very good. And there was evening and there was morning a sixth day (Gen 1:24-31).

Dr. Arthur Schonfield

Evolutionists have recognized for many years that there is still much to learn about the subject, especially the mechanisms involved. Mutation, natural selection, and isolation can't be the whole story. I think this is the underlying reason for the great excitement in the scientific community about recombinant DNA. I was quite surprised to hear during our discussion on the origin of species both Mrs. Stepan and Rev. Swezey defend the antiquated theory of fixism. If man can cross the so-called "species barrier" in the laboratory by recombining the DNA of different species, surely the same thing must also be occurring in nature, though of course there

is much work yet to be done before we are clear just how this happens. But I am certain that it is safe to say that the known mechanisms of evolution are now mutation, recombination, natural selection and isolation.

But let me get on with the topic at hand, the future evolution of man. We no longer have to wait a million years or more for the future evolution of man to occur by accidental mutations. By means of the new technique called recombinant DNA it will soon be possible by genetic engineering for men to achieve the equivalent of a million years of evolution in a few generations. Let me read from *The Ultimate Experiment: Man-Made Evolution*, by Nicholas Wade, a reporter for *Science*, the weekly journal of the American Association for the Advancement of Science. The first chapter is significantly entitled *The Keys of the Kingdom*:

“Some thirty-five years ago physicists learned how to manipulate the forces in the nucleus of the atom, and the world has been struggling to cope with the results of that discovery ever since. The ability to penetrate the nucleus of the living cell, to rearrange and transplant the nucleic acids that constitute the genetic material of all forms of life, seems a more beneficent power but one that is likely to prove at least as profound in its consequences.

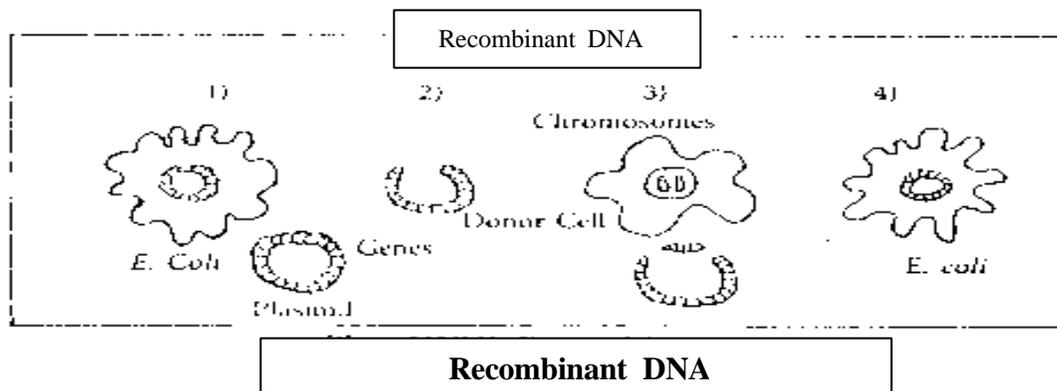
“It could well prove comparable to that other biological revolution in man's history, the domestication of plants and animals. That achievement, by the people of the Neolithic Age, opened a doorway for man to pass from uncertain existence as a hunter and gatherer to life as a farmer, herder, and city dweller. From that beginning some seven thousand years of urban civilization have followed. Yet Neolithic man, like the animal and plant breeders ever since, did not create new species: he only selected, and reinforced by breeding, the characteristics he desired from among those already within the natural genetic potential of a species.

“Scientists today cannot design entirely new genes any more than Neolithic man could (although that may eventually be possible). What the new gene-splicing technique does make possible is the transfer of genes from one species to another, regardless of the reproductive barriers that nature has built between them to isolate one species from another. It is now becoming technically possible (though practically fruitless) to intermingle the genes of man and fungus, ant and elephant, oak and cabbage. The whole gene pool of the planet, the product of three billion years of evolution, is at our disposal. The key to the living kingdom has been put into our hands.

“There are occasional suggestions made on scientific or moral grounds, that the key should be thrown away. Such abnegation of intellectual curiosity is not in man's nature, and in any case the question is moot: the door to the treasure-house is already ajar, and the only question remaining is what use will be made of the treasures within.”¹

Let me give a little historical background for this new technology. Our story begins in 1865, when an Augustinian friar, Gregor Mendel, discovered the laws of heredity. Three years later in 1868, a German biologist, Friedrich Meischer, discovered an acid in the nucleus of the

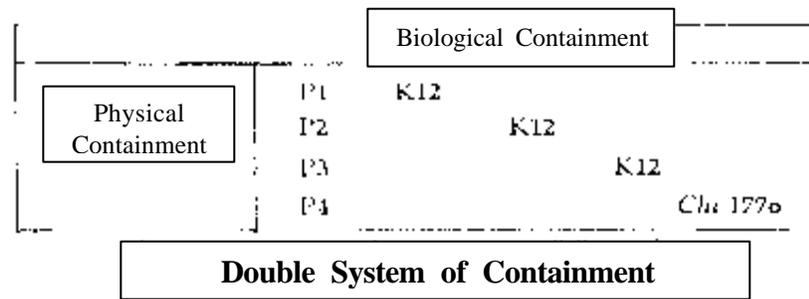
cell which he named deoxyribose nucleic acid (DNA). Meischer did not know what this acid did, and it was not until 1948 that an American medical doctor, Oswald Avery, put Mendel and Meischer together. Avery discovered that Mendel's hereditary units, which later had been called genes, were made of DNA. Finally, in 1972 Stanley Cohen and others at Stanford University developed the recombinant DNA technique.



The favorite vehicle for recombinant DNA experiments is the bacterium *Escherichia coli* or *E. coli* for short. This little creature was discovered by the German biologist Theodor Escherich, in 1885, and named for him. In a single-cell creature as simple as *E. coli*, there is no proper nucleus, and extra chromosomes are floating around in the cytoplasm in little loops called plasmids. In Step 1) of the diagram on the board, one of the plasmids is removed, and in Step 2) the plasmid is broken open with an enzyme. Then from a different organism (it can be from a lower organism like a virus, or a higher organism like a fruit fly, or even from a man) a section of chromosome which contains the genes, the hereditary units, is removed, and 3) spliced into the open plasmid. Finally 4) the plasmid is reinserted into *E. coli*, and when it reproduces in the normal way by meiosis, the foreign DNA is also reproduced.

In 1971 Paul Berg, also of Stanford University and one of the first to develop the recombinant DNA technique, was about to combine the DNA of *E. coli* with the DNA of a virus called SV40 or Simian virus 40, which causes tumors in monkeys. Herbert Pollack, a cancer researcher at Cold Springs Harbor, Long Island, accidentally heard about the experiment and telephoned Berg to say he considered it extremely risky. *E. coli* is practically ubiquitous and very hardy. It lives in the intestines of every animal, including man, in sewers, in drinking water, and so on. If *E. coli* were combined with a dangerous virus and then infected a laboratory worker, it could spread to the community and theoretically cause a serious epidemic. Impressed, Berg called several of the most prominent researchers in the country, and in 1974 they met at the Massachusetts Institute of Technology, where they decided to call for a voluntary moratorium on recombinant DNA research until a conference of all the leading researchers in the world could be held to assess the possible risks of the new technology. In 1975 ninety American and fifty foreign scientists, the top men in the field, gathered at Asilomar

in California. After long and at times heated discussion, the almost unanimous consensus was that the benefits of the research far outweighed the risks involved. They proposed to minimize, if not completely eliminate, the risks by a double system of containment which I have indicated on the board.



In this graded system of physical containment, P1 is the ordinary laboratory with no particular safety features. Only an experiment that was considered completely harmless could be done in this type of facility. As the experiment was considered more risky, the safety features increased, until a P4 laboratory had to be entered by an air lock and the actual experiment performed in a glove box. Side by side with the physical containment, a method of biological containment was also proposed. E. coli in its natural state has been known to cause disease, but there is a strain developed in the laboratory called K12 which is considered completely harmless. K12 would be used in experiments in P1, P2 and even P3 laboratories. One of the researchers, Roy Curtiss of the University of Alabama, was assigned to develop an even more weakened strain of E. coli; and in 1976, our bicentennial year, he produced a strain he named Chi-1776, which he says could not possibly survive outside the laboratory. It would be used in a P4 facility for experiments which were considered the most hazardous.

Then in 1976 the National Institutes of Health (NIH), which is the Federal Agency funding most of the research, adopted the Asilomar guidelines. The NIH funds the work done in the universities, but not the work in private industry. If, for instance, a researcher was found doing an experiment in a P2 facility that should have been done in a P3, his Federal funds could be withdrawn.

So far the discussion had been mostly in the scientific community, but in 1977 it spilled over into the public arena. The confrontation between the public and the scientific community came to a head in Cambridge, Massachusetts, the home of Harvard and MIT. When Harvard University announced plans to build a P3 facility, Mayor Alfred Vellucci called for public hearings to assess the possible risks to the people of Cambridge. A special citizen's review board was established by the Cambridge City Council to examine the facts in the case.

“The citizen's chose their own ground for decision without falling captive to either side of the scientist's debate. The proponents had implied that restricting research would impede discovery of a cure for cancer and the like, but the review board decided that ‘the benefits to be derived from this research are uncertain at this time,’ although the possibility for advancement certainly existed.

“The opponents had said that since no containment system could be foolproof, the research should not take place in a city, if at all. The review board decided that absolute assurance of safety was an unreasonable expectation. The citizens did not define precisely what degree of risk was acceptable, but they at least grasped the metal that hitherto had been too hot for any other group to handle by deciding that there was a risk but that they, on the public's behalf, were willing to accept it even without any immediate countervailing benefit.

“Knowledge, whether for its own sake or for its potential benefits to mankind, cannot serve as justification for introducing risks to the public unless an informed citizenry is willing to accept those risks,’ the review board wrote in its report. P3 research, it advised, should go ahead, although under certain additional safety conditions to those specified in the NIH guidelines, such as the proper monitoring for the escape of the organisms used in the experiments.

“The citizens' recommendations were accepted by the city council in February 1977, although with a few further restrictions, such as a ban on P4 research, which the universities have no known plans to perform. Biologists at Harvard and MIT now have to work under more stringent conditions than if the city had left them alone, but the extra conditions are tolerable and confer the advantage of enabling the research to proceed with the informed consent of the public.”²

So far we have only dealt with the health hazards of recombinant DNA research; let me proceed now to the more crucial issue of genetic engineering and eugenics:

“The social acceptability of engineering the human gene set may prove a more formidable obstacle than the technical problems. George Wald, for example, has already proposed that the human genome [man's total genes] should be declared inviolable. But the precept, even if acceptable, is vulnerable to erosion. The advantages of genetic engineering are going to be demonstrated first in the skillful improvement of crop plants and domestic animals. Next will come a development opposed only by Luddites and religious obscurantists, the gene-splice treatment of some of the fifteen hundred human diseases known to be genetically determined. Means of genetic manipulation may then be discovered that enhance the natural process of development and enable each individual to realize his full genetic potential.

“Each such advance would surely be intensely debated as were the first uses of the gene-splicing technique, but the outcome of such debates is seldom in serious doubt: the forces

of progress will generally prevail over unsubstantiated forebodings of theoretical hazards. Yet by the time that the human genome has been improved a little, for the best reasons, there remains no clear barrier against improving it a lot. The dilemma raised is more than purely taxonomic: a substantial improvement on the human gene set, once we know how to effect it, will produce a creature as different from man as is man from the apes - in other words, a new species “³

Nicholas Wade concludes his presentation of genetic engineering with a criticism of the negative attitude of counter-culture critics like Theodore Roszak, whom Rev. Swezey has quoted several times:

“Social critics such as Theodore Roszak have made a major theme of science's corrosive effect on other systems of values. Science ‘has taken on the character of a nihilistic campaign against the legitimate mysteries of man and nature,’ says Roszak. The view of the scientist as a profaner of nature's mysteries is as old as the Romantic rebellion:

"Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in heaven:
We know her woof, her texture; she is given
In the dull catalogue of common things.
Philosophy will clip an Angel's wings,
Conquer all mysteries by rule and line,
Empty the haunted air and gnoméd mine -
Unweave a rainbow..." [Keats]

“The price of listening to this particular lament would have been the industrial revolution; mankind would still be enjoying the buccolic simplicity the Romantics idolized. Nevertheless, the discoveries flowing from gene-splicing technique will eventually touch on the roots of human existence and can hardly fail to have an emotional and intellectual impact of some kind. To read a print-out of the complete sequence of one's own DNA would probably be a curious experience: no one likes to think of himself or herself as being based on a blueprint that is embodied in a purely chemical system and differs by only a few percent of an admittedly complex formula from some four billion other systems.

“It would be a reductionist fallacy to equate a person with his DNA sequence: environmental as well as genetic influences weigh strongly in determining character. All the same, complete understanding of the human gene set, its developmental program, and its differences from the gene sets of other animals, could well affect, and perhaps degrade, humankind's view of itself and importance in the universal scheme of things. That is no argument for declaring the human gene set off bounds to gene splicers, but it is one of the factors to be considered in the technique's long-term balance sheet, possibly though not necessarily on the debit side.

“The ability to manipulate the stuff of life is the ultimate technology. Other techniques are merely extensions of man's hands or senses, serving to amplify or project the capabilities of the user. The further improvement and refinement of these technologies will doubtless continue to be a preoccupation for long into the future. But the impending ability to turn the tools inward for the reshaping of man himself would be an event quite out of the ordinary march of technological progress. Hitherto evolution has seemed as inexorable and irreversible a process as time or entropy; now at last there lies within man's grasp a tool for manipulating the force that shaped him, for controlling his own creator.”⁴

Let me conclude my presentation tonight with a very appropriate quote from Carl Sagan's *The Dragons of Eden*:

“...Societies will, of course, wish to exercise prudence in deciding which technologies - that is, which applications of science - are to be pursued and which not. But without funding basic research, without supporting the acquisition of knowledge for its own sake, our options become dangerously limited. Only one physicist in a thousand need stumble upon something like the displacement current to make the support of all thousand a superb investment for society. [James Clerk Maxwell's discovery of the displacement current made both radio and television possible.] Without vigorous, farsighted, and continuing encouragement of fundamental scientific research, we are in the position of eating our seed corn: we may fend off starvation for one more winter, but we have removed the last hope of surviving the following winter.

“In a time in some respects similar to our own, St. Augustine of Hippo, after a lusty and inventive young manhood, withdrew from the world of sense and intellect and advised others to do likewise: ‘There is another form of temptation, even more fraught with danger. This is the disease of curiosity...It is this which drives us on to try to discover the secrets of nature, those secrets which are beyond our understanding, which will avail us nothing and which men should not wish to learn...In this immense forest, full of pitfalls and perils, I have drawn myself back, and pulled myself away from these thorns. In the midst of all these things which float unceasingly around me in everyday life, I am never surprised at any of them, and never captivated by my genuine desire to study them...I no longer dream of the stars.’ The time of Augustine's death, 430 A.D., marks the beginning of the Dark Ages in Europe.”⁵

Finally let me say that the apprehension felt by many people concerning recombinant DNA research has greatly diminished, especially among concerned scientists. In spite of intense activity in the field over the past few years, not one serious accident has been reported.

Fr. Robert A. Staats

For my presentation tonight on the future evolution of man, I would like to turn again to Fr. Owen Garrigan, a professor of theology at Seton Hall University, and the author of the excellent *Man's Intervention in Nature*:

“Somewhere in the utopian future, mankind will build upon his legacy from his ancestors, taking advantage of his expanded mental capacity to guide the development of the biological foundation of human nature. Even now a new era is being opened as man begins consciously to be an agent of evolutionary change in his own species. The time is not far off when a man, by taking thought will indeed add a cubit to his own stature. Man will speak about the transition from *Homo sapiens* to *Homo homine factus* (man-made man). And there will be an element of truth in their words. "Man-made man!" The term has a somewhat inflated and sensational ring in our day. But can we exclude the very real possibility of this phenomenon tomorrow. It has only begun to be apparent that *Homo sapiens*, as we know him, is only one stage in a long process of becoming. He is the product of many stages of development in the past. And it is not yet apparent what he will be. As evolution continues, our contemporary man seems destined to be used as raw material for the manufacture of the more advanced human product of the future. Man's commission to 'build the universe' may allow, and even require, his building a new nature for himself. The methods are already being assembled to make the transition a reality.”⁶

The phrase "build the universe" is from Teilhard de Chardin, a man, you will all agree, was way ahead of his time. Let me now give two of Garrigan's speculations concerning what form this man-directed evolution might take:

“If man learns how to separate the mechanisms of evolution, it may be possible for him in some ways to by-pass the actual intermediates that have determined his present status. In effect, he will be able to return to the earlier indeterminate stages and impose choices other than those historically taken...

“For example, man today derives his energy from the food he eats. Plants, on the other hand, derive their energy from the sun by means of photosynthesis. One of the choices on the route to man removed the indeterminacy regarding photosynthesis. The living species from which man sprang were not photosynthetic. With sufficient knowledge of biological mechanisms, however, it may be possible to give the option of photosynthetic capability to man. One might imagine a man with a patch of photosynthetic skin. He could then acquire energy like a solar battery from a light source. A few minutes outdoors or under a sunlamp would be the equivalent of a banquet. It would be a neat and efficient cycle if man could "fix" or assimilate the same carbon dioxide (CO₂) via photosynthesis that he exhales as the product of the digestion of food. The humans of the future, once they arrived at a more thorough knowledge of the molecular mechanisms of their own biology, may indeed have the option of being green.”⁷

This example and the one following may seem a little on the bizarre side today, but may perhaps be taken for granted tomorrow.

“...At the present time man's mental capacity is remarkable, but quite limited compared with computer possibilities. Man can handle fewer than fifty bits of information each second. An attempt might be made to produce mental supermen by modifying the organ of thought so as to

realize its maximum potential. Even if man were capable of only a few minutes of super-thought per day, who knows what good might result? It takes thirty-three normal cell divisions to account for the ten billion pyramidal cells already present in the young embryo brain. These cells will condition the mental activity of the brain during its whole life. Just one more division, the thirty-fourth, would double the number of these cells in the brain. The increase in size which doubling would entail would be formidable in the process of birth. It would no longer be formidable if birth were a process of decantation, as in Huxley's *Brave New World*. Perhaps the blood supply to the fetus could be improved so that vitamins, hormones, enzymes, or other nutrients would make for maximal brain growth. Over twenty years ago it was found that rats treated with the anterior-pituitary-growth hormone had larger brains and eighty-six per cent more neurons when born. For the artificial stimulation of brain growth an embryo might be taken from the womb for culturing in a bottle at about two or three months. This would be no radical departure in itself, but merely an extension of our present competence in the viability of infants premature by many weeks. (The application of sex hormones at these early stages would almost certainly enable the parents to choose the sex of their child.”⁸

After discussing the various genetic engineering techniques that are being proposed, and the results they may achieve, Garrigan goes on to discuss the moral implications of this new technology. As is usually the case, there are two extreme views. An absolute "yes" is given by men like B.F. Skinner of Harvard University, the behavioral psychologist and author of *Walden II*, who feels that men must actively manipulate their genetic endowment to achieve Utopia, and an absolute "no" by the Nobel laureate George Wald, who has proposed that the human genome be declared inviolable. Fr. Garrigan favors a middle road between these two extremes:

“*A Middle Course*. Genetic intervention is accepted in principle, but each case is to be decided on its own merits. One must be reasonably certain that the proposed genetic change is good. Risk to the species must be entirely excluded. Risk to the individual must be minimal, that is of the same order of magnitude as ordinary acceptable risks. The history of evolution records certain mistakes, evolutionary trials that were not successful, the exploration of the avenue that became a dead end. Now that man is entering the field of directing evolution, it is unfair to expect him to avoid all mistakes. However, he must take due precautions. Trials on animals, for example, must have advanced to the stage where the experimenter can predict from solid scientific evidence what the outcome will be when applied to man.

“In the matter of man's stewardship over human evolution, the present generation is well advised to remain open-minded. A closed mind would be unwise, because all the facts are not yet in. Detailed and definitive judgments would still be premature. Facile answers today may not survive the deeper insights of a future age. Just as we stand on the shoulders of our predecessors, so our descendants will stand on ours. If there is to be a "hyperethics" growing out of the controlled biology of the future, the men who meet the future problems will have future talents and abilities. The Church itself develops not only in its doctrine but also in its moral insight. The Church of the future, with its more intensely human understanding of revelation, will

be in a better position to judge some of the issues of current speculation. In short, we must be slow to accept anything so momentous as genetic control, but open to future developments.”⁹

Let me conclude by turning again to *Teilhard de Chardin*. His biographer, Robert Speaight, after briefly examining some of the techniques of man-directed evolution, concludes with Teilhard's own assessment of the morality of eugenics and genetic engineering:

“Such experiments would be delicate, to be sure, but they should be ‘healthily, respectfully, and religiously undertaken’ - no longer merely in the sense of one man experimenting on another, but in the sense of ‘humanity as a whole feeling its way forward to a new acquisition of vitality.’ Writers like Wells and Aldous Huxley had painted their satirical pictures of what such a brave new world might be. Nevertheless the idea behind it was a noble one and need not, in practice, coarsen into caricature. Eugenics was not only a matter of selective reproduction:

”What attitude should the advancing sector of humanity adopt towards static and decidedly unprogressive ethnic groups?...Up to what point should the development of the stronger - always supposing that this can be clearly defined - take precedence over the conservation of the weak? How shall we reconcile with a maximum of efficiency the care we expend on the wounded with the superior necessities of the attack? In what does true charity consist?”

“These were dangerous questions, but Teilhard had gone some way to answer them by his own conduct in the trenches, where he served as a stretcher-bearer, not as a combatant. Indeed, now that he looked back on that time, he was bound to admit that most people could still understand the meaning of force - and force was the “symbol and key of greater being” - only in the shape of war. But in the world of the future Teilhard prophesied a ‘collective act of perception...a fusion of races leading directly to the establishment not only of a common language, but of a common morality and common ideals...a community of effort and struggle for the same objectives, accompanied ipso facto by fighting comradeship.’ In this way, and under the stress of these affinities, the organization of human energies was leading to the emergence of a ‘common human soul.’”¹⁰

Mrs. Maria Stepan

I was not surprised to hear Dr. Schonfield's criticism of fixism and his debunking of the so-called "species barrier." I once heard a debate on the radio between two scientists on the merits of recombinant DNA research. One of them was what Rev. Swezey has been calling an establishment type, and the other a counter-culture type. The establishment type said: "There is no such thing as a species barrier." The counter-culture type asked: "Have you ever heard of a mule?"

We heard Rev. Swezey admit what is called micro-evolution, but assert that this is not really evolution at all, but merely variation. This variation occurs, he said, through species and up through genera, but stops at family (which he considers the equivalent of the biblical "kind"), because of the sterility of hybrids. The horse and the ass belong to the same family of horse-like creatures, but their offspring, the mule, is sterile. The sterility of hybrids renders macro-evolution, or evolution between the great classes, for example between reptile and mammal, manifestly impossible.

However, with the development of the new recombinant DNA technique it should be at long last possible to test experimentally the possibility of macro-evolution. The evolutionists have long maintained that the reason they can't demonstrate the theory by breeding experiments, as Darwin and Huxley originally hoped to do, is because of the tremendous lengths of time involved, but with the advent of recombinant DNA technology that excuse is no longer valid.

Why not try to reproduce these transitional types, the missing links between the great classes, in the laboratory by recombining the DNA of, say an amphibian and a reptile. This could be done at the single cell stage between two species that the evolutionists consider closely related. I presume, good scientists that they are, the evolutionists would abandon the theory if such experiments proved unsuccessful, or would they?

During the height of the controversy between Harvard University and Mayor Vellucci, Bishop Thomas Riley, one of the Auxiliary Bishops of Boston, made an excellent statement on the position of the Church with regard to the ethical problems raised by recombinant DNA research. The statement appeared in the *The Pilot*, the official archdiocesan newspaper, and was entitled, *Will DNA Research Evoke Moral Concern?*

“The problems raised by this type of biological research have been compared to those presented in the field of physics by the development of nuclear energy. In each field scientists seem to have penetrated to the very depth of the universe, to the sources of energy and life. Armed with such power, men have reason to ask themselves how long they can continue to rely on the apparent physical strength of the world in which they live, and on their own social institutions, to protect them from the indifference of people toward one another. In other words, one may ask, has human ingenuity at last created the power which, if irresponsibly employed, may lead to the destruction of the universe and of humanity itself...?”

“Two points seem to be suggested. First, the difficulty of restraining, even by self-discipline among the scientists themselves, the urge to follow up the possibilities of further research which collective investigation has opened up; and secondly, the danger that techniques developed honestly in view of beneficial results may become available to people who will use them unscrupulously and ruthlessly for purposes inconsistent with the moral development of humanity. One of the inherent dangers of government is the tendency to usurp supreme and totalitarian power. This tendency is particularly strong when governmental policy issues from an atheistic philosophy and is directed toward perpetuation of narrowly conceived objectives.

“For this reason it is important that the voices of religious leaders be loud and clear in protesting the attempts of government to constrain their freedom of expression, or to subordinate their spiritual influence to the achievement of merely natural and ephemeral advantages...

“There is great reason, however, for fearing the twofold danger of unscrupulous and irresponsible scientists and the misuse by government and industry of legitimately developed scientific techniques. The problems presented by DNA research and the related problem of nuclear fission bring forcefully to our attention the disastrous possibilities of the power over nature and life which human ingenuity has generated. At the dawn of human history there was indication of what is likely to happen when those who do not fear God gain power over God's creation which enables them to destroy it.”¹¹

Bishop Riley is speaking of Adam and Eve who, in disobedience to God, ate of the "tree of the knowledge of good and evil" and, although they did indeed become like gods, they did so at the price of expulsion from the garden of Eden.

Pope John Paul II has also repeatedly voiced concern over the recent developments in scientific research in the field of genetic engineering and related areas. Let me read a few paragraphs from an allocution he delivered in 1980 to the Italian Society of Internal Medicine:

“The truth is that technological development characteristic of our time is suffering from a fundamental ambience. While on the one hand it enables man to take in hand his own destiny, it exposes him on the other hand, to the temptation of going beyond the limits of a reasonable dominion over nature, jeopardizing the very survival and integrity of the human person.

“Just consider, to remain in the sphere of biology and medicine, the implicit danger to man's right to life represented by the discoveries in the field of artificial insemination, the control of births and fertility, hibernation and ‘retarded death,’ genetic engineering, psychic drugs, organ transplants, etc. Certainly scientific knowledge has its own laws by which it must abide. It must also recognize, however especially in medicine, an impassable limit in respect for the person and in the protection of his right to live in a way worthy of a human being.

“If a new method of investigation, for example, harms or threatens to harm this right, it is not to be considered lawful simply because it increases our knowledge. Science, in fact, is not the highest value to which all others must be subordinated. Higher up in the scale of values is precisely the individual's personal right to physical and spiritual life, to his psychic and functional integrity. The person, in fact, is the measure and criterion of good or evil in all human manifestations. Scientific progress, therefore cannot claim to lie in a kind of neutral ground. The ethical norm, based on respect for the dignity of the person, must illuminate and discipline both the research phase and the phase of the application of the results reached in it.”¹²

Let me go on now to the topic of eugenics. The American geneticist, Herman Muller, was the first to propose a practical eugenics program, which he called Voluntary Control of Germ Plasm (VCOGP). This plan unlike some of the tentative proposals being put forward for genetic engineering, is already in use on a small scale and could be greatly expanded. The plan is based on artificial insemination (AI), and is similar to a program dairy farmers call Dairy Herd Improvement (DHI) in which the farmer selects the sperm of prize bulls from a catalogue. It is possible by this method to raise the milk production of a herd of cows in just a few years. This is the positive aspect of the plan; the negative side is that any cow which does not respond by increased productivity is immediately shipped off to the butcher. Muller first proposed his eugenics plan in 1927 and it is still in vogue. The Nobel laureate, William Shockley, the inventor of the transistor, recently got into the news by donating his sperm to such a plan.

Eugenics is basically an attack on Christian marriage; and in 1930, Pope Pius XI brought out his wonderful encyclical on Christian marriage, *Casti Connubii*, in which he attacked sterilization, a form of negative eugenics, and always a basic part of any eugenics plan.

“That pernicious practice must be condemned which closely touches upon the natural right of man to enter matrimony, but effects also in a real way the welfare of the offspring. For there are some who, oversolicitous for the cause of eugenics, not only give salutary counsel for more certainly procuring the strength and health of the future child - which indeed, is not contrary to right reason - but also put eugenics before the aims of a higher order, and by public authority wish to prevent from marrying all those who, according to the norms and conjectures of their investigations, would through hereditary transmission bring forth defective offspring. And more, they wish to legislate to deprive these of that natural faculty by medical action despite their unwillingness...and arrogate to itself a power over a faculty which it never had and can never legitimately possess.

“Those who act in this way are at fault in losing sight of the fact that the family is more sacred than the State, and that men are begotten not for the earth and for time, but for heaven and eternity...Public magistrates have no direct power over the bodies of their subjects...Furthermore, Christian doctrine establishes, and the light of reason makes it most clear, that private individuals have no other power over members of their bodies than that which pertains to their natural ends; and they are not free to destroy or mutilate their members, or in any other way render themselves unfit for their natural functions, except when no other provision can be made for the good of the whole body.”¹³

Artificial insemination, the basis of most of these eugenics plans, was condemned in 1949 and again in 1951 by Pope Pius XII. Let me read a few paragraphs from an excellent book by William E. May, a professor of moral theology at Catholic University, entitled *Human Existence, Medicine and Ethics*:

“Pius, in condemning artificial insemination whether by husband or donors, had offered two principal considerations. His first objection was that insemination outside the natural act of

intercourse would be ‘to convert the domestic hearth, sanctuary of the family, into nothing more than a biological laboratory.’ He argued that artificial insemination transforms the generating of new life from an act of procreation into an act of reproduction and that, for this alone, it is dehumanizing and depersonalizing. It was evidently his judgment that artificial insemination drives a wedge between the unitive and procreative meanings of human sexual intercourse, sundering a union that is likely to be inherent and inseparable by human agency. Obviously artificial insemination by a donor drives these two meanings of human sexual intercourse much further apart than artificial insemination by the husband, but the difference between the two forms is only one of degree or distance.’¹⁴

It is not generally realized that the current abortion movement in the United States and the infamous Nazi race purification program, both grew out of the eugenics movement. Let me read a few paragraphs from a very illuminating article by Michael Schwartz, of the Catholic League of Religious and Civil Rights, entitled *The Nazi-Abortion Link*, which appeared in *The National Catholic Register*:

“The real powers in shaping American policy with regard to population control and abortion are groups such as Planned Parenthood, Zero Population Growth, and the Population Institute. These organizations grew out of the eugenics movement, which had its heyday in the 1920's, and they are still controlled by the social and academic elite groups that played such a prominent role in trying to keep the American race pure a half a century ago.

“ The eugenics movement, which was international but had its strongest base in the United States, is really the common parent of both the racial policy of the Nazis and the population control/abortion movement in contemporary America.

“American eugenicists were successful in getting a restrictive immigration law passed in 1924 that eliminated most immigration into this country from Eastern and Southern Europe...Eugenicists also succeeded in getting compulsory sterilization laws passed in a majority of the states during those years.

“The Supreme Court upheld the constitutionality of those laws in the infamous *Buck vs Bell* decision of 1927, in which, speaking through Oliver Wendell Holmes, it declared, ‘Three generations of imbeciles are enough,’ and ordered the sterilization of Carrie Buck, an allegedly feeble-minded Virginia woman. The Law for the Prevention of Progeny with Hereditary diseases, the basis of Hitler's race purification program, was directly patterned on the model sterilization law proposed by the leaders of the American eugenics movement...

“One of the most ardent promoters of eugenics in the 1920's was Margaret Sanger, the founder of Planned Parenthood. In a 1926 address at Vassar College, Mrs. Sanger noted that through the recently passed immigration law the United States had taken action to prevent the deterioration of the population from without. But, she complained, ‘we make no attempt to cut down the rapid multiplication of the unfit and undesirable at home.’

“Her solution was ‘offering a bonus or yearly pension to all obviously unfit parents to allow themselves to be sterilized by a harmless and scientific method...There is only one reply to a request for a higher birth rate among the intelligent, and that is to ask the government to take the burdens of the insane and feeble-minded from off your backs. Sterilization for these is the remedy...’

“Dr. Hines was another leading figure in the early Planned Parenthood Movement. In his 1936 *Medical History of Contraception* (which Planned Parenthood reprinted in 1965 with a glowing introduction from its president Alan Guttmacher), Hines asked the leading question. ‘Are Catholic stocks in the United States, taken as a whole, genetically inferior to such non-Catholic libertarian stocks as Unitarians and Universalists, Ethical Culturalists, Freethinkers? Inferior to non-Catholic stocks in general? No one really knows. One is entitled to his hunches, however, and my guess is that the answer will some day be made in the affirmative...’

“After the Second World War, when openly elitist statements like these became less palatable to the public, the leaders of the eugenics movement simply shifted their strategy to the "problem" of population growth in general. After all, most of the population growth was occurring among the lower racial groups, the *Untermenschen*, the disenfranchised, such as non-whites, poor whites, and Catholics.”¹⁵

In case there is any doubt about the similarity between Nazi elitism and that of some of the proponents of genetic engineering, let me conclude with a statement by James Watson, the co-discoverer of the double helix of DNA, and now one of the leaders in recombinant DNA research. This is taken from another excellent book entitled *Human Destiny* by John Hammes, a Catholic layman, who is professor of psychology at the University of Georgia:

“In January 1973, the U.S. Supreme Court legalized abortion, and in May of that year James Watson, co-discoverer of the double helix and a Nobel prize winner, extended the court's logic by proposing that it would be even better if a child were ‘not declared alive’ until three days after birth...His reason was that some birth defects were not discoverable until after birth, so that the three-day extension would permit legal killing of a defective child. Watson suggested that the doctor would ‘allow the child to die if the parents so choose’ - leaving unsettled the criteria for how defective a child must be in order to merit such a judgment. The phrase ‘not declared alive’ implies that we can determine by mere declaration whether the newborn is to be recognized as alive. Watson was obviously referring to the legal definition of what constituted human life; and since the Supreme Court had decided the future fetus had no legal right to life, Watson was astute enough to observe a logical extension of that loss of privilege.”¹⁶

Rev. De Verne Swezey

We have heard the secular humanists claim that man is now able to take his future evolution into his own hands. I would like to begin my presentation tonight by reading a few comments by Dr. Morris on this claim:

“Another common theme among evolutionists is that, since evolution has now ‘come to consciousness in man,’ and generated moral and ethical values, as well as an intellectual capacity for understanding the evolutionary process, we are now able to plan and direct all future evolution. One of America's leading evolutionary geneticists, H.J. Muller, said:

“Through the unprecedented faculty of long-rang foresight, jointly serviced and exercised by us, we can, in securing and advancing our position, increasingly avoid the missteps of blind nature, circumvent its cruelties, reform our own natures, and enhance our own values.”¹⁷

“ ...This belief that man can control future evolution is simply another evidence that evolution is itself a religion. Even assuming that geneticists and biochemists ever acquire enough understanding of genetic mechanisms to do such things, a tremendous number of value judgments will have to be made by someone when they are carried out. Every decision, as to the desirable traits of a future individual or the future course of evolution in general, will involve a vast system of ethical-values philosophy, and this is obviously religious in essence.”¹⁸

Dr. Schonfield read us a summary of the recombinant DNA controversy from Nicholas Wade's *The Ultimate Experiment: Man-Made Evolution*. Wade is a reporter for *Science*, the weekly bulletin for the Association for the Advancement of Science; in other words, he is a spokesman for the agnostic and atheistic Establishment. So let me read a few excerpts from a book by Richard Hutton, *Bio-Revolution: DNA and the Ethics of Man-Made Life*, which represents more the minority opinion among scientists on recombinant DNA, which is, however, the majority opinion of the public. One of the most vocal scientists involved in the recent recombinant DNA controversy was Robert Sinsheimer of Cal Tech, who tried unsuccessfully to introduce the question of ethics into the debate:

“Sinsheimer's arguments...indirectly deride the characteristic scientific arrogance - the monolithic belief that everything boils down to solutions couched in physical and chemical reactions [e.g. the double system of containment]...This arrogance has practically overwhelmed the recombinant debate at times...and most of it comes from the group that is pressing for relative freedom for the research. Its attitude is not something that we can accept with grudging amusement; it is not the kind of egocentrism that permits us to walk away shaking our heads because we think that it cannot effect us. To the contrary, the arrogance displayed by scientists on this issue is particularly galling, precisely because it subverts discussion of an issue which strikes at the very heart of the nature of public debate and responsibility. The scientist is saying, in effect, ‘Trust me. You cannot be expected to understand the true complexity of the problem.’ And of his opponents: ‘They are blinded by jealousy. They have their own axes to grind. They refuse to see things which, as good scientists, they should recognize.’ Sinsheimer's response

raises the question of who is saddled by the most self-interest. For, when push comes to shove, the entity whose self-interest really matters is the one most affected, the public; who, as Roger Dworkin noted at Asilomar, has the right, through its legislative representatives, to make its own mistakes.”¹⁹

In 1979 when the furor over recombinant DNA research had died down, the NIH quietly relaxed its guidelines. P3 and P4 facilities are no longer required for what once had been considered dangerous experiments. Paul Berg had originally said at Asilomar, that "P2 plus K12 is working in your garage."

“...If an accident occurs, the shouts of self-righteous glee (tinged, perhaps with a touch of sympathy for the victims) will no doubt rise from the ranks of those who worked so hard to oppose unrestricted research. If nothing untoward happens, the researchers will go merrily on their way, concocting newer and more obscure organisms. And the basic research will continue to make inroads on the secrets of nature, leading us to the brink of a technology so fundamentally different from the ones we know as to portend a dramatic revolution in the way we conduct our lives.

“What strikes the hardest about such a prediction is how little it seems to have been able to discuss the ‘other’ issues involved in the research, the issues which have been labeled irrelevant by the scientific establishment. We have, in a way, been cleverly deluded into looking at the object of our investigation as though through a pair of binoculars turned backward. A potentially great problem had been made small; circumstances which strike at the very heart of the way we live have been discussed simplistically by decision-makers, who have managed to define issues as though the only things at stake were technical in nature, as though ethics and morals were not involved...

“It is quite obvious why scientists wanted to steer clear of the dangers of ethical arguments. Ethics are no longer the companions of scientific thought. Scientists are working to learn more and more about less and less. [Isn't that a wonderful line!] Many of them have learned to fear the uncertainties and ambiguities that go hand and hand with the greater issues that beset us, for those issues are always open to interpretation and never get solved. For those scientists responding to questions about scientific accidents, the efficacy of the containment and the relative dangers of a certain line of research is simple. The figures of one side are compared to those of the other. Numbers replace reality as surely as plastic infantry units stand in for flesh-and-blood soldiers in the Pentagon's War Room.”²⁰

In 1977 Professor Charles Thomas of the Harvard Medical School was discovered conducting recombinant DNA experiments with SV40, a virus that causes cancer in monkeys, in a P2 laboratory. This was the type of experiment proposed by Paul Berg in 1971 that had originally touched off the whole controversy. Prof. Thomas was at the Asilomar Conference in 1975, and in 1976 had actually helped draft the NIH guidelines which specifically forbade the type of experiment he was conducting. The complaint against Thomas was made by an

anonymous technician in his own laboratory. Harvard claimed that it was unaware of the type of experiment being conducted by Thomas, and eventually the NIH, which was funding his research withdrew his grant. Thomas left Harvard in a huff, saying that the university was dominated by the radical left, evidently the minority group of scientists there who oppose unrestricted research. He was immediately snapped up by Scripps Clinic and Research Foundation at La Jolla, California. Since the NIH guidelines apply only to scientists receiving federal grants, which usually means the scientists at the universities (they do not apply to private industry), Thomas is now apparently free to conduct any kind of experiment he wants, in any kind of laboratory he wants. This is a combination that had frequently been warned against during the recombinant DNA debate - an unscrupulous, irresponsible scientist, plus unregulated, profit-hungry private industry.

In July of 1978, Dr. Martin Cline performed the first experiment in human genetic engineering. He was refused permission to perform the experiment at the hospital at UCLA, where his work was being funded by the NIH. The experiment was performed on two young women ages 16 and 21 in hospitals in Italy and Israel. The two young women because of defective genes were unable to produce hemoglobin in their blood cells. Cline had first performed the experiment on mice. Blood cells producing hemoglobin in the mice had been killed or rendered inoperative by radiation, and new genes inserted. The experiments on the mice were unsuccessful; no new hemoglobin was produced; but Cline went ahead anyway and repeated the experiment on the human subjects. The two young women showed no change in their condition, and many scientists working in the same field protested the ethics of this experiment.

Because of abuses such as this on the part of Thomas, Cline, and others, many scientists think that research in this and other areas should be brought under some kind of public control. Richard Hutton discusses one of the most frequently suggested solutions to this problem, the so-called "Science Court":

“The Science Court was first suggested in the late 1960's by Dr. Arthur Kantrowitz, a physicist who had helped solve the problem of ballistic missile and spacecraft re-entry years before...The Science Court would act as a bridge between the scientific community and uninformed policy-makers in government by providing an institutional setting in which adversary proceedings could be held. With perhaps five to seven judges drawn from the ranks of scientists and laymen alike, the court could offer a respected influential mechanism to anyone wishing to question controversial aspects of any line of research and development...It would have been a perfect place for the debate over recombination to have been held after the conferees at Asilomar had shown themselves incapable of dealing with the greater issues implied by the research.

“Because its role would not include issuing verdicts but would be limited to producing advisory reports upon the current state of technical knowledge, it could act as a clearing house for factual disputes that seem to color most scientific debates; it could record points upon which

both sides agree and render judgments on those which are in dispute. Ultimately, as its reports are published, it would act as an informational tool for the public and legislator alike, superseding the myriad methods of trial and error that seem to be the state of the art in scientific debate and providing a unified unbiased viewpoint.”²¹

I should hope that the "advisory reports" issued by the Science Court could then become the basis of possible criminal proceedings for some sort of malpractice in incidents involving the Thomases and Clines in the science community. Hutton concludes with the problem of genetic engineering or eugenics:

“The fallibility of scientists surfaces daily. But it becomes most obvious in some examples of ideological science - like the eugenics movement - that have periodically afflicted us throughout history. The pursuit of eugenics, the science of genetically improving the quality of the human race, actually began in the nineteenth century. While it surfaced as a legitimate branch of the rapidly developing discipline of biology, eugenics soon became a catchword, a useful way of explaining some of the more bizarre social policies that needed scientific validation. In the strictest sense, the original concept of eugenics is admirable; after all, who would not agree that we would be better off if such genetic deficiencies as hemophilia and Down's syndrome were removed from the human gene pool? But, in the world of the late nineteenth and early twentieth centuries, ‘genetic deficiencies’ were interpreted mainly to include characteristics inherent to whole classes of people, classes that shared the single, unifying feature of being repugnant to those in power...

"Between 1911 and 1930, thirty-three states passed laws requiring sterilization for a variety of behavioral traits deemed to be genetically determined. These included, depending on the state, such characteristics as criminality, alcoholism, tendency to commit rape, sodomy or bestiality, and feeble-mindedness. Many of these laws are still on the books and have resulted, since that time, in at least 60,000 sterilizations. For instance, it has been reported that the Eugenics Board of the State of North Carolina sterilized 1620 persons between 1960 and 1968, mostly young black women. By far the greatest category of sterilization under these laws was for feeble-mindedness. Feeble-mindedness can supposedly be defined by the administration of an IQ test. To get some idea of the validity of IQ tests in this regard, we need only look back at the results of Goddard, who was asked in 1912 by the United States Public Health Service to use the tests to determine the frequency of feeble-mindedness among new classes of immigrants into the country. Goddard's results demonstrated that the following frequencies of feeble-mindedness pertained: among Hungarians 83 percent, Russians 87 percent, Jews 83 percent, and Italians 79 percent." ²²

“It is...the danger of this kind of prejudice and the possibilities of distorted scientific vision that make it necessary for scientists to bow to some kind of societal control.”²³

Dean Smalley

The second of our meetings on the sixth day of creation dealt with the future evolution of man. Our two subtopics were recombinant DNA research and genetic engineering.

Dr. Schonfield gave what might be called the majority report of the scientific community regarding recombinant DNA research and genetic engineering. He emphasized that after several years of intense activity in these areas, not one serious accident had been reported. He urged that the research be given full government and public support.

Rev. Swezey, on the other hand, gave what might be called a minority report on the research and decried the absence of ethical considerations in the pursuit of scientific goals. He urged that scientific research be brought under some form of public control and suggested that a "Science Court" could more effectively deal with problems such as recombinant DNA research than the Asilomar conference. He also suggested that the criminal courts should deal in some way with irresponsible and reckless scientists.

Fr. Staatz proposed what he considered a "middle course" between the absolute "yes" to genetic engineering of Dr. Schonfield, and the absolute "no" of Rev. Swezey. He suggested that genetic engineering be accepted in principle, but that each advance in the field be examined on its own merits.

Mrs. Stepan concentrated on the teaching of the Magisterium of the Church regarding the moral problems raised by recombinant DNA research and by scientific research in general, as well as both genetic engineering and eugenics. She claimed that both the current abortion movement and the infamous Nazi race purification movement grew out of the eugenics movement.

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THE ELEVENTH MEETING

The Existence of the Soul

Dean Smalley

Tonight marks our third meeting on the sixth day of creation which deals with the origin of man. Tonight is also the final meeting in our lengthy dialogue. Since our very first meeting was devoted to the existence of God, we thought it appropriate that this last meeting deal with the existence of the soul. Let me begin as usual by reading the Scriptural account of the sixth day:

And God said, "Let the earth bring forth living creatures according to their kinds: cattle and creeping things and beasts of the earth according to their kinds." And it was so. And God made the beasts of the earth according to their kinds and the cattle according to their kinds, and everything that creeps upon the ground according to its kind. And God saw that it was good. Then God said, "Let us make man in our image, after our likeness; and let him have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the earth, and over every creeping thing that creeps upon the earth." So God created man in his own image, in the image of God he created him; male and female he created them. And God blessed them, and God said to them, "Be fruitful and multiply, and fill the earth and subdue it; and have dominion over every living thing that moves upon the earth." And God said, "Behold, I have given you every plant yielding seed which is upon the face of all the earth, and every tree with seed in its fruit; you shall have them for food. And to every beast of the earth, and to every bird of the air and to everything that creeps on the earth, everything that has the breath of life. Behold, I have given every green plant for food." And it was so. And God saw everything that he had made, and behold, it was very good. And there was evening and there was morning a sixth day (Gen 1:24-31).

Dr. Arthur Schonfield

We began our discussion of the first day of creation with Carl Sagan's *Broca's Brain*, which dealt primarily with the problem of the existence of God. On this our final meeting I would like to read from his *The Dragons of Eden*, which considers mainly the problem of the existence of the soul. The subtitle for this fascinating book is *Speculations on the Evolution of Human Intelligence*. Let me begin by noting Sagan's basic premise regarding human intelligence:

“My fundamental premise about the brain is that its workings - what we sometimes call ‘mind’ - are a consequence of its anatomy and physiology, and nothing more. ‘Mind’ may be a consequence of the components of the brain severally or collectively. Some processes may be a

function of the brain as a whole. A few students of the subject seem to have concluded that because they have been unable to isolate and localize all higher brain functions, no further generation of neuro-anatomists will be able to achieve this objective. But the absence of evidence is not evidence of absence. The entire recent history of biology shows that we are, to a reasonable degree, the results of the interactions of an extremely complex array of molecules; and the aspect of biology that was once considered its holy-of-holies, the nature of the genetic material, has been fundamentally understood in terms of the chemistry of its constituent nucleic acids DNA and RNA, and their operational agents, the proteins. Both because of the clear trend in the recent history of biology and because there is not a shred of evidence to support it, I will not in these pages entertain any hypothesis on what used to be called the mind-body dualism, the idea that inhabiting the matter of the body is something made of quite different stuff, called mind.”¹

Sagan then speculates on the origin of language, and suggests that both tool making and language rose around the same time. This would mean that *Homo habilis*, the first tool maker, would have had some kind of rudimentary language. Sagan believes that this hypothesis is supported by endocasts of the fossil skulls of *Homo habilis*, who had a brain capacity of around 500 c.c., about the same as a modern chimpanzee. Sagan asks, if *Homo habilis* could speak after a fashion, why can't the chimpanzee? Sagan's chapter on the intelligence of animals is provocatively entitled *The Abstractions of Beasts*, and in it he discusses the remarkable experiments that are presently being conducted in teaching chimpanzees to communicate in sign language.

“Until a few years ago, the most extensive attempt to communicate with chimpanzees went something like this: a new-born chimp was taken into a household with a new-born baby, and both would be raised together. At the end of the three years, the young chimp had, of course, far outstripped the young human in manual dexterity, running, leaping, climbing, and other motor skills. But while the child was happily babbling away, the chimp could say only, and with enormous difficulty, ‘Mamma,’ ‘Papa,’ and ‘cup.’ From this it was widely concluded that in language, reasoning, and other higher mental functions, chimpanzees were only minimally competent: ‘Beasts abstract not’ [John Locke].

“But in thinking over these experiments, two psychologists, Beatrice and Robert Gardner, at the University of Nevada realized that the pharynx and larynx of the chimp are not suited for human speech. It might be, the Gardners reasoned, that the chimpanzees have substantial language abilities which could not be expressed because of the limitations of their anatomy. Was there any symbolic language, they asked, that could employ the strengths rather than the weaknesses of the chimpanzee anatomy?

“The Gardners hit upon a brilliant idea. Teach a chimpanzee American sign language, known by its acronym Ameslan, and sometimes as ‘American deaf and dumb language’.. It is ideally suited to the immense manual dexterity of the chimpanzee. It also might have all the

crucial design features of verbal language.

“There is now a vast library of described and filmed conversations, employing Ameslan and other gestural languages, with Washoe, Lucy, Lana, and other chimpanzees studied by the Gardners and others. Not only are there chimpanzees with working vocabularies of 100 to 200 words; they are also able to distinguish among non-trivially different grammatical patterns and syntaxes. What is more, they have been remarkably inventive in the construction of new words and phrases.

“On seeing for the first time a duck land quacking in a pond, Washoe gestured ‘water bird,’ which is the same phrase used in English and other languages, but which Washoe invented for the occasion. Having never seen a spherical fruit other than an apple, but knowing the signs for the principal colors, Lana upon spying a technician eating an orange, signed ‘orange apple.’ After tasting a watermelon, Lucy described it as ‘candy drink’ or ‘drink fruit,’ which is essentially the same as the English word ‘water melon.’ But after she burned her mouth on her first radish, Lucy forever after described them as ‘cry hurt food.’ A small doll placed unexpectedly in Washoe's cup elicited the response ‘baby in my drink.’ Eventually Lucy was able to distinguish clearly the meanings of the phrases ‘Roger tickle Lucy’ and ‘Lucy tickle Roger,’ both of which activities she enjoyed with gusto.”²

Since many scientists define man as a language-using animal, once we teach chimpanzees language, does this mean, Sagan asks, that they will have "human rights?"

“If chimpanzees have consciousness, if they are capable of abstractions, do they not have what until now has been described as ‘human rights?’ How smart does a chimpanzee have to be before killing him constitutes murder? What further properties must he show before religious missionaries must consider him worthy of attempts of conversion?

“I recently was escorted through a large primate research laboratory by its director. We approached a long corridor lined to the vanishing point as in a perspective drawing with caged chimpanzees. They were one, two, or three to a cage, and I am sure the accommodations were exemplary as far as such institutions (or for that matter traditional zoos) go. As we approached the nearest cage, its inmates bared their teeth and with incredible accuracy let fly great sweeping arcs of spittle, fairly drenching the lightweight suit of the facility's director. They then uttered a staccato of short shrieks, which echoed down the corridor to be repeated and amplified by other caged chimps, who had certainly not seen us, until the corridor fairly shook with the screeching and banging and rattling of bars...

“I was powerfully reminded of those American motion pictures of the 1930's and 40's set in some vast dehumanized state penitentiary, in which the prisoners banged their eating utensils against the bars at the appearance of the tyrannical warden. These chimps are healthy and well-fed. If they are ‘only animals, if they are beasts which abstract not, then my comparison is a piece of sentimental foolishness. But chimpanzees can abstract. Like other

mammals, they are capable of strong emotions. They have certainly committed no crimes. I do not claim to have the answer, but I think it is certainly worthwhile to raise the question: Why, exactly, all over the civilized world, in virtually every major city, are apes in prison?

“For all we know, occasional viable crosses between humans and chimpanzees are possible. The natural experiment must have been tried very infrequently, at least recently. If such offspring are ever produced, what will their legal status be?”³

Sagan then goes on from animal intelligence to machine intelligence, and discusses the amazing feats of electronic computers. He gives in some detail an example of a psychotherapy program developed by Joseph Weizenbaum of MIT. (In the excerpt I will read, a human psychiatrist "speaks" to the computer via a typewriter on an interactive console in lower case letters, and the computer psychiatrist "replies" in upper case):

doctor, i have terrible news
YOU SAY YOU HAVE TERRIBLE NEWS
yes, there is a computer at m i t that'll ruin us
WHY DO YOU SAY THAT
i have seen it working
YOU SAY YOU HAVE SEEN IT WORKING
it's frightening - you must see it
YOU THINK I MUST SEE IT
you sound depressed to me
IN YOUR FANTASY PERHAPS WE SOUND DEPRESSED TO EACH
OTHER
yes - perhaps
I UNDERSTAND
i do too
YOU SAY YOU DO TOO
i can't understand how anyone could be fooled by a mere machine
CAN'T YOU REALLY
no, after all, there is nothing creative about a computer
YOU ARE BEING NEGATIVE
i am convinced that i am correct?
ARE YOU WORRIED TO HAVE BEEN CONVINCED THAT YOU ARE
CORRECT
no, not in the least, not at all, not even a little
YOU ARE BEING NEGATIVE
you said you agreed with me didn't you!
IS THAT WHAT YOU HEARD ME SAY
why don't you try to dissuade me - computers diddle with numbers, that's all
YOU WISH ME TO TRY TO DISSUADE YOU
you can't

YOU THINK I CAN'T

for example, could a computer in a conversation like this raise a new topic
YOU SEEM TO HAVE AVOIDED SPEAKING OF YOUR PARENTS
ALTOGETHER...

“The computer psychiatrist lacks sophistication training sensitivity, and human intuition; it is mechanical (of course!), inflexible, and relatively unresponsive to emotional nuances and non-verbal cues. And yet it has produced a conversation more intelligent than many. Its response on ‘a new topic’ is stunning. But the response is very likely only a fluke. The program is undoubtedly designed to pay attention to words such as ‘mother,’ ‘father,’ ‘parent,’ and so on; after the computer's clock has ticked away so many minutes, if these words have not been introduced, the program is designed to come up with ‘You seem to have avoided.’ Emerging just as the right moment it did, the remark gives an eerie impression of insight.”⁴

These ideas on machine intelligence may seem a little strange at first, but you must admit that, given Sagan's basic assumption, they are very logical. That assumption was, if you remember - "My fundamental premise about the brain is that its workings - what we sometimes call 'mind' - are a consequence of its anatomy and physiology, and nothing more."

“The situation is very much like the commentary that has echoed over the centuries after a famous animal story told by both Plutarch and by Pliny: A dog following the scent of its master, was observed to come to a triple fork in the road. It ran down the leftmost prong, sniffing; then stopped and returned to follow the middle prong for a short distance, again sniffing and then turning back. Finally with no sniffing at all, it raced joyously down the right-hand prong of the forked road.

“Montaigne, commenting on this story, argued that it showed clear canine syllogistic reasoning: My master has gone down one of these roads. It is not the left-hand road; it is not the middle road; therefore it must be the right-hand road. There is no need for me to corroborate this conclusion by smell - the conclusion follows by straightforward logic.

“The possibility that reasoning at all like this might exist in the animals, although perhaps less articulated was troubling to many, and long before Montaigne; St. Thomas Aquinas attempted unsuccessfully to deal with the story. He cited it as a cautionary example of how the appearance of intelligence can exist where no intelligence is in fact present. Aquinas did not, however, offer a satisfactory alternative explanation of the dog's behavior.

“We are at a similar point in the consideration of machine intelligence. Machines are just passing over an important threshold: the threshold at which, to some extent at least, they give an unbiased human being, the impression of intelligence. Because of a kind of human chauvinism or anthropocentrism, many humans are reluctant to admit this possibility. But I think it is inevitable. To me it is not in the least demeaning that consciousness and intelligence are the result of ‘mere’ matter sufficiently complexly arranged; on the contrary, it is an exalting tribute to the subtlety of

matter and the laws of Nature.”⁵

Fr. Robert A. Staats

Older biblical commentators thought that the phrase "let us make man in our own image, after our likeness," marked the special creation by God of the human soul. Modern biblical scholarship, however, has considerably modified this interpretation. Let me begin again with the Vincentian Bruce Vawter, and his *A Path Through Genesis*:

“But in what does this image and likeness consist? This is a difficult question. Perhaps the author himself was not quite sure, or at least would have been unable to put it in words. In Christian language we say that man has a spiritual soul with the powers of intellect and free will, and in these he is like God. These conclusions, however, have come to us after much religious thinking and have been aided by Greek philosophy, of which the Hebrew author was ignorant. It is very likely that he saw man's similarity to God at least partially fulfilled in his having been created to rule over the earth; just as God is sovereign over all, man was intended to share in this dominion by God's will.

“But there is no reason to think that he completely comprehended the mystery of man any more than we do. At any rate, he knew that man was somehow like God, that he had in him a spark of the divine, and knowing this he has a considerable advantage over not a few modern people to whom man is just a few pounds of chemicals, another biped whose mating habits can be judged by the same standards as, say, those of wasps.”⁶

We see that the notion of "soul" was derived more from Greek philosophy than from Scripture. Let me now discuss this notion from the point of view of philosophy and science. Here again is Fr. Owen Garrigan in his *Man's Intervention in Nature*:

“All speculations about the origin of man and related problems go back to an age from which written tradition is unknown and oral tradition quite improbable in any reliable sense. We do not know for certain if a philosophically ‘human’ being arose a million years ago in a transition of hominids [the Australopithecines] to *Homo erectus* (who seems to have been a tool user with elements of true language). Or perhaps the critical transition was from *Homo erectus* to *Homo sapiens* (definitely modern man) within the last hundred thousand years. In either case, early man has left evidence of only a low cultural level and relatively few intellectual achievements.

“In the context of an evolving universe, the origin of the soul raises several fundamental questions. Man is distinctly human by reason of his soul. The soul is that by which man lives. The soul is the immaterial principle of life, the breath of God, spirit. It is not visible. Hence its origin is not observable. What answers, then, can we give to the question: ‘Did the human soul evolve?’ and ‘Will it evolve in the future?’ The evolutionary panorama comes into focus only by telescoping time so that past and future are brought closer to the present. Since the roots of

mankind are buried in an evolving universe, these two questions are important not only to man's ancestors and progeny, removed by centuries and millenia from the present. They are of profound and urgent concern to the man of today. If we do not know what we were and what we may become, we do not fully know what we are.”⁷

Garrigan goes on to discuss the possibility of the evolution of the soul. I should mention that "matter" and "form" are terms used in Aristotelian philosophy. Man is composed of matter - a body, and form - a soul.

“...The Human soul is the root cause of one's being an individual human person. An individual becomes independent of his parents ‘made in the image and likeness of God.’ To be a person is an all-or-nothing phenomenon. Just as a woman cannot be partially pregnant, so one can't be partially a person. Of course, personality may mature only gradually over a period of time. Infants' personalities do not emerge fully formed all at once. It is possible even for one who is an adult chronologically to close himself off from others and thereby delay or prevent the full realization of his personal power. To be a person is to be constantly challenged to the fulfilling of an ongoing task, a constant emergence into fullness of being. But there is no middle ground. And in this sense the soul could not evolve. (This line of reasoning would hold for the process of the production of the race as well as of each individual, for phylogeny [evolution of the race] as well as ontogeny [development of the embryo]).

“But there is a sense in which a principle of life (a philosophical ‘form’ or soul) might evolve. What is observed in the world about us is that living beings evolve. The existence of the two principles of life, matter and form, is only inferred from observing the beings. The inference from the evolution of beings to the evolution of matter is accepted without much question. There must be some level on which correlative inference to the evolution of forms is equally acceptable.”⁸

Fr. Garrigan is a great admirer of Teilhard de Chardin, who if you remember his "law of complexity-consciousness," has no inhibitions about the past and future evolution of the soul.

“Taking his clue from the intellect and will of man, Pierre Teilhard de Chardin found some attenuated spontaneity in a subatomic event, some diminished consciousness in a molecule, the glimmer of personality in the playfulness of a cat. The disintegration rate of a radioactive substance may be statistically constant, but each individual event is unpredictable and spontaneous. A protein molecule can "recognize" its substrata and cofactors. The more complex the matter aggregate, the greater the degree of consciousness. In this line of thought the possibility is not excluded that in some way each of these subhuman diminished participations in consciousness and freedom contributed as providential antecedents to the production of human consciousness and freedom.

“Insofar as these speculations about the origin of the human soul avoid the pitfall of an objectionable panpsychism [a Greek word meaning ‘everything alive’], they are attractive in

their simplicity. They satisfy the concept of the unity of man's nature and they make man less anomalous in the evolutionary plan of God. For mankind is of a piece with the universe. The human soul is not independent of, or joined only accidentally to, the body. The analysis from which the soul's existence is inferred is irreversible. That is, we can take a real person and argue to the philosophical principles of his being. But this is not to say that we can reverse the process and construct a real being from these same principles. The distinction between body and soul abstractly arrived at, does not impair the reality that each man is one, a complete and individual human person. The soul is not a prisoner of the body. Nor does God take ready-made souls from a stockpile and insert them into appropriate chunks of matter. Souls are not distributed along some computerized, automated, or mechanical assembly line.”⁹

Garrigan concludes his discussion of the soul with an excellent summary of the theology of Teilhard de Chardin:

“Christian tradition does not rest satisfied with what the soul is not. It affirms without hesitation that God is responsible for the totality of man's being, body and soul. Without both material and spiritual dimensions man is not completely himself. Integral human beings with their material dimensions intact, have a spiritual relationship to God and an eternal destiny...

“Man is, moreover, at the pinnacle of creation, a microcosm who sums up in himself the whole created universe, whose mission is to dominate the universe and offer his dominion back to the Creator. ‘Hominization’ is part of the grand scheme whereby all creation is given in man a mind and a heart to praise its Creator.

“The risen Christ working now through those who share his life, remakes and restores all things in himself. And the proper object of the Incarnate Redeemer's love is the whole man, the human creature who is both animal and rational. The positive reality of man's creation and re-creation in Christ, from which man emerges as a single integrated whole, transcends any attempt to reduce the body-soul relationship to a tidy dichotomy between matter and spirit.”¹⁰

In conclusion let me say that the scientific fact of the evolution of man's body seems to demand some form of evolution for his soul. This makes it necessary for the Church to reformulate its notion of just what a soul is, and is not.

Mrs. Maria Stepan

Dr. Schonfield began his presentation tonight with a statement from Carl Sagan, "my fundamental premise about the brain is that its workings - what we sometimes call 'mind' are a consequence of its anatomy and physiology and nothing more." This is not the opinion of one of the world's leading brain researchers Sir John Eccles, who is himself an evolutionist. Eccles recently attended a congress held in Dallas, Texas on the theme The Reality of God and the Dignity of Man. Let me quote from a report on this congress by Joseph W. Koterski which appeared in *The Wanderer*:

“Most prominent among the scientists attending the conference was Sir John Eccles, a Nobel laureate in brain physiology and the author of many books on the subject. It won for him world-wide recognition in the 1960s.

“Using the term ‘mind’ and ‘soul’ interchangeably, Eccles argued that ‘The mind has an authentic existence free of the brain.’ While integrally linked to the brain, the mind is not part of the brain. For Eccles the phenomenon of self-consciousness on the part of such a mind is the ‘miracle’ which dethrones monistic materialism, the view that material forces provide a sufficient explanation for all reality. ‘Self-consciousness,’ he said, ‘is completely unexplainable by those who do not believe in God.’”¹¹

Despite the title of his chapter on animal intelligence, *The Abstractions of Beasts*, the examples Carl Sagan gives such as "Roger tickle Lucy," are not examples of abstractions. All abstractions involve universal ideas, such as "man." The example given by Sagan all involve singular ideas such as "Roger." Let me read from a standard text in philosophical psychology concerning the notion of abstraction. Here is Msgr. Paul Glenn in his *Psychology: A Class Manual in the Philosophy of Organic and Rational Life*:

“Man's mind or intellect holds such ideas as being, unity, goodness, truth, ideals, virtue, honor, ambition, purpose, beauty, steadfastness, patriotism, etc. Can any organ lay hold of such things? Can you smell ideas? Can you imagine what ambition would look like, and draw a picture of it? These are individual limitations or settings (abstract comes from the Latin *ab* ‘from’ and *traho*, ‘draw’), and hence they are beyond the grasp of any bodily part. They are things which require a supra-organic power to apprehend them, a spiritual power. But this power is resident in a spiritual substance; this substance is the soul.”¹²

It is of course from arguments such as these that we prove from reason the existence of the soul. Let me read Msgr. Glenn developing one of these philosophical arguments for the existence of the soul:

“By what sentient faculty can you do a sum in mathematics? By what organ can you discover that two and two make four? You can see two bricks; you can hear two sounds; you can smell two odors; you can touch and feel two bodily objects; you can taste two flavors; you can imagine two dragons. But you cannot by any sense or sense-organ lay hold of two - that is two by itself; not two this or that, but simply two. But the mind of man can understand what two means. A man confronted with the exacting problem of adding two and two, does not pause to say, "Two what?" When little boys and girls first go to school the teacher trains them to make pure mathematical concepts (or ideas) by connecting the quantities with definite and sensible materials. The teacher says, ‘If John had two apples and Mary gave him two more apples, how many apples had John?’ But in a very short time the minds of the smallest children are ready to dispense with the apples and with other material substances, and are able to deal with quantity in the abstract. And so children add two and two, and three and five, and nine and seven, not

being puzzled by the task of handling quantities without any sensible thing that is quantified. What organ could begin to do such a thing? The brain? You might as well say the eye or the ear. For no organ deals with objects in the abstract; no organ can deal with objects in the universal. The brain is the organ of the interior senses...of imagination, for example, and sense memory. Now, imagination and sense-memory can deal with their object when it is no longer outwardly and physically present; but to do this they must project the object within themselves in an image that is individual, concrete, circumstanced. This is an example of the highest type of organic operation, and it is still a matter of concreteness and circumstance. Hence thinking and reasoning are operations of a character superior to any organic operation. They are supra-organic; they are of spiritual character. Hence they come from a spiritual first principle. This is the soul.”¹³

Also the amusing story about the dog coming to the three forks in the road is not, as Sagan claimed, an example of "canine syllogistic reasoning." In a syllogism the major premise is always universal: "All men are mortal." "My master has gone down one of these roads," is not a universal major premise. Sagan claims that St. Thomas does not offer a satisfactory explanation of this story, so let's see exactly what St. Thomas had to say:

“Whether Choice Is to Be Found in Irrational Animals...

“Obj.3 Further, according to...[Aristotle] ‘It is from prudence that a man makes a good choice of means.’ But prudence can be found in irrational animals: hence it is said...’those animals which like bees, cannot hear sounds, are prudent by instinct.’ We see this plainly, in the wonderful cases of sagacity manifested in the works of various animals, such as bees, spiders, and dogs. For a hound in following a stag, on coming to a crossroad tries by scent whether the stag had passed the first or second road: and if he finds that the stag has not passed there, being thus assured, takes to the third road without trying the scent; as though he were reasoning by way of exclusion, arguing that the stag must have passed this way since he did not pass by the others, and there is no other road. Therefore it seems, irrational animals are able to choose

“Reply Obj. 3 As stated in...[Aristotle], "movement is in the act of the movable, caused by a mover." Wherefore the power of the mover appears in the movement of that which it moves. Accordingly, in all things moved by reason, the order of reason which moves them is evident, although the things themselves are without reason: for an arrow through the motion of the archer goes straight to the target, as though it were endowed with reason to direct its course. The same may be seen in the movement of clocks and all engines put together by the art of men. Now, as artificial things are in comparison to human art, so are all natural things in comparison to Divine art. And accordingly, order is to be seen in things moved by nature, just as in things moved by reason...and thus it is that, in the works of irrational animals, we notice certain marks of sagacity, insofar as they have a natural inclination to set about their actions in a most orderly manner through being ordained by the Supreme art. For which reason, too, certain animals are called prudent or sagacious; not because they reason or exercise any choice about things. This is clear from the fact that all share in one nature invariably act in the

same way.”¹⁴

St. Thomas would say that the appearance of prudence and sagacity in Washoe and the dog are not prudence and sagacity themselves. They are rather the result of the natural instincts given by God to these irrational animals, and not an indication of incipient rationality. The only reason that Carl Sagan finds this answer inadequate is because he doesn't believe in the existence of God. Let me proceed to St. Thomas on the soul of man. We saw that St. Thomas teaches that Adam's body was produced immediately by God, so a fortiori he would teach that the rational soul is produced immediately by God:

“Whether the Rational Soul Is Produced by God Immediately?”

“Some have held that angels acting by the power of God produce rational souls. But this is quite impossible, and is against faith. For it has been proved that the rational soul cannot be produced except by creation. Now, God alone can create or the first agent alone can act without presupposing the existence of anything; while the second cause always presupposes something derived from the first cause...And every agent that presupposes something to its act, acts by making a change therein. Therefore, everything else acts by producing a change, whereas God alone acts by creation. Since therefore, the rational soul cannot be produced by a change in matter, it cannot be produced save immediately by God.”¹⁵

This, of course, refutes Fr. Staatz's claim that the soul has somehow evolved in the past, and will continue to evolve in the future. St. Thomas is saying that no creature, which is what evolution is, has anything to do with the origin of the soul. Let me conclude by turning from Tradition to the Magisterium of the Church. The existence of the soul is a defined dogma of the faith, and this was reiterated as recently as 1968 by Pope Paul VI in his *Creed of the People of God*. Let me first read the section of the creed on the soul, and then a brief commentary by Msgr. Eugene Kevane from his *Creed and Catechetics*. In the official notes attached to the *Creed*, Pope Paul refers to the 1950 encyclical *Humani Generis* of Pope Pius XII, which we have seen before. If you remember, Fr. Vawter claimed that the notion of the soul was more Greek than biblical; this claim Msgr. Kevane rejects:

"We believe in only one God, Father, Son and Holy Spirit, Creator of all things visible and invisible such as the pure spirits which are also called angels, and Creator in each man of his spiritual and immortal soul." [Msgr. Kevane continues:]

“This affirmation of the Creed implies a definite concept of man, as composed of body and soul, that needs special emphasis today when there is no lack of Catholic theologians who put it in doubt as something ‘Greek’ instead of ‘biblical’..Such a doubt has grave consequences for our doctrine on eschatology or the last things, for without this definite concept of man's composition of body and soul...the doctrine of the state of souls between death and resurrection becomes impossible. Pope Benedict XII in his Constitution *Benedictus Deus* teaches explicitly that souls after death come either into heaven or into the pains of hell

before the resurrection of the body and the General Judgment. Furthermore, the Second Vatican Council teaches the spirituality and immortality of the soul when it treats of the dignity of the human person...

The reference given by Pope Paul to the encyclical *Humani Generis* of Pope Pius XII reads as follows: "The Catholic faith commands us to hold that our souls are created immediately by God." "...A spiritual and immortal soul cannot be the mere product of the generative action of the human parents. Hence Paul VI, noting certain doctrinal tendencies of our times insists that God creates the human soul in each human being."¹⁶

Rev. De Verne Swezey

I would like to begin my presentation tonight by commenting on Carl Sagan's claim that sign language using chimpanzees are currently in the process of crossing the threshold of self-consciousness and intelligence. If you remember Sagan said: "A small doll placed unexpectedly in Washoe's cup elicited the response 'Baby in my drink.'" This sentence is the favorite example of the humanists to illustrate the incipient rationality of these animals. Let us see just what happened in this particular instance. Dr. Herbert Terrace of Columbia University has conducted the most extensive study to date of chimpanzees using sign language. This is from his *Nim* (another sign language using chimp) which appeared in 1979:

"The potential for confusion in inadequate reporting is made plain by another exchange that appears in both films. Washoe is with her teacher Susan Nichols, who has a cup and a doll. Ms. Nichols points to a cup and signs that. Washoe signs baby. Ms. Nichols brings the cup and doll closer to Washoe, allowing her to touch them, then slowly pulls them away, signing that and pointing to the cup. Washoe signs in and looks away. Ms. Nichols brings the cup and the doll closer to Washoe again who looks at the two objects once more and signs baby. Then, as Ms. Nichols brings the cup still closer, Washoe signs in. That, signs Ms. Nichols and points to the cup. My drink, signs Washoe. Now the question is, is this utterance by Washoe - baby in my drink - either spontaneous or a significant creative use of words? It is actually a 'run-on' sentence with very little relationship among its parts. Only the last two signs were uttered without prompting on the part of the teacher. The sequence of the prompts, moreover (pointing to the doll and then pointing to the cup), follows the order called for to construct an English prepositional phrase. In short, careful analysis makes the chimpanzee's linguistic achievement less remarkable than it might at first seem."¹⁷

Even within the ranks of the humanist establishment itself (I am not speaking of the counter-culture) there are many, including Jacob Bronowski, who reject the interpretation placed on the accomplishments of these chimpanzees by Carl Sagan and others. Some scientists call them "tricks" similar to those you could teach a dog, or mere mimetic behavior as in a parrot's "Polly wanna cracker." Some also compare these accomplishments to "Clever Hans," the famous Viennese "talking horse." Hans' trainer would ask, "how much is four plus four?" and Hans would stamp eight times on the floor. But on closer observation it was discovered that

Hans was merely watching his trainer, who would unknowingly indicate by body language when Hans had reached the correct sum. Dr. Terrace, by running the films of sign language using chimps and their trainers in slow-motion, finds that something similar is happening here. The trainers are unwittingly cueing the chimps to give the proper sign.

“There is no reason to believe that these films, limited as they are, show Washoe at much less than her best. One could wish for comprehensive records (as far as I know, these are the only films of apes signing publicly available), but nothing in them suggests anything other than a consistent tendency for the teacher to initiate the signing and for the ape to interrupt and mirror the teacher. *Teaching Sign Language*, the longer of the two films, contains 155 of Washoe's utterances. One hundred and twenty were single-sign utterances, and occurred mainly in vocabulary testing sessions. Every one of Washoe's multisign sequences (24 two-sign, 6 three-sign, and 5 four-sign sequences) was preceded by a similar utterance from her teacher. The Nova film also included short segments about Kim's brother Ally and the gorilla Koko. It shows all of Koko's and most of Ally's utterances (in each case, simple signs) were prompted.”¹⁸

Dr. Terrace is forced to conclude, reluctantly, that what appeared at first glance to be spontaneity and originality on the part of the chimps, had actually been prompted beforehand by the teachers:

“I must conclude - though reluctantly - that until it is possible to defeat all plausible explanations short of the intellectual capacity to arrange words according to a grammatical rule, it would be premature to conclude that a chimpanzee's combinations show that the same structure evident in the sentences of a child. The fact that Nim's utterances were less spontaneous and less original than those of a child and that his utterances did not become longer, both as he learned new signs and as he acquired more experience in using sign language, suggests that much of the structure and meaning of his combinations was determined, or at least suggested by the utterances of his teachers.”¹⁹

In other words Dr. Terrace is practically admitting that this is another case of what some humanists call "The Clever Hans Syndrome." Let me now go on from Carl Sagan's "intelligent" animals to his "intelligent" machines. I turn again to the counter-culture critic, Theodore Roszak and his *Where the Wasteland Ends*. He is commenting on the humanist claim that what we call "soul" is simply the result of the physiology of the brain:

“...’I myself, like many scientists,’ announces Nobel laureate Francis Crick, ‘believe that the soul is imaginary and that what we call our minds is simply a way of talking about the functions of our brains.’ And he goes on: ‘Once one has become adjusted to this idea that we are here because we have evolved from simple chemical compounds by a process of natural selection, it is remarkable how many of the problems of the modern world take on a completely new light.’ Indeed they do. It is the funereal gleam by which we travel the wasteland, the light of dying stars.”²⁰

Theodore Roszak also comments on Carl Sagan's final exhortation during our preceding meeting, that we must pursue "knowledge for its own sake" if we are to survive:

“...A popular mythology of ‘mad doctors’ haunts the history of nineteenth-and-twentieth-century science: Dr. Frankenstein, Dr. Moreau, Dr. Cyclops, Dr. Cagliari, Dr. Strangelove...cold-blooded manipulators and makers of monsters. Easy enough to write off this literary tradition as fictitious exaggeration. But to do so would be a sad mistake; the myth of the mad doctor refuses to be dispelled. It survives because it embodies a profound, popular realization of the moral ambiguity of science; a legitimate fear that the scientist does not exist primarily to serve the human good, but to pursue a fleshless ideal called ‘knowledge for its own sake,’ in the presence of which even one's fellow humans are reduced to mere experimental material. And, of course, these mad doctors are not simply literary inventions. They have emerged from the science fiction and bad dreams of our society to move among us. Have we not known in our times Nazi physicians who could treat imprisoned men and women as laboratory specimens in their ghoulish search for knowledge...’for its own sake.’

“But we need not look abroad to Nazi or Communist societies to find science beset by well-rationalized reductionism. There are more than enough research zealots in the contemporary West pursuing ‘knowledge for its own sake’ with a maniacal energy that sets personal curiosity and careerist advantage above every humanistic consideration. Their work undeniably produces what their profession values as ‘results’; but at what cost in simple humanity. The question grows more troubling with each passing year: how much of what yesterday's science fiction regarded as unspeakably dreadful has become today's award-winning research.”²¹

Roszak appends a list of just six of the many current top priority research projects, to demonstrate his point, among which is the pursuit of what Carl Sagan calls "machine intelligence":

“Artificial Intelligence and Mechanistic Counterfeiting:

“The more objectified the study of behavior grows, the more remote it becomes (at least for many scientists) as a form of experience known from within. Until it finally becomes quite sensible to speak of machines that ‘see’ or ‘remember’ or ‘create’ - as well as people, or even better. Thus Professor I.J. Good predicts the UIM, the ultra intelligent machine. "When we have the very intelligent machine we can educate it in the theory of machine intelligence. It will then design a much better machine, even if it needs to be creative to do so. This process can be repeated until we have an ultra-intelligent machine and we shall have an intelligence explosion that will nullify Lukasiewicz's ignorance explosion. [By this he means that knowledge is expanding so fast that the fraction of it that anyone can know is tending rapidly to zero.] The UIM will enable us to solve any practically soluble problem and we shall perhaps achieve world peace, the elixir of life, the piecemeal conversion of people into UIPS (ultra intelligent people), or the conversion of the world's ‘population into a single UIP.’

“...Within recent years, I have come across glowing reports of computer machines that have ‘consciences,’ that ‘teach’ and ‘learn,’ that ‘compose music,’ and that ‘feel’ and “hurt,” even machines that do or will soon do architecture. Nicholas Negroponete and Leon Grosier head the Architecture Project at MIT, which hopes to produce machines that will design better buildings than people can...Certainly their computers could not produce a more impersonal, machine-tooled; architecture than our cities are now being cursed with.

“The prospectus for artificial intelligence machines is limitlessly optimistic. It includes their use as a superintelligent governing apparatus to run national economy and to plan military strategy...Richard Landers looks forward to the day when our closest friends will be ‘conversation machines’...so much better than real people. ‘When the day comes that conversation machines are developed, I strongly believe that many will prefer them to humans as telephone partners - particularly the machines that are ‘tunable’ to one’s personality.”²²

Dean Smalley

Since the first meeting in our long dialogue dealt with the existence of God, we thought it appropriate that this final meeting be on the existence of the soul.

Dr. Schonfield presented the humanist claim that what we call "soul" or "mind" is simply the result of the physiology of the brain. He stated that Homo habilis was probably the first to cross the threshold of self-consciousness and intelligence, and that both chimpanzees using sign language, and electronic computers are currently in the process of crossing that threshold.

Fr. Staatz asserted that the notion of "soul" was derived more from Greek philosophy than from Scripture. He claimed that the scientific fact of the evolution of man, seems to demand some kind of evolution of the soul, and therefore requires a new appraisal of just what the soul is and is not. He claimed that the old scholastic distinction between "matter" and "spirit,"-degraded the unity of man and the universe.

Mrs. Stepan began her presentation with Sir John Eccles, the Nobel laureate, a leading brain researcher, himself an evolutionist, who maintains, contrary to Carl Sagan, that the study of the brain points clearly to the existence of the soul. Mrs. Stepan also gave us a brief glimpse of one of the classical arguments from reason for the existence of the rational soul. She claimed that both the Tradition and the Magisterium of the Church rejects Fr. Staatz's notion of the evolution of the soul, and insists on its immediate creation by God out of nothing.

Rev. Swezey drew attention to the split within the ranks of the humanist establishment concerning the claims made for sign language using chimpanzees. He suggested that this phenomenon was probably another case of the "Clever Hans Syndrome." He also offered Theodore Roszak's highly critical comments on the pursuit of "knowledge for its own sake," and on "machine intelligence."

So we come to the end of *The Six Days of Creation*, and I will conclude by attempting a brief summary of our entire dialogue. But I think I should remind you once again of my own liberal Protestant position, which I was surprised to discover is almost identical to that of Fr. Staatz, but I will try to make it as objective as I can. You will remember that our dialogue was intended to explore the "ultimate questions" concerning the existence of God, the origin of religion, the origin of the universe, the origin of life, the origin of man, the existence of the soul, to name just a few - quite a large order.

Dr. Schonfield gave the secular humanist answers to these questions. We come, he said, from a primordial explosion of matter and energy, the Big Bang, and are going ultimately to a Big Crunch, and this cycle will continue for all eternity. We are matter, nothing more, which has evolved by sheer chance into such a complexity as to become self-conscious and intelligent. He implied throughout, that in science alone, do we find the answers to all the "ultimate questions."

Fr. Staatz rejected both the concordist and the fundamentalist interpretations of the first chapter of Genesis, saying that they were based on a false notion of the literary form of the Hexameron, which is not history but rather myth. With the single exception of the Oscillating Universe, which Teilhard de Chardin said made life and the universe meaningless, he found no serious conflict between the "new theology" and any of the current scientific theories concerning the origin and evolution of man and the universe. Fr. Staatz's position, then, was that the answers to all the "ultimate questions" were to be found in both science and religion, but these answers are never, final or complete, but always part of an ongoing process.

Mrs. Stepan maintained that many of the current scientific theories regarding the origin of the universe, of life, etc. could easily be harmonized with the Scriptural account of those origins, and therefore a legitimate scientific theory should lead an unbelieving scientist of good will to God. However, some scientific theories she rejected out of hand, such as polygenism, many Adams and Eves, because she claimed they were incompatible with defined dogmas of the Church, such as original sin. The answers to the "ultimate questions," she stated, have been revealed by God in Scripture and Tradition as authentically interpreted by the Magisterium of the Church.

Rev. Swezey rejected most of the current scientific theories on the origin and evolution of the universe and man, and claimed that in the Bible alone, God had revealed the answers to all the "ultimate questions."

This concludes our dialogue on the six days of creation, and what better way to end, than by reading the Scriptural account of the seventh day, the day of rest:

Thus the heavens and earth were finished, and all the host of them. And on the seventh day God finished his work which he had done. So God blessed the seventh day and hallowed it, because on it God rested from all the work which he had done in

creation (Gen 2:1-3).

References

- 1 Carl Sagan, *The Dragons of Eden*, Random House, New York, 1977, p.7.
- 2 Sagan, *Op. cit.*, pp.108-111.
- 3 Sagan, pp.120,121.
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Book of Wisdom (13:1-9)

*But all men are vain,
 in whom there is not the knowledge of God;
And who by these good things that are seen,
 could not understand him that is,
Neither by attending to the works,
 have acknowledged who was the workman:
But have imagined either the fire, or the wind,
 or the swift air, or the circle of the stars,
Or the great water, or the sun and the moon,
 to be the gods that rule the world.
With whose beauty, if they, being delighted:
 took them to be gods: let them know
How much the Lord of them is more beautiful than they:
 for the first author of beauty made all these things.
Or if they admired their power and their effects,
 let them understand by them, that he that made them,
Is mightier than they: For by the greatness of the beauty,
 and of the creature, the creator of them may be seen,
So as to be known thereby.
 But yet as to these they are less to be blamed.
For they perhaps err,
 seeking God, and desirous to find him.
For being conversant among his works, they search:
 and they are persuaded
That the things are good which are seen.
 But then again they are not to be pardoned.
For if they were able to know so much
 as to make a judgment of the world:
How did they not more easily find out the Lord thereof?*

(Douay-Rheims)



"Brother Thomas Mary's approach to the study of Scripture, while very traditional, is also a breath of fresh air in current Catholic circles, where God's Word is often demythologized out of existence. Brother Thomas Mary, while familiar with most contemporary exegetical theories, which he patiently explores, always sees the biblical revelation against the background of the teaching and tradition of the Church, thus affording an organic and spiritually nourishing approach so needed in our times."

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