

(Address given by the Rev. Theodore M. Hesburgh, C.S.
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A VISION OF SPACE

I am delighted to have been invited by Karl Harr, Senior Fellow of the Eisenhower World Affairs Institute, to deliver this keynote address at the Conference on Space Policy. When I was much younger, in the early fifties, I found that it was an easy and quite natural transition to move from aviation buff to space buff. The imaginative books of Willy Ley and the burgeoning volume of science fiction books captured the imagination of millions, mine included.

My academic specialties were philosophy and theology, seemingly a far cry from the new vision of space. Not so, as I hope to demonstrate to you this morning. Science and technology look to immediate problems and solutions. Philosophy and theology look to ultimates, stimulating creative imagination and, ultimately, a vision that transcends the immediate concerns of the here and now. When President Eisenhower invited me to join the National Science Board in 1954, I told him that he must be mistaking me for someone else. "No," he said, "I want a philosophical and theological point of view represented on the National Science Board."

When a few years later, Det Bronk, our Board Chairman, and Alan Waterman, the National Science Foundation's Director, came from a meeting with President Eisenhower, they announced to us a momentous decision. As part of the United States participation in the International Geophysical Year, we were to launch a scientific satellite into space, a program named Vanguard. My heart jumped

and even sang at the thought: The Space Age was about to begin. I mention this incident because it underlines the appropriateness of this Eisenhower Centennial Conference on Space Policy.

Because we are endowed, beyond all other earthly creatures, with those two godlike qualities of intelligence and freedom, human kind has been a curious, wondering and wandering species, always questioning what lurked beyond the next hill and wandering there to find out. All manner of mysteries have always intrigued us, for we were meant to discover and to understand and to know. The most insistent and important question of every human child is "Why?" Even a child wants to explore everything it sees.

The history of exploration has important lessons for us today, as we hesitate on the verge of a great adventure in space for humankind. From whatever place humankind first began, probably Africa, he moved to see and to learn more and so better to pit his wits against the natural obstacles he faced. Over millennia, human kind explored the face of the earth and wondered at what he faced nightly in the splendor of the sky: heavenly bodies sparkling in the black void of space and beckoning to us.

Some of these prehistoric human wanderings typify the restless questing of human spirit. About twelve thousand years ago, humans dared to cross a dried up Bering Strait during the recent Ice Age. They walked into our then uninhabited Western Hemisphere, but most of them did not stay in Alaska. Ten thousand years later, they were at Tierra del Fuego, at the other extremity of the hemisphere. Once the adventurous trek began, it did not stop until it arrived

at land's end.

Another segment of humanity were not stopped at land's end in Asia. They learned sailing and navigated by the stars to explore and to people widespread islands from Southeast Asia to Hawaii. They traveled and they learned as long as there were new worlds to inhabit.

The classic Age of Exploration stemmed from two great civilizations: Asian and European. The Chinese built seagoing vessels that eventually reached the cost of Southern Africa. One wonders how the world might have changed if they kept on exploring. But, troubled by domestic problems at home, they returned to the Middle Kingdom and destroyed their seagoing ships.

The hardy Vikings made a second historical landing on the Western Hemisphere which they call Vinland because of the grapes growing there. That great find also dried on the vine because of lack of imaginative interest in the new World.

When the Italian sailor and navigator, Cristoforo Columbo, armed with an austrolabe, a new instrument of celestial navigation, sought funds from Spanish King Ferdinand and Queen Isabella to explore the Western Ocean, all he got were three small, leaky ships to test the winds and waves and shores unknown. Even those who dared to join him were constantly imploring him to turn back. But his daring, courage, and especially his vision drove him forward. His discovery of a New World changed the face of the Old World immensely and for all time.

In this century, the conquest of the until then inaccessible

North and South Poles, the depths of the oceans, and the heights of the Himalayas, seemed to bring an end of the Age of Exploration, with no more shining goals for our questing spirit. Then on October 4, 1957, there came from space the eerie beeping of Sputnik, following soon, thanks to the genius of Von Braun, the beeping of Explorer I. Cosmonaut Gargarin was following by Astronaut Glenn and the space race was on. Exploration had a new and exciting rebirth.

One must concede at this point that the enormously generous spending that characterized the first decades of our National Aeronautical and Space Agency and the Soviet program were in large measure spurred on by the military challenges and national pride born of the Cold War, both here and in the Soviet Union. When the National Science Board first considered the organization of NASA, we strongly suggested that it should be a civilian agency headed by a civilian, Jim Webb, a former member of our Board. And so it was, but inevitably, given the political climate here and in the USSR, the military applications were immediately latched upon and most of the wonderful astronauts came from military careers. The most difficult political, and philosophical, question facing us today is: absent the Cold War and the overhanging threat of mutually assured destruction, will the potential benefits to humankind everywhere continue to drive space exploration, discovery and development, or will we renew the experience of the Chinese and Viking explorers or the penurious attitude of the Spanish monarchs who paradoxically were immeasurable rewarded for their stingy

response to Cristoforo Columbo.

I submit that we will not move forward into space without compelling motives, bold and creative ideas, and the deep conviction that a new world is dawning. We can welcome or reject it, but first, let us try to understand this new challenge of space and its many implications for the future of humankind on this planet.

I take as our most compelling symbol, the most intriguing photograph of all times, the portrait of Planet Earth, a veritable jewel shining in the darkness of outer space, blue, and brown, and flecked with white clouds, the human habitat of incomparable beauty.

What does it say to us? I will suggest five important messages. First, as we contemplate earth from the moon, it gives no indication of the many divisions that have separated us humans here on earth, differences and divisions that have all too often divided our one earth and human habitat into factions that have spawned an incredible centuries-long series of wars and injustices. One sees in this vision of one earth no territorial political boundaries, no religious, political, or ethnic differences, just one earth, beautiful and tranquil as it whirls around the sun each year, not too close to the sun and yet not too far away either. Is not this vision laden with other philosophical and theological implications: that like Planet Earth, humankind is one and potentially more beautiful than our past human history has indicated; that we survive together or perish together in this

unitary habitat, sharing the same hospitable climate, the air, the water, the land and, more significantly, the yearnings for knowledge, freedom, peace, development, and a civilization marked by justice, not the wars that injustice spawns? This beautiful vision of our only human habitat underlines the interdependence that does and should characterize our globe and our lives upon it. It is a great gift of God to each and all of us. It is ours to use with responsible and reverent stewardship, to pass on to succeeding generations of humans of every kind, whatever their race, current nationality, language, or color. The challenge here is to create a human spiritual unity of understanding and justice that matches the physical beauty of the planet that is a pure gift to us, to use it together not to abuse it separately. This is the message heard from Bethlehem that first Christmas eve: Peace on earth to men of good will.

Secondly, as we have learned from that first great scientific and technological exploratory accomplishment, the grand tour of our solar system from the sun to neptune, our planet earth is absolutely unique: in its climate so hospitable to life of all sorts, including human; in its salubrious clean air, pure liquid water, vast oceans, lakes, and rivers, and earth upon which to grow the food that sustains all life. True, we have vast tracts of arid and semi-arid lands, too, but it does not require unusual imagination to see how these too, as demonstrated in the Negev, can be converted to our need for good through innovative agricultural technology. Again, there is the promise of the Old Testament: the

deserts will bloom.

There are other physical wonders, as we have learned from this newborn space technology. We are constantly and massively being bombarded by deadly cosmic rays from outer space. Explorer I, rudimentary as it was, discovered the Van Allen magnetic belts, a wondrous shield that covers us as a skin covers an apple, coming to earth as an apple skin does at the stem and the bottom, in this case, at the magnetic poles, North and South. I once stood in a research hut at McMurdo Sound in the Antarctic. We were in a small unprotected atmospheric funnel near where the Van Allen belt comes to earth. We had a small metal table there, hooked up to a scintillometer that recorded each cosmic ray impact on that small metal table top. It registered a thousand impacts every six seconds. Under the table was a foot thick insulation of lead, with another metal plate underneath the lead. Even there, each second there were multiple impacts of particles charged with 10,000 electron volts. The Van Allen belts, protecting us from these cosmic rays, are another pure gift to our plant earth.

Then there is the ozone layer which intercepts noxious ultraviolet rays. Also, we have long known of the marvelous balance of oxygen and carbon dioxide in our atmosphere: We breath oxygen and exhale carbon dioxide; forest and plant life do the opposite. Then again, there is our cloud cover which permits enough heat and light from the sun to promote photosynthesis for plant growth, with enough heat escaping so that our climate is salubrious, our seasons regular and our ice cover at the poles

intact, our ocean levels stable.

Fortunately for us, space exploration arrived in time to underline for all the earth's inhabitants in stark detail, what we are now doing, largely due to our profligate use of energy from hydrocarbon fuels, to destroy, possibly irreversibly, most of these unearned physical blessings, unique to our Plant Earth. Thanks in large measure to Landsat, we know that we are destroying our oxygen--carbon dioxide life balance by destroying and burning our tropical forests worldwide, multi-millions of acres each year. Greenhouse gases, mainly carbon dioxide, methane, and chlorofluorocarbons are pumped into our atmosphere to pollute our air and adding cover to prevent sufficient heat from being radiated from the planet's surface, the greenhouse effect. The CFC's rise to the ozone layer where this stable compound is broken into its constituent elements. One molecule of chlorine destroys one hundred thousand molecules of ozone. Already our ultraviolet ozone shield almost disappears each Winter in the Antarctic and now partially in the Arctic. The depletion of the shield is moving North and South from the poles. Who knows how to replace it? And remember that it takes fifteen years for this to happen. If all this has happened already, think of what will happen when the last fifteen years supply of CFC's arrive. Meanwhile, Landsat programs are falling by the wayside as we dilly-dally about the use of CFC's in refrigeration, air conditioning, and spray cans. Fortunately, we have not found a way of destroying the Van Allen belts, but we are certainly doing our best to make our air unbreathable, our

water undrinkable, and our land unproductive, mainly through industrial pollution. At least the image of Plant Earth reminds us of what we have been given as a heritage of all humanity, to have and to hold, not to pollute and destroy.

I believe the space program has a solution to this worldwide problem. The Industrial Revolution was built on energy. Our enlarged quality of life also depends on energy at every step of progress and development. But at the heart of the environmental problem is the production of energy from hydrocarbons -- oil, gas, coal, and wood, and even they are non-renewable, except wood, and at the present rate of use, one can speculate about their future availability. In a work, we need a new massive inexhaustible source of energy -- aside from hydroelectric, tides, wind and thermal water sources, hardly sufficient. I pass over nuclear energy while simply saying that there is all too little current research to make it safer. But then there is the sun, the one source of all our energy.

Despite the enormous technological problems involved, I believe we can, without science fiction, visualize a large solar array in geocentric high orbit (about 22,300 miles above the earth) that would convert solar energy into electrical energy at no cost, beyond maintenance, once the system is deployed. Three such arrays could collect inexhaustible energy around the clock, irrespective of earth's seasons, night and day. Impossible? So was landing men on the moon and bringing them home safely fifty years ago. Space invites us to dream.

Thirdly, the serenity of the photo of Planet Earth invites us to dream about ways that we inhabitants of this habitat of mankind might truly become united in human development. To use a space metaphor, reduce the five billion plus people on earth to five persons, astronauts traveling in a space ship. Imagine that one of them, representing us in the developed world, had possession of 80% of the life resources aboard that space craft, and the other four, representing the rest of the world's inhabitants, had to share the 20% of the resources left, 5% each. It is difficult to conceive of this as a situation of justice and peace. But this is precisely the situation in our world today. I take life resources here to translate into food, housing, education, health care, gainful and satisfying employment, communications, transportation, and all that is involved in the pursuit of happiness in its spiritual and material aspects.

Time does not permit me to discuss how the space program would enable us to address all of these problems, but let me speak to one in which I have been engaged all of my life, education. A measure of the problem is that today about 400,000 students come to America from all over the world because we have the best educational system on earth. Suppose we could bring our educational system to every country on earth. Impossible? No more than upclose pictures of all the planets, save Pluto, in our solar system was impossible, just a few years ago.

What it would involve is simply three geocentric satellites positioned to transmit, line of sight, to all the world. What

would they transmit?

All of human knowledge, in the principal world languages, presented by the best teachers of each subject, from three (it could be done with one) world libraries. Since a disk can now contain the whole Encyclopedia Britannica, collecting and storing the lectures is no great problem. As to transmission, even with illustrations and texts, the technology is practically available today. Every ground receiver would be a school, in a remote village, wherever. There could be a University of the World, a phone book, indicating the call numbers for subject matter, intellectual level, and language. The very best teachers would teach everyone who wants to learn anything.

Eliminated are the costs of preparing teachers (although local student aides would be useful) building schools and libraries, and scheduling classes (24 hour service). Given that over a billion of today's world inhabitants are illiterate, that cultural enjoyment is limited to the large metropolises, that so many humans lead unskilled lives of meaningless boredom, why not share the best of cultural events that we and other developed nations enjoy with all the world? That would add new cultural beauty and indeed justice, to our vision of Planet Earth from afar. Incidentally, I would eliminate sitcoms from this satcom system.

Fourthly, while much that I have derived from the space image of earth may seem to involve our country doing things for others (nothing wrong with that), I would see the space vision of the future as a new world doing good things, for the good of the earth

and all of its inhabitants, together. Interdependence is best realized by international cooperation, making the earth a better place for all, with everyone involved (as in education and learning and growing) as much as possible. It used to be thought insidious or revolutionary or unpatriotic or worse to speak of one world -- but if you look at us from the moon, that is what we are. One of the great visions of the space program is that it has shown us earthlings the truth about ourselves in one picture. This is the picture, not of the century, but of all human time on earth. Thank God, we have seen it before we blew ourselves and our earth into a lifeless cratered planet like Mars. If we are unique in our solar system, we are unique for a purpose, I believe, and that is to make our planet as materially and spiritually beautiful up close, as it appears from afar.

This inner commitment to work together to beautify the earth need not involve shedding our nationality, race, or religion. It does involve seeing all of these in perspective. I am all that I am, however different from others on earth, but something more. I am a proud American. I was born here. But beyond and even perhaps transcending that, I also declare myself a citizen of Planet Earth, committed to the great vision of what it still may be, for the good of all its inhabitants, my brothers and sisters.

Fifthly and finally, I would broach a difficult question, often scorned, ridiculed, and denigrated, but nonetheless, important to us because we are intelligent and questing for the vast knowledge that may yet exist in space. This is the matter of

the Search for Extraterrestrial Intelligence (SETI). Much of what I now say, I have said before in introducing an early volume of NASA on SETI. It is more theological than what I have said heretofore, but no less interesting, I trust.

There are a few questions that more excite the curiosity, the imagination and the exploratory bent of modern man that the one posed in the Search for Extraterrestrial Intelligence (SETI). Are we humans alone in this vast universe? The question is usually expressed in terms of other possible intelligent being, not necessarily humans, on other planets. The philosopher in me would want to believe that if there are other intelligent beings, they are also free, and will use that freedom to try to find us. The basic problem to which this study is addressed is similar: Will we use our freedom to find them? What priority should this search have for modern men and women, everywhere?

Few would disagree with the proposition that we are living in a truly revolutionary age, inaugurated by Sputnik and the first trip to the Moon. In another such age -- the Copernican -- the prevailing religious or theological thought resisted, with the then current wisdom, the proposition that the Sun and the Universe did not rotate around the Earth. They mistakenly believed that man was the center of the Universe, and that astronomy should reflect that anthropocentric belief. They may ultimately be right about man, though not about astronomy, if we do not every find intelligent life elsewhere in the Universe. However, we should not be predisposed to accept the proposition that we indeed are alone and

unique as creatures possessing intelligence and freedom in this whole vast Universe.

I must now mention God -- otherwise quite properly unmentioned in scientific studies -- and must go a step further and pose the question: Can a religious person, or even more, a theologian, possibly be legitimately involved in, even be excited by these discussions of the possibility of other intelligent and free creatures out there?

Some time ago, I was discussing this subject with a Russian lawyer who regarded me with some surprise and asked: "Surely you must abandon your theology when you consider these possibilities?" "Indeed, I don't," I replied. "It is precisely because I believe theologically that there is a being called God, and that He is infinite in intelligence, freedom and power, that I cannot take it upon myself to limit what He might have done." Once he created the Big Bang -- and there had to be something, call it energy, hydrogen, or whatever, to go bang -- He could have envisioned it going in billions of directions as it evolved, including billions of life forms and billions of kinds of intelligent beings. I will go even further. There conceivably can be billions of universes created with other Big Bangs or different arrangements.

Why limit Infinite Power or Energy or Intelligence which are names of God? We should get some hint from the almost, but not quite, infinite profusion of the Universe we still know only in part. Only one consideration is important here regarding creation. Since God is intelligent, however He creates -- "Let there be

light" -- Bang -- or otherwise, whatever He creates is a cosmos and not a chaos since all His creation has to reflect Him. What reflects Him most is intelligence and freedom, not matter. "We are made in His image." Why suppose that He did not create the most of what reflects Him the best. He certainly made a lot of matter. Why not more intelligence, more free beings, who alone can seek and know Him?

As a theologian, I would say that this proposed search for extraterrestrial intelligence (SETI) is also a search for knowing and understanding God through His works -- especially those works that most reflect Him. Finding others than ourselves would mean knowing Him better.

I do not think that the question that faces our conference is whether or not space will be explored. The question is whether our blessed country will take an imaginative, creative, and visionary part in the newest and greatest exploratory venture that has ever beckoned humankind. I hope we will and I think we should, especially in the context of what you have listened to, so graciously.

Thank you very much.