

(Address given by the Reverend Theodore M. Hesburgh, C.S.C., President, University of Notre Dame, at the National Science Foundation Board dinner, California Institute of Technology, Pasadena, on Friday, November 16, 1962)

SCIENCE AND MAN

I wish to address you this evening on the subject of science and man. It is a fair assumption that the majority of this audience knows much more about science and technology than I do. This being so, one might wonder why I do not drop the first part of my title of science and man. This is why: I shall not pretend to make any startling revelations in the field of science and technology; but I do want to consider this twin reality in conjunction with man and his actual world. What I have to say may not be popular, but then I never have found this to be a good reason for not saying something that should be said. Anyway, most statements that are popular and safe are also generally dull. This you should be spared.

Too often when the scientist or engineer speaks of science and technology, he speaks of them in isolation, because this is the world he knows best, in some cases, the only world he knows. Do not blame the scientist or engineer too much for this. He has grown up in a world of vastly expanding knowledge and it takes his every waking hour just to stay on top of all that is happening. If you want to dramatize the fact, remember that over 90% of

all the scientists who have ever lived are living today. And most of them are working at their art. Chemical Abstracts, for example, covered 42,000 papers in 1948, and 145,000 last year. The Armed Services Technical Information Agency furnished 113,300 reports to engineers ten years ago, as compared to over 700,000 this past year.

I do not have to assume this burden of research and reading. Perhaps I can make a virtue of this deficiency, since it leaves me time to look at the broad lineaments of science and technology by reading the headlines of movement, project and discovery, and to relate this vast human effort to deeper realities in the total world of man which is in a sense my chosen world.

I trust you will forgive me if for a few moments at this point I am autobiographical. This is a dangerous business. As St. Francis once said, speaking of oneself is like walking the tight rope. It takes balance, but it may contribute ultimately to what I have to say, so I will take the chance. Eight years ago, I had a call from the White House asking if I would accept a position on the National Science Board. I replied that I must be the wrong man since all of my education had centered on philosophy and theology. Then I was told that President Eisenhower wanted a philosophical and theological point of view represented on the Science Board. What can one say to that? I joined, and my scientific education began.

Other assignments followed subsequently to fill out the picture:

The Board of the Midwestern Universities Research Association, working on a new scheme in high energy physics, the Nutrition Foundation Board, the Policy Advisory Board of Argonne National Laboratory, the International Atomic Energy Agency - Atoms for Peace - and the Board of the original Physical Science Study Committee, to mention a few. Our own science program at the University also filled some gaps in my scientific education. As the years passed, I suddenly found that I had many more friends among the scientists and engineers than among the philosophers and theologians. I still read the journals of my own profession, and have enjoyed those rare moments when I could be a philosopher and theologian, but the pressure has been relentless to learn more and more about science and technology. I shall never be a scientist or engineer since I started all this too late, but I have learned something of the language and the vision and the adventure of science and technology. I have also learned to respect these exacting arts and their practitioners. It is wonderful to stand on a street corner in San Francisco and have Glenn Seaborg explain the relationship between his discovery of the transuranium element of Californium and the Crab Nebula as described in Chinese scientific observations of the Eleventh Century when this super nova occurred. These have been good years, filled with good people - especially the distinguished members of the National

Science Board, including Cal Tech's outstanding President, Dr. Lee DuBridge.

Each of us must, however, be ourselves and I know you will forgive me if I see science and technology in our day through my own special spectrum of philosophy and theology. This may at first blush seem to be a negative reaction, but may I insist that it is more in the nature of a maser, magnifying natural perception many fold, giving a wider perspective and a deeper meaning to science and technology in our day. Whatever else these past years have meant, they have made of me no enemy of science and technology, but rather a friend that would like to see these twin currents make their full and complete contribution to the life of man in our times. This will not automatically happen. In fact, if science and technology are turned in upon themselves, with no reference to the higher and deeper realities of human life and aspiration, they may ultimately become the scourge instead of the great benefactor of mankind.

It is all a matter of perspective, a simple statement, but a reality not easily perceived or appreciated. No one can deny that science and technology are the greatest and most impelling forces in Twentieth Century culture. Just look at what they have accomplished for this nation which has totally espoused them. We are better fed, better housed, better clothed, better medicated, longer lived than any people in the history of mankind. We have better communications,

better transportation, and more electrical energy than any nation on earth. We are indeed the affluent society, almost overwhelmed by every convenience and gadget, envied and emulated by every other society that may condemn us at one moment and imitate us the next.

Our Lord once made a telling point that is amply verified today. He said: "Where your treasure is, there also will your heart be." Anyone looking at where our money is spent can easily diagnose our heart's desire. For example, this year we are spending more for research and development than was spent in the totality of our national history from the American Revolution until the end of the World War II. In the past sixteen years since the war, our total expenditures for research and development have multiplied eight times, from 2.1 billion dollars in 1946-47, to almost 16 billion dollars this year.

The growth of these expenditures has been even more dramatic as regards our colleges and universities. In 1940, the Federal Government was supporting research and development in our educational institutions at the annual rate of 15 million dollars. This has now multiplied sixty times to a rate of 900 million dollars in 1961. And this is not the total picture of support, although it is the largest segment, since the tax dollar presently supports 75% of all academic research in the physical and life sciences.

There has been much study and pronouncement lately on the effect of this growing federal support on the life and programs of the university. There is still much to be said, and it is relevant to my theme, but I shall avoid this interesting side road and keep to my main line this evening, which is not the university, but man. /

Question: Is this monumental and rapidly accelerating movement towards science and technology a bad reality of our times, dangerous and prejudicial to man's better interests? Are science and technology getting out of hand? One cannot give a simple yes or no answer to these questions, for science and technology are of themselves morally neutral, neither good nor bad. Science and technology are simply means not ends, and they are only good or bad depending upon how they are used by man. This leads us to the really significant question: How well are science and technology being used by man and for man in our times?

To answer this question in any depth, one must move out of the scientific and technological dimension. The nature and destiny of man is not a scientific or technological question. It is essentially philosophical and theological. As far as man is concerned, one might say it is the philosophical and theological question, the basis for moral judgment about

every human activity, including science and technology.

There are two classic answers to this question that stand in stark contention today. These answers are generally classified as those of East or West, as material or spiritual, as Communistic or Democratic, but the real answer is not quite as simple as the good guys and the bad guys, if one is truly honest. ⁶ All of us like to be on the side of the angels - especially in Los Angeles, the City of the Angels. However, let us remember that this means to be on the side of honesty, and here alone do we get a glimmer of the real answer. ⁷

The Communistic viewpoint on the nature and destiny of man is forthright and clear cut. We must give them that. They view man as a simple material reality, of the earth earthy if you will, with no destiny beyond time, the pawn of deterministic causality, bereft of innate spiritual dignity and, therefore, a creature of the state with no inherent or inalienable rights. In their view, there is no question of a Creator or Divine Providence, no eternal destiny, nothing beyond matter and, therefore, the task of science and technology for them is quite simple: to create ^{a world engine} an earthly paradise by whatever procedures the state determines, without personal freedom or choice on the part of the scientist or engineer.

This is not my dream, but theirs: I merely quote their stated intentions. I am ready to concede that within this scheme, science and technology can hasten the achievement of their stated goals. Again, do not condemn science and technology for this, since as I have said, science and technology are morally neutral, ready and available to serve any goal men choose, good or evil. Men make the choice. I happen to believe that the Communist choice is evil and in so believing I think that they prostitute science and technology to goals unworthy of man as he truly is, unworthy of man's highest and truest aspirations, destructive of human dignity and freedom.

Believing this, I would sincerely like to say that we do better, that our science and technology are more attuned to a higher vision of man. But again, the picture is not quite so black or white.. Our performance is not quite so clear cut in opposition to theirs. May I go farther and say that our vision of man's nature and destiny, although higher and better in statement, is often fogged by our actual performance. We may assert a more spiritual philosophy of man's nature and destiny, but in the use of science and technology, we are in practice rather selfishly committed to our own material satisfactions and survival, largely unmindful of the total human situation today.

I think it fair to say that, on balance, we Americans as persons identify ourselves with that which is best in our tradition. The American

Revolution launched by the shot heard 'round the world; the proposition that all men are endowed by their Creator with certain inalienable rights, life, liberty and the pursuit of happiness; the vision of a free society of free men who see in freedom the opportunity to ennoble mankind everywhere. These are lofty statements. They presuppose that man is spirit as well as matter, that we have an eternal as well as temporal destiny, that we are captains of our destinies, not creatures of the state. One might further suppose, in keeping with these noble and traditional American propositions, that we would use every means at our disposal to further our high purposes for mankind: education, public policy, science and technology, too. Yet have we been as single-minded in achieving our vision as the Communists have been in realizing theirs? Are we really so much different, especially in the use of this most potent means at our disposal today, the knowledge and power of science and technology?

Much of their science and technology is used for pure military purposes, human talent and brain power dedicated to the means of destroying man. Is our record much better? We can plead defense and it is a plausible plea, but does it say everything that might be said? I am tempted here to suggest what the worldwide fraternity of scientists and engineers might do to ameliorate this tragic situation, but this would lead us too far afield

at the moment. To return to our trend of thought, what of the overage, if we bypass the predominant element of military research and development? How much of what is left to expend of the resources of science and technology do we dedicate to liberating man from his ancient bondages of hunger, illness, grinding poverty, and homelessness? Page through any newspaper or magazine, listen to our radio and look at our television programs. What image do these give of the production of the white-coated army of scientists and engineers? To a hungry world we give the image of stored surpluses, better dog food, more esoteric dishes, how to eat more and still lose weight, how to have more appetite and then alleviate the effects of over-eating, how to stimulate and then sedate. Better soap, better deodorants, better beer, better cigarettes, better heating and cooling, better barbiturates, better cars, better chewing gum: these seem to be the ultimate blessings that science and technology have afforded us, the highly visible trappings of our American society, the most widely advertised contributions of science and technology to modern-day America and to the world.

I fully realize that science and technology are committed in our day to tasks other than war and luxuries. There are exciting adventures in space, but even here the pressured pace and the resulting escalated costs would not be so extreme if we were not operating under the exigencies of cold war competition and military possibilities. And remember that even we and the

Russians do not have infinite resources of men and money. Enormous sums of money spent on Project A cancel out the possibility of undertaking Project B, C, and D, and in this present case, almost all the way to Z. But even so, we are still doing other things, too, even if on a reduced scale: radio astronomy, oceanography, genetics, cryogenics, cybernetics, atmospheric research, high energy physics, Mohole, and others. Even so, I submit to you that what really has impact on the earth's people, outside of America, is that thanks to science and technology, we are wealthy while they are poor, we are healthy while they are diseased, we live in palaces compared to their shacks, we are well fed while they are hungry, we are educated while they are ignorant, in sum, we have the good life while they have only frustrated hopes. We may think to win them by the dazzling performance of putting men in space, but this is meager inspiration to people living in the swamps of poverty, ignorance, and disease, below the arching orbits.

As Sir Oliver Franks has stated, the real question today is not East and West, but North and South, the rich nations and the poor nations, the haves and the have-nots. Barbara Ward has amply indicated that the gap is not closing but widening, and the frustration mounts by the minute.

None of us have written the script for the condition of mankind today.

But we can, if we really believe in freedom and human dignity, help create in our day a new condition of mankind, a situation in which human freedom and dignity are at least possible, and not a bitter travesty. Never before in the history of mankind has this been possible. The vast majority of mankind has ever been hungry, diseased, ignorant, poor, and badly housed. The great glory of science and technology in our day is that it now provides the means of relieving this ancient human bondage, these cruel forms of universal human slavery. Science is most nobly described in our day as the great liberator of man in his present earthly condition.

But will science and technology in our day be dedicated to this great and noble work of human liberation? The best way to approach an answer to this question is not to ask it of science and technology, which are impersonal, but to ask the men who are the scientists and the engineers, the men who create and operate the present world of science and technology. Maybe it is time for scientists and engineers to become philosophers and theologians, too, that they might question the moral impact of their work on the world of man in which they live. Is this asking too much of scientists and engineers? Ask anything less, and you reduce scientists and engineers to the level of automotons, and condemn them to the same state that we bemoan in our adversary.

It really makes little practical difference if scientists and engineers in the Soviet realm are forced to dedicate their lives to utterly materialistic ends, and ours are seduced to do likewise, by financial support, by prestigious appointments, or by the wave of our present affluent culture and material pre-occupations. In either case, science is prostituted to something far below its greatest human potentiality in our times. In either case, mankind is the loser, and indeed the heaviest moral condemnation may fall upon the scientists and engineers who act freely, who might have chosen differently.

I realize that both science and engineering may be a spiritually satisfying experience for the scientist and engineer, but this is not the thrust of my remarks which concern the moral and social effects of science and technology in our day. I would even say that this personal satisfaction would be greatly enhanced if the individual scientist and engineer knew that his unique efforts were part of a great human endeavor to reverse the historic inhumanity of man to man, and to make nature work for instead of against mankind. If on the other hand, the efforts of the scientist and engineer are directed towards trivial or worse ends, his personal satisfaction will have a rather pathetic hue to anyone who thinks seriously of the total human situation today.

We all admit the impact of the scientific and technological revolution in our times, but we have yet to witness the revolution of scientists and engineers. Do not be afraid of the word, "revolution". Our country began with one. And all of the new countries, a third of mankind, are now experiencing another: the revolution of rising expectations. The realization of these expectations will not come to pass without the total application of science and technology to their many problems of development. If their expectations are frustrated, we can write off our hopes for their entrance into the world of free men. Man's spiritual potentialities are not well realized in an atmosphere of material stagnation, abysmal poverty, and general hopelessness. As St. Theresa of Avila, the great Spanish mystic, said with her characteristic good sense: "If a hungry man asks you to teach him how to pray, you had better feed him first."

Think for a moment of what would happen if the revolution of scientists and engineers should occur in our times. Suppose that our scientists and engineers really decided to make an assault on hunger: by developing both good and arid lands abroad and organizing large scale agriculture around the world as we have in this country where 5% to 10% of the population feed all the rest of the people and develop huge surpluses. We have proved that

it can be done, but we have been satisfied to do it mainly for ourselves. If scientists and engineers put their talents to work, do you believe that there would be 900 million illiterates in this world, with all the riches of human culture closed to them? With modern communications, one master teacher can teach millions - but it isn't being done, except in a few isolated places where it has begun without our help. What if more scientists and engineers decided to make a concerted assault on disease, through better sanitation, vaccination, nutrition and all the rest? Again, we do it for ourselves and seem largely unconcerned about the rest of humanity. We know that industrial development depends largely upon electrical energy. Africa, for example, has 40% of the hydro-electrical potential of the world. But only $\frac{1}{2}$ of 1% of the potential is developed. We balked at the Aswan Dam and let the Russians do it. Italian engineers built the Kariba, and we argued for months about the Volta in Ghana. People might legitimately ask, "Are they really interested?" The scientists and engineers in turn might blame the politicians who make the decisions, but I insist: we are committed to freedom and we are still free to work where and as we wish. Am I then suggesting that scientists and engineers take over the governance of our country? Not quite, but I am more than suggesting that scientists and engineers cannot be oblivious to the moral

quality and effects of their handiwork. No one of us, as a person, likes to be used for purposes other than those of our personal choosing. This is the meaning of freedom and responsibility which is an individual, not a mass affair. Dr. Oppenheimer was, I take it, rather deeply moved when he remarked, after Hiroshima and Nagasaki, "The scientist has now known sin." Virtue and sin are the fruit of freedom, impossible without it. And freedom is a precious heritage. When we say that freedom is ours to have and to hold, we do not exclude scientists and engineers. Freedom is also indivisible. When one man or one nation of men is not free, all freedom in this world is endangered.

How free are the ignorant of this world, how free are the diseased, the undernourished, the homeless, the poor, those without hope for themselves and their children? There are many things that science and engineering cannot do, but there is one task that is made to order for them in our day, and it is to buttress freedom, to better the conditions of mankind on earth, to liberate man from his ancient servitudes, to provide for man a human situation in which he can truly manifest his dignity, practice his freedom, and follow his high spiritual calling. This is why I said earlier that in our day science can be the great liberator of mankind.

This will not happen, I submit, until scientists and engineers decide

that this is a task of the highest priority, and that they will commit themselves to do it. Someone may remark at this point: "But we are spending billions for foreign aid." Yes, about four billion annually to be exact. But again, about half of this is military aid, and the two billion that are left seem hardly sacrificial when you compare it to the six billion we spend annually for tobacco, the twelve billion for alcohol, the twenty billion for that ancient pastime called gambling. I shall spare you the bill for entertainment.

I am speaking of values, and proportion, or perspective if you prefer the word. We cannot blink at the fact that there are only eighty engineers backing up our multi-billion Agency for International Development, as against eight or nine thousand in our Space Agency. We cannot overlook the fact that the total 78 nation budget for the International Atomic Energy Agency - the Atoms for Peace Program - is less than the cost of our single October moon shot. We spend more to produce one nuclear submarine than our total annual budget for agricultural research, and this in a world of hunger. I could multiply examples, but by now the point should be fairly obvious: the Russians may be the bad guys, but we are not automatically the good guys. We have the talent and potential for greatness, we have the great tradition of the West,

a deep concern for the dignity of man, for freedom, but in the terminology of the space age, the destruct button is getting more attention from science and technology than the construct button. People are coming out second best to things.

What do we do about it - if you are still with me? Facile solutions are useless. Revolution may seem too strong a word. Yet all it means is a turnabout, in this case a review of values, not as professed but as practiced. No one can do this for the scientist or the engineer. He must do it for himself. This is the age-old burden of freedom and individual responsibility. Pasternak, in his Nobel Prize winning novel, Dr. Zhigavo, says that gregariousness, the mass mentality, is the refuge of the mediocre. Science and engineering, in our times, are anything but mediocre. Why then should the scientist and engineer allow them to be used for mediocre ends and to hide himself in the mass. Ours is a time of great change, of revolutionary winds, of new breakthroughs on every front. Should the one great problem, the condition of man, be deprived of breakthrough in our times? Should we pioneer in space and be timid on earth? Must we break the bonds of earth and leave man in bondage below? This, I submit, is the core problem of Science and Man in our times. I claim no special wisdom, no prophetic charisma, but

I do sense the call of compassion to science and technology today from mankind everywhere. The question still remains, will there be this new day for mankind in our times?

Until this day dawns, whatever the blessed condition of our beloved America, our political philosophy will be sterile abroad, our theological vision will atrophy, and our magnificent vision of man's nature and destiny may shine in the heavens, but be denied on earth. And sadly enough, unless a true revolution occurs, future generations of historians may ask why our scientists and engineers did not really join the human race in our times, when the opportunities were so great, the means at hand so magnificent, but so badly used despite those who most desperately needed our help to realize what we profess to be man's exalted nature and destiny.

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President of the California Institute Associates

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Dr. Lee A. DuBridge

RESPONSE

Dr. Detlev Bronk

Chairman of the National Science Board

ADDRESS

"SCIENCE AND MAN"

The Reverend Theodore M. Hesburgh, C.S.C.

President of the University of Notre Dame

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