

(Address given by the Reverend Theodore M. Hesburgh, C.S.C., President, University of Notre Dame, at Commencement Exercises of Massachusetts Institute of Technology, Cambridge, Massachusetts, Friday, June 8, 1962)

### SCIENCE AND TECHNOLOGY IN MODERN PERSPECTIVE

The greatest temptation facing a commencement speaker at M.I.T. is to tell you what you want to hear and probably believe: that in a world deeply committed to science and technology you have completed an education that assures you of great success. I trust that there have been enough recruiters here during recent months to sing this song, so I shall spare you another rendition. Besides, it is somewhat of a siren song, because what it says is only half true, if that much. The truth, I think, hinges on the meaning of success.

A lesser temptation would be for me to recount what a mess the world is in, and how eagerly the world beyond needs and awaits you to save it. The only problem with this approach is that unless you really understand the true dimensions of the mess, and what is causing it, you are likely to go forth and make the world yet messier.

Suppose rather than telling you something, which you might not believe anyway, I ask you a few questions mainly relating to science and technology in modern perspective. There ought to be some ground rules for these questions, however, since otherwise I have you at a disadvantage. Let us say that the

questions should be relevant to the world, or better, relevant to the life for which you have been preparing yourself, and that I, too, should commit myself to a few answers so that you may agree or disagree with me as you answer the questions for yourselves. This is in the academic tradition, and fair game.

First question: Are science and technology a blessing or a curse in today's world? I suspect most of you would answer - "A blessing." That had better be your answer if you expect to be alumni in this institution in good standing. If you do say simply this, however, I disagree with you, and I shall tell you why.

Most briefly, may I say that science and technology are in themselves neither a blessing nor a curse, although, in fact, they are a bit of both and may be either depending upon how they are actually used. Science and technology are in themselves neutral, neither good nor bad. Most simply, they represent two great realities: knowledge and power. Insofar as you have become competent in science and technology, you possess this knowledge and this power. It is yours to use or abuse, as are all other forms of knowledge and power.

Herein lies the true meaning of science and technology as a blessing or a curse in our day. It is not the quality of our science and technology

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that really answers this first question, but the quality of our scientists and engineers, as persons. It is mainly persons who give a moral quality to things, who bless or curse, who do good or evil, with the means available.

Second question: Are science and technology the greatest forms of knowledge and power in the world today? I do not know you well enough to suppose your answer to this question, but may I say that many in today's world would answer simply, "Yes." I dislike being disagreeable, but with those who answer thus, I must again disagree. And this is why.

Science is knowledge of the physical world, of those things which are sensibly observable, or measurable, capable of being conceptualized in mathematical formulae, submitted to hypothesis and verification. The power of science and technology is physical power, awesome, yes, if seen internally as fission or fusion in the heart of the atom, or externally in the brilliance of a super nova. One can well respect and reverence this knowledge and this power. Science and technology represent the really obvious new frontier in our day, they command and fashion most of our resources, they man our front line defenses, they produce the affluent society, they attract the majority of our most brilliant people, they spark the revolution of rising expectations around the world.

One can say all of this and yet not admit that science and technology are the greatest forms of knowledge and power in our day. To disagree, one need only believe that there are realities that transcend the physical order. If one says this, he also says that there are limitations to knowledge and power of a physical order, that indeed this knowledge and power need something outside and beyond themselves for their true meaning and direction in the total life of mankind. This proposition was stated very simply ages ago. I cannot improve on the statement: man does not live by bread alone.

In saying this one need not denigrate science and technology. It is not a question of either-or, but of both - and. It is a matter of proportion, of total meaning. Man does need bread, too.

Third question: In view of the foregoing, are science and technology overemphasized in the world today? If you have been with me thus far, you might be inclined to utter a cautious and qualified, "Yes", but even then I would disagree. I am not for less science and technology, but more. However, this "more" must be qualified. It is not necessarily more of the same. I will agree that in our own country we have, thanks to science and technology, created the highest standard of living yet known to mankind: better food, better housing, better clothing, better communications and transportation,

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better medicine and better life expectancy. Is this bad? Of course, not. But it is not automatically good either. We have spoken here of material benefits - and these alone do not make the life of man good. The worst gangster may enjoy a ranch house, air-conditioning, good food and drink, a Cadillac, a private airplane, the best medical care that money can buy, and a long life, too.

When I say more science and technology, I am not thinking of more luxurious living conditions for Americans of every and any quality. I am thinking of the broader context of the world in which never before have so many millions of people been more poorly housed, or fed, or clothed. Never before have there been more illiterates, more infant deaths, or more people with frustrated hopes for a better life. More science and technology does indeed have an answer for all of these very real human problems, but the answers will only come if scientists and engineers put their science and technology to work in the true service of mankind everywhere, to respond to real human needs rather than pampering imagined wants, piling luxury upon luxury, and convenience upon convenience.

Personally, I am not interested in better dog food when people are hungry. I spoke earlier of proportion. Even in the material order, proportion plays an important role. I have seen people dying on the streets of Calcutta;

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I have seen hungry refugee children on the sampans and in the shacks of Hong Kong; I have seen unnecessary disease in Uganda, in Pakistan, in Brazil and Chile. I have sensed the hopelessness of many of the 900,000,000 illiterates of this world. Against this background, I am slightly nauseated when I see science and technology dedicated to trivial purposes like better deodorants and better detergents, better cosmetics and more aesthetic telephones, better garden sprinklers and better remote control of wrestling and horse operas on television. If this is the overemphasis spoken of, of course we have too much, but how can this knowledge and power be overemphasized if it is directed against man's ancient enemies of hunger, disease, illness, and ignorance? In a world largely frustrated, we cannot be against that which brings great hope.

It is not really science and technology we speak of, but the forces that motivate their use for trivial or meaningful purposes in our day. And again, we speak of a personal equation, of the inner values that lead a scientist or engineer to use his knowledge and his power for noble or trivial ends. The trivial use of science and technology may mean a great personal profit to the scientist or engineer; the noble is rarely profitable. But this is only to say again that there is indeed a higher order of values that makes science and technology meaningful, and that these values reside not in

science and technology, but in the person of the scientist or engineer. He alone confers human nobility upon his knowledge and his power. With highly-motivated and dedicated scientists and engineers, the knowledge and power of science and technology will always be a blessing to mankind; indeed in our day, they may help create a physical situation in which human dignity can finally flower all around the world. But in the hands of those to whom knowledge is a means of personal selfish profit, and power a raw edge for creating fear of utter destruction and conquest of the world to slavery, science and technology can well become a curse. In any event, man makes the difference for man alone of God's creatures is free to reproduce beauty, order and justice in this world - or ugliness, disorder and grinding injustice. Science and technology are powerful means to either purpose. In a free world, it is man, the scientist or engineer, who makes the choice of goals for science and technology in our day.

Fourth question: Wouldn't the world really be a better place if we could replace the current leadership: the politicians, the philosophers, the lawyers, the humanists, and the theologians, with scientists and engineers? I am sure that this question, on the surface, sounds somewhat preposterous to you, but there are scientists who do profess to have an answer for everything,

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who have been disillusioned by political and legal forces in our day, who often feel unduly inhibited by philosophy and theology, who legitimately bristle when they are portrayed by the humanists as the new savages, bringing the world to the brink of destruction.

One might make the point that these others, the non-scientists, acted mighty selfish themselves when they had their day of ascendancy. I must resort to some oversimplification here, but I think the main point at issue will be evident to you. The Greeks in their day reduced all knowledge to philosophy: a remnant of this remains as many scientists today receive Ph.D.'s - Doctors of Philosophy. The Romans brought our civilization a heritage of law and political order. Many of our current legal principles were formulated long ago in the Code of Justinian, when science was fairly primitive. Renaissance man almost worshiped the arts. Science was simply a liberal art in those days. In Mediaeval times, theological synthesis was in highest vogue. The earliest universities turned round about the faculty of theology. The queen of the sciences was theology's most cherished title. None of you would have had then, the ascendancy you enjoy today. In fact, the explosive beginnings of science and technology were most often met with resistance and misunderstanding.



Would it be any surprise then if history were to repeat itself, if you who hold the ascendancy today were to claim as your exclusive right the center of the stage, as the philosophers, the lawyers, the humanists, and the theologians did in their day? Would it be incomprehensible if scientists and engineers were to claim today that they, with their revolutionary new knowledge and power, could do a better job of running the world than those who preceded them in man's long history of intellectual development? I grant you that the temptation is there, and very real. There is historical precedent for those who would answer my latest question in the affirmative and claim exclusive leadership today for scientists and engineers as the best the world may expect and need.

I could readily understand this stance, but again, in disagreeing with this position, I would only underline one perceptive statement: that those who are merely children of their day, who do not understand history, condemn themselves to repeat all the human errors of the past. I have commented amply on the modern world's need for science and technology, but have always reiterated the need for other values if this new knowledge and power are not to be perverted in our day, to man's great loss, indeed, possibly to his utter destruction. I have no argument against the enthusiasm and zeal you have for science and

technology - indeed I share it with a great and abiding new hope. But man does have other needs. There are other legitimate and very important areas of knowledge and power, and frankly some of them are ultimately much more important to man than science and technology. Indeed, science and technology cannot have their true human meaning and direction without reference to this total world of the human spirit.

What is really needed today is not exclusivity of knowledge, but a deeper unity of all knowledge, past, present, and yet to come. Each kind of knowledge, scientific, humanistic, philosophical, and theological, has its proper sphere, its proper method of learning and knowing, its innate limitations, too. And each kind of knowledge bears some relation to man's nature and destiny, some service to offer to man and to the God who made man to know, to love, and to be happy in the knowledge of all that is true, and in the love of all that is beautiful and good.

It is true that man's intellectual history up to now has represented a long series of abortive efforts to establish an unwarranted hegemony for this or that kind of knowledge. In our day, you who represent that which is best in science and technology have the unique opportunity of changing this unhealthy historical trend. I cannot imagine this happening in our day unless you possess

some deep conviction to see that it does happen, especially in your own intellectual and professional life. It is most probably you who must take the lead in becoming humanists, jurists, philosophers, yes theologians, too. It is you who must begin to repeat with Terence: nothing human is alien to me: no human insight, no human misery, no human beauty, no human knowledge, no human anguish, no human value, no human hunger. Anything less than this leads to a truncated or sterile life, a life without fullest meaning and direction and depth.

It is meaningless and futile, for example, to labor for better communications without being interested and concerned about what is being communicated, to make abundance of food available in one corner of the world for storage while countless millions go hungry, to make quantum advances in the speed of transportation without ever asking yourselves: why am I here and where am I going? All of these questions and concerns relate not to the quality of things, but to the quality of persons. Any person, whatever his talent or skill or competence, who does not seek wise answers to these broader human questions, is unfit for significant leadership in human affairs. He is at best an anchorless manipulator, at worst a menace.

To return to our specific question: May I now answer - scientists and engineers who are only scientists and engineers and nothing else should have exclusive leadership in the world today only if man has only material needs, only if he has a purely temporal destiny, only if he is not a person capable of wider ranges of knowledge and power, only if a transcendent moral order does not exist in the universe, only if people can be manipulated like things, not possessing inalienable spiritual rights as persons created in the image and likeness of God. What I have just described is, of course, the world view of the Communists. It is not illogical that their educational system, from top to bottom, is rather totally dedicated to the almost exclusive production of scientists and engineers, who are this and little else.

If we believe differently, should we ask that scientists and engineers abdicate world leadership and confine themselves to the area of science and technology? By no means. One might as well ask that parents forget their children, or that the artist disown the work of his hands. Such is the significance of the knowledge and power of science and technology today that the scientists and engineers would indeed be immoral to be unconcerned with the consequences of their work. As Oppenheimer remarked after Hiroshima and

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Nagasaki: "The scientist has now known sin." The only point I have been making is this: you should be concerned, you should indeed lead, but the beginning of significant human leadership involves a deep respect for the totality of man's intellectual and moral heritage, an active cultivation of the wide areas of wisdom above and beyond your science and technology.

I grant you that many humanists, jurists, philosophers, and theologians are illiterate in the vast and growing area of modern science and technology. Their illiteracy in your area is no argument for your illiteracy in their field. I am not excusing them; I am only trying to make the centrality of your position in the world today more fruitful, more meaningful, more significant in its total effect. I believe it was with all of this in mind that your Alma Mater has lately opened its doors to so many significant areas of knowledge beyond the realms of science and technology. I like to believe, immodestly to be sure, that my presence here today is an expression of this same concern. Since you have borne with me thus far, may I direct one final and most personal question to each of you. It is in a very true sense, the most important question of all. It has to do with you, not specifically as a scientist or engineer, but as a person.

Last question: What do you want from life? There are many who

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would answer for you. First, the obvious answers from Madison Avenue, which I trust you do not take too seriously, the trappings of the affluent society: food and drink, martinis and charcoal broiled steaks from your very own backyard grill; the status symbols: house, sports cars, vacation spots, clothes, gadgets, hobbies, and the money to make all of these possible. Material security and success, pleasure and ease, fun and games, so the litany goes. Fortunately, there is enough spiritual adventure in science, enough hard and rigorously dedicated work involved in technology, to insulate you somewhat against these more infantile answers to what makes life worth living. There is nothing wrong, of course, in the material amenities of our day. But to make their acquisition and enjoyment the end all of human existence is a folly worth avoiding like the plague. Too many people spend their lives on this narrow, inane track today and retire all too early to become vegetables.

To take a more serious approach to an answer, you might ask yourself, what are your values? I take it we might assume that these values are of a spiritual character, and that they represent what you really intend to live and work for, or if need be, to suffer and die for. These values are what you must use to define the kind of person you wish to be, the kind of life you intend to live, the best hoped-for meaning of your life in the days ahead, however many or few they will be.

You must make up your own list, of course, for you must live your own life for your own goals. My last words to you are suggestive of some of the enduring values that have made human existence worthwhile in every age, and that could make your life most meaningful in our times. Beyond that, these values also share the fine patina of eternity, for they have withstood the test of time, they have endured through every crisis that man has known.

First of all, commitment to truth in all its forms: the joy of ever seeking truth, the peace of finding truth everywhere, the courage of living truth always. Open-mindedness is the prelude to this commitment, intellectual honesty is its truest spirit, and purity of life is essential to both possession of the truth and commitment to what it demands of us.

Commitment to what is good and excellent. I mean here no narrowly selfish good, but that every good and noble inspiration might find in you a champion and a defender, and indeed a personification. What is good for your own moral integrity, yes, but also the realization that you will often find yourself and your good in spending yourself and your talent for the good of others who need you. To avoid the taint of intellectual and moral mediocrity, to be willing to stand for something, even something unpopular, if it is good; to be willing to be a minority of one if needs be, this is part of the commitment. But not to be a neutral where principle is involved, a moral cipher, a

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pragmatic compromiser who easily takes on the protective coloration of whatever moral environment happens to be at hand, this also is ruled out by commitment. Is it too much to expect of you? Anything less is all too little.

A passion for justice in our times. Again, not merely justice for yourself, or your family, or your profession, but especially a passion for justice as regards those who have few friends and fewer champions. There are great and festering injustices in our country and in our world. You can side step them if you wish, you can close your eyes and say it is none of your business. Then remember that freedom and equality of opportunity in our times are quite indivisible. If one class, or nation, or race of men is not really free, then the freedom of all men is endangered. Injustice breeds more injustice, disorder begets more disorder. You do not need a suit of armor, or a white horse, or a sword, but just a sensitivity to justice wherever it is endangered, a quiet passion to be concerned for justice in our times, a compassion for all men who suffer injustice, or the fruits of injustice. Why suggest this to scientists and engineers? Indeed, why not?

Lastly, I would suggest a value that could have many names, but the simplest name of all is Faith. Faith is not an easy virtue for scientists and engineers who in their own profession instinctively take nothing on faith.



But in the broader world of man's total voyage through time to eternity, faith is not only a gracious companion, but an essential guide. Let us face the matter frontally and in its deepest dimensions. Faith begins with belief in God, He who is, the ultimate eternal Source of all else that is: all truth, all goodness, all beauty, all justice, all order. Science, as science, tells us nothing of this, nor does science deny any of this, unless you take seriously the prattling of Cosmonaut Titov about not seeing God while in orbit.

On the other hand, one should observe, as Whitehead did, that the world of faith is not uncongenial to science. God is not only a God of omnipotence and freedom, but also a God of rationality and order. While He was free to create or not create a cosmos, and in choosing to create was free to create this cosmos or some other, when He did create it was a cosmos and not a chaos that was created, since it had to reflect His own perfection.

Because God is rational, His work is orderly, and because He is free, there is no predicting absolutely just what that precise order will be. The world of faith is then a world congenial to empirical science with its twin method of observation and experiment. Unless there were regularities in the world, there would be nothing for science to discover, and being contingent regularities, they must be open to hypothesis and verified by experimentation.

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This is the rhythm of modern physics: experimental expansion and theoretical development. As an aside, may I express in passing the hope that the theoretical physicists will soon bring some order out of the present chaos of sub-atomic particles. I am sure there is more to this than we now know.

Every year in Vienna, at the Atoms for Peace Conference, I have to assure my Russian scientist friends that I do indeed believe in God and that this does not preclude my believing in science, too - for entirely different reasons, but without becoming schizophrenic about it either. Much would be gained, I believe, if the scientists and engineers in our day were men of faith as well as men of science. Too long has there been an imagined chasm between the very real values of the physical and spiritual worlds. Faith I take to be a gift of God, but one that is amenable to rational foundations and prayerful preparation. It is not just a blind leap into the dark on no evidence whatever. It is rather a luminous opening on another world, that adds new personal dimensions to one's life and wider vistas to one's highest endeavors, in science or in any other field of intellectual interest. For these reasons, I have added faith to my list of the values that make life more meaningful.

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Well now, you have my questions and my answers. I trust you have also had within the citadel of your own person, the opportunity to sort out some of your own answers. A lifetime is not too long to cherish such values, nor is eternity too long to reward them.

My prayer for each of you today is that you might find answers that are equal to your opportunities in the days ahead: to be a truly significant person, to live a meaningful, happy, and productive life, to be an influence for truth, justice, and the good life for the vast fraternity of mankind in our times, and ultimately to achieve excellence in all of those endeavors which are to be the sum of your lives. May the good Lord bless and keep you, today and always.