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INSTITUTE FOR THEOLOGICAL ENCOUNTER WITH SCIENCE AND TECHNOLOGY

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OPENING MESSAGE

Rejoice with us! The Our Sunday Visitor Institute, OSV, recently notified us that ITEST would receive funding (\$50,000.) for the second year of our three-year pilot program, Exploring the World, Discovering God, interfacing educational modules in faith/science. The ITEST Board of Directors, Staff and Project Manager anticipate a productive year as we move into the more concrete aspects of the program for K-4th grade. With this funding Father Brungs' dream and vision for the future will be "well on the way" to realization, thanks in large part to the OSV.

From Earth dust to Star dust:

You may wonder about the thematic connection between the two major essays in this volume: Father Brungs' article deals with the earth and "earthly things"; while, Dr. Kerwin's treats of things "beyond the stars." Thus, from Earth dust to Star dust suggested an appropriate link between the two. Written over twenty years ago these articles reveal the poet in both authors educated in the rigors of science. Brungs predicts that the coming "conflict" between faith and science will occur in the life sciences. He wonders why "...an incarnational, sacramental, covenantal faith has to resort to the Old Testament for its praise to God for ...the beauty of creation." Seemingly in response Kerwin sings his own psalm of praise, sharing his personal experience of the beauties of God's creation seen from an orbiting space ship built by human sweat and ingenuity.

Dr. Sheahen's short article prepares us for the October working conference by providing us with the ABC's of science, explaining how, although "...there is a continuity to all of science,...each new science builds upon the foundation set by the level below it." Hence the title, "The Ladder of Science." We don't want to exaggerate the correspondence between Sheahen's article and that of the first two authors, but the connection is there.

Finally, let me extend my sincere gratitude and that of Father Brungs' family and Board of Directors of ITEST, for all the Masses and Mass enrollments received following Father Brungs' death and rising to new life. Although we were not able to respond personally to each of you, please know that your gifts, prayers and Mass offerings gave us great comfort. Though he had many friends, he would never have imagined the place of honor he held in so many hearts.

May the Lord and Lady of Heaven and earth hold you all in their loving hands!

Marianne Postiglione, RSM
Acting Director: ITEST

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ANNOUNCEMENTS

1. The invitations to the Saturday November 18, Memorial Dinner in honor of Father Brungs have arrived and will be sent to all ITEST members, colleagues, friends and relatives within six weeks of the event. Noted for its fine dining, Kemoll's Restaurant in Downtown St Louis at One Metropolitan Square, gave us a very good deal and are providing complimentary cocktails from 6:00 – 7:00 PM. This celebration of Father Brungs' life and work in the faith/science mission and ministry will afford us an opportunity to exchange reminiscences while sharing in an evening of joy, some sadness perhaps but above all gratitude for the four decades Father Brungs almost single-handedly directed the ITEST mission. Help us celebrate! We can promise you an enjoyable evening.
2. A reminder that the date for our October 20-22 "working conference" titled, Education for the Faith/ Science Ministry is fast approaching. If you haven't made reservations yet, please contact S. Marianne Postiglione, RSM postigm@slu.edu or 314-633-4626. We accept MasterCard or Visa. For complete details on the conference visit our web site at <http://www.faithscience.org>, click on "Events" and then on "Upcoming".
3. We draw your attention to two books of interest at opposite poles in the current "faith/science" debate: A. The Language of God: A Scientist Presents Evidence for Belief, (2006) by Francis S. Collins, geneticist, is Head of the Human Genome Project. I recommend the former for those who still find explanations of the genome a bit arcane. Publishers Weekly states: "(this book) combines a personal account of Collins's faith and experiences as a genetics researcher with discussions of more general topics of science and spirituality, especially centering around evolution... the book argues that belief in a transcendent, personal God... can and should coexist with a scientific picture of the world that includes evolution." (ITEST has a copy of this book; if anyone is interested in reviewing it, please let us know and we will send you a copy) B. The God Delusion (2006) by Richard Dawkins, biologist, is the Charles Simonyi Professor of the Public Understanding of Science at Oxford University. Publishers Weekly notes, "The antireligion wars started by Daniel Dennett and Sam Harris will heat up even more with a salvo from ...Dawkins. For a scientist who criticizes religion for its intolerance, Dawkins has written a surprisingly intolerant book, full of scorn for religion and those who believe." (In early September this book was not yet available in book stores.)
4. Through the generosity of a friend, ITEST will soon have our two videos available on DVD. The award-winning, Lights Breaking: A Journey Down the Byways of Genetic Engineering, (1985 – Cusack Productions) still speaks to us 21 years later in that it discusses with foresight many of the bio-technological advances we read about every day. The second video, Decision, (1987, Cusack Productions) addresses the scientists who are Christian and poses the questions, "Where are the Christian explorers in science? Is this the only area to receive no apostles?" In an interview with the St Louis Review in May, 1989, Father Brungs who collaborated on the script, noted that the video has two goals, "1)...to encourage those Catholics now working in science and technology to commit themselves to the mission of the Church...they are the only apostles we have in this community and if they don't evangelize it, it's not going to get done," and 2) to encourage young Catholics "...to think of a career in science as part of their Christian vocation... as an authentic way to worship God." Brungs added, "This is a world of wonder. The Church will never be at home in it until individual Catholics are involved in it..." in understanding and explaining it. These words sound an echo today as ITEST begins the second year of our project designed to explore the wonders of the world through science and come to discover the great love God has for all his creatures. As Father Brungs said many times, "God seemingly has decided to contact his creatures only through his creation; creation is the thread that binds us to God and God to us."
5. We are researching material for a book we will publish on excerpts from letters, lectures, addresses and articles written by Father Brungs over the years. If anyone has anything you would particularly like to see included in this book, please contact Sister Marianne Postiglione. We've completed a good portion of the research already but we would like to give you an opportunity to offer further suggestions.

PROJECT MANAGER'S REPORT

Evelyn Tucker

Since my last report, I have been on the road to the NCEA Convention in Atlanta, GA where I distributed our project brochures to all delegates registered at the hotel headquarters of the National Association of Parish Catechetical Directors (NPCD) as well as handing out the brochures on the convention floor.

On September 16, 23 and 30, we will hold our Creative Teacher Think Tank Sessions at Jesuit Hall, home of the ITEST offices. Several publishers have graciously accepted my invitation to co-host the function. We are actively recruiting creative teachers for these sessions. At these sessions, the teachers will write the educational modules using their science curriculum as the starting point and interfacing it with their religion curriculum. They will list the goals, the strategies, the materials required, and the expected outcomes. We will start the sessions with prayer followed by brief commercials from our publishing co-hosts. Sister Marianne will then trace the growth of ITEST and how the project grew out of the visions of Father Brungs. I will explain the task before them and set them to work.

We will have our project curriculum library in the meeting room as resource materials. After lunch we will continue working with the intention to complete many of the modules in this four-hour session. We will cover Kindergarten and Grade One in the first session, Grade two in the second and Grade 3 and 4 in the third.

Following each session I will be editing and completing the modules and preparing them for review by the Project Advisory Council who will be participating in the ITEST "working conference in October. They will review the completed work, offer suggestions and needed revisions. This will be my work for the rest of the fall and winter season.

After revisions are completed, the Creative Teacher Think Tank Participants will gather in one group for review of the modules. Their task will be to see how "teachable" the modules are. What follows next is pilot teaching in the fall of 2007.

FAITH AND SCIENCE TODAY

Fr. Robert Brungs, S.J.

(This is the first of three lectures delivered in 1984 at Our Lady of Fatima Hospital, Providence, RI to physicians, nurses, hospital staff, academicians and allied professions. Bishop Louis E. Gelineau, then Bishop of Providence, invited Fr. Brungs to give these lectures in faith/science to prepare those in the health care professions, social work and teaching for the issues they would most likely face daily in the near future. It certainly "speaks" to us today as we strive to bridge the "gap" of understanding between the scientific/technological and theological communities.)

In July, 1979 almost a thousand people attended the World Council of Churches' Conference on Faith, Science and the Future, held on the campus of the Massachusetts Institute of Technology. In the introduction to the Conference Report, the editor remarked:

No major arguments shaped up in which the scientists and theologians confronted each other in

opposition. In the big debates – and there were some – scientists and theologians stood together on both sides of the issue....¹

The conference stands as a monument to a spirit of cooperation between science and theology. Five years ago it seemed for one brief and shining moment as if the old animosity between science and faith had become an anachronism. Dr. Robert Hanburg Brown, Head of the Astronomy Department in the School of Physics, University of Sidney, Australia stated at that conference:

... our scientific knowledge is based on abstractions which we choose to make from a more complex, essentially mysterious realityAs for the great mysteries which stand in the shadows of all human thought, such as the origin and purpose of the world, modern science cannot be accused of sweeping them away. They mystery of creation is intact, pushed back by

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twenty billion years, but, nevertheless, where it always was - in the beginning

Secondly, I think we must accept that the scientific vision of the world is neither a rival nor an alternative to any other point of view²

These accents are basically the same as those of Pope John Paul II in an address to the members of the Pontifical Academy of Sciences on the occasion of the centennial of the birth of Albert Einstein in 1979.³ There the Pope states that collaboration between religion and modern science works to the advantage of both without violating the autonomy of either. He compares religion's demand for religious liberty to science's demand for freedom of research. The Pope then calls for theologians to discover the harmony existing between scientific truth and revealed truth.

Such thinking and expression has become commonplace, especially since World War II. Over the last several decades we have tended to give little thought to and manifest little concern toward the controversies that once surrounded the scientific and religious views of the universe. We had seemed to have entered into a period of at least coexistence (detente?) if not positive cooperation. Now, five years later, I would ask whether such a rapprochement is even possible? A new struggle between science and religion is arising. I think that any attempt to handle it in the harmonizing accents of the past would trivialize the issues.

Let me say that I hope I am wrong, that I am misreading events. I would very much like to be wrong because I love both "science" and "religion." Like a child caught between contesting parents, I hope we can bridge the rupture between them; but I feel it necessary to put out for discussion the depth of the rupture as I see it. Remember, however, this is offered for discussion and comment, not as an apodeictic statement of reality.

SCIENCE

There are some things which the English seem naturally to do better than most everyone else, for example, the art of the trenchant cartoon. In the 1880's *Punch* published a cartoon showing a primate hanging by one arm

from a bar in a cage in the London Zoo. The cartoon's caption was: "Am I my keeper's brother?" I offer this as an illustrative frontispiece of the tangled relationship between the Church and science.

In discussing a topic like church and science we are immediately at a disadvantage, because *science* can mean so many different things. Science can be a method of intellectual search whose conclusions are mathematically consistent, measurable, and verifiable through experiment. Science can also mean a philosophical system or a belief system, one which, for instance, simply assumes either that there is no final causality or that, even if there is, it is irrelevant. It can represent an intellectual system that consciously or unconsciously grounds much of scientific thinking and, on a larger scale, much of secular thinking. "Science" in the sense of some quasi-transcendental explanation of reality, is the "science" which is most frequently at odds with Christianity. "Science" can also mean what we can call "pure science" or it can be, and often is, used to designate what is really a technology – as in, "putting a man on the moon was a great 'scientific' achievement."

SCIENCE AS A METHOD

Undoubtedly, science, viewed as a method for obtaining verifiable, quantitative information about material reality, has caused Christianity to revise, however reluctantly, formulations of its faith. The Copernican-Galilean-Newtonian formulation of celestial mechanics is a case at point. In cases of such conflict, i.e., between scientifically *verifiable* information and our understanding of the faith, there is only one thing to do: the Church must alter and make more adequate our understanding of the faith. In such conflict, the burden is on us to adapt.

For example, evolution is, in its *scientific* details, a relatively new problem for Catholicism. In its implications, however, it represents part of a much older problem, one which goes back to the very beginnings of Christianity. There have always been conflicts between the many forms of learning and biblical revelation, in its traditional statement. In a discussion of the apparent conflict between science (evolution) and the Bible, Pope Leo XIII, in *Providentissimus Deus* (1893), cites with approval a principle enunciated by St. Augustine: "Whatever they (here scientists) can really demonstrate to be true of

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physical nature, let us show to be capable of reconciliation with our Scriptures” (*De Genesi ad litteram* 1b, No. 41).

This principle is based on the belief that God’s biblical revelation of himself cannot be in conflict with his revelation of himself in the universe he created. Vatican I rather common-sensically stated that, since the same God gives revelation and reason, one cannot contradict another (Dogmatic Constitution on the Catholic Faith).

So, when it comes to a fact that is scientifically verifiable, it is our duty to harmonize our understanding of scripture and tradition to it. While the principle of the matter is simple enough, it may not be easy in the concrete. Yet it is surely something that can be accomplished. The question of science as a *worldview* and its conflicts with the Church is more difficult and much more serious.

SCIENCE AS A WORLDVIEW

Let us begin with a few statements: Teilhard de Chardin:

Is evolution a theory, a system or a hypothesis? It is much more; it is a general condition to which all theories, all hypotheses, all systems must bow and which they must satisfy henceforward if they are to be thinkable and true. Evolution is a light illuminating all facts, a curve that all lines must follow.⁴

Teilhard proposes evolution as a principle which determines the validity of every hypothesis, theory or system. It represents a statement far more sweeping in its scope than anything subject to scientific verification. It is already an assumption on which to build a cosmology.

Julian Huxley:

In the evolutionary *pattern of thought* (italics mine) there is neither room nor need for supernatural beings (spiritual) capable of affecting the course of human events. The earth is not created, it evolved. The human body, mind, soul and everything it produced, including its laws, morals, religions, gods, etc., is entirely the result of evo-

lution by natural selection....Evolutionary man can no longer take refuge from his loneliness in the arms of a divine father-figure whom he himself has created, nor escape from the responsibility of making decisions by sheltering under the umbrella of Divine Authority, nor absolve himself from the hard task of meeting his present problems and planning his future by relying on the will of the omniscient, but unfortunately inscrutable, Providence.⁵

This is a classical statement of science as a worldview; it represents a *pattern of thought* that is to supplant all other ways of thought. In essence it is a faith, a substitute religion to which all others must succumb.

William Provine:

The vast majority of people believe there is a design or force in the universe...that it is somehow responsible for both the visible and moral order of the world. *Modern biology has undermined this assumption* (italics mine). Even though it is often asserted that science is fully compatible with our Judeo-Christian ethical tradition in fact it is not....

One of the most important consequences of modern science, especially biology, is that this outlook (i.e., mechanism) is gradually becoming the common one. As a result, ethical choices are likely to become more difficult, not because people are less moral but because they are unable to justify their choices with fairy tales.⁶

These are not statements talking about verifiable, quantitative information about material reality.

In the conception of science that underlies statements such as these, there is an implicit (more or less) understanding of the nature and condition of human beings. Science as a worldview, presupposes the autonomy of the human being. The notion of the autonomy of the person has directed science and has been, in its turn, influenced by scientific progress.

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Herbert Butterfield has pointed out:

The whole tendency of the new philosophies was to shelve the idea of Providence, which seemed a capricious interference with the laws of nature; and, indeed, the new power which was coming to be acquired over material things encouraged the idea that man could, so to speak, play providence over himself....The way was open for the doctrine of the perfectibility that was to be achieved by remedying institutions.⁷

Also, as Karl Lowith has asserted:

Christianity...replaced impersonal fate by personal providence; the task of the modern revolution, according to Proudhon, is the *defatalisation* of the latter by taking into the hands of man and of human judgment the direction of all human affairs. Man has to replace God, and the belief in human progress has to supplant the faith in providence....Instead of man's being created in the image of a providential God, God is created in the image of man's power of foreseeing and providing.⁸

The scientific movement has been a part of a secularizing movement of western thought and life at least over the past three centuries. Two essential Christian truths, namely, providence and original sin, have been denied in contemporary western gnostic culture. These truths have been replaced in the general culture, and in many elements of the scientific sub-culture, by the gnostic dogma of human prevision and the immanent perfectibility of human beings. Progressivist scientism (and an evolutionary *pattern of thought*) is a salvation scheme, not merely another system of thinking.

A quite likely rekindling of the science/faith conflict has to be seen in the context of this cultural nation of the autonomy of human beings. The real problem in this renewed conflict between science and faith is in the arena of the life sciences. We are gaining an immensely powerful capability to change ourselves at a time when the notion of *homo mensura omnium* (man, the measure of all

things) really refers to autonomy. The Jewish-Christian revelation tells us that human beings are made in the "image and likeness of God." The contemporary *homo mensura omnium* would have us made in the image of human images of man.

What can and should be the Church's response? The primary response to "science" in both of the senses used earlier is a positive approach.

We must increase our knowledge and appreciation of those *positive* contributions that scientific and technological advance makes to our understanding of created reality. We have done this very poorly. I don't recall any major difference in our theology or philosophy occasioned by the discovery of the human ovum and by the understanding of this scientific discovery. Science as such provides us with no direct information about God; but then no human knowledge does. Nonetheless, it is axiomatic to Christian thinking that God reveals himself to us in creation as well as in scripture. We at least pay lip service to this axiom. But it's strange that the more exact a science is, the less place it has in Christian thought. We pay tremendous (even fawning) attention to the rather more ephemeral conclusions of the "humane" sciences. We avoid the more permanent results of the natural sciences, especially the biological sciences. Our theology of the created world, while maybe not pre-Copernican or pre-Newtonian, is certainly pre-Einsteinian and pre-Watson-and-Crick, and perhaps even pre-Darwinian. It is certainly anomalous that our incarnational, sacramental, covenantal faith has to resort to the Old Testament for its liturgical exaltation and praise to God for the beauty of his creation. Incredible!

The central religious questions (for *all* religions) is the creation's unity with God. Unity is the key religious concept. Yet, strangely, the unities inside the creation which science has found are not clearly incorporated into Christian understanding. Three centuries ago (in 3 years) Newton published his *Principia* in which he showed that the mechanics of the heavens and of the earth could be described by the same mathematical formulations. In its day it represented a profoundly deeper understanding of the unitary character of creation. Darwin proposed a unity of living systems at the level of the species. Whatever we may feel about Darwinism (not all those feelings ought to be good), Darwin's work was another watershed in our

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understanding of creation's unities. In our own day, in the aftermath of the double helix and as a result of the extraordinary development in recombinant DNA research, we are becoming aware of the unity of all living systems at the very basic organic levels:

Noted scientist Maxine Singer writes:

Once we thought the DNA of complex organisms was inscrutable. Now we cope with it readily. We thought of DNA as immovable, a fixed component of a cell. Now we now that some models of DNA are peripatetic; their function depends on their ability to move about in a genome.... We have learned that genes are fungible; animal genes function perfectly well within bacteria and bacterial genes within animal cells, *confirming the unity of nature* (italics mine)
9

This development represents one of the greatest possible advances in the understanding of the unities which God has built into the universe. The discoveries of these unities can be the springboard for a much more mature theology, if only we would reflect on what science has *already* taught us.

Father Walter Ong, SJ, (*RIP 2003*) feels that the central intellectual and emotional problem in the Church's realization of her mission in the world today is that we have no cosmology. He has said (in a private note to me): "We have had none (a cosmology) since the Aristotelian spheres and all that went with them were shown not to be there. The lack of a cosmology affects Christology, ecclesiology, and just about everything else in evangelization, including especially any real planning for the real future. For metaphysics, you obviously need a physics." The same is true of an anthropology. You cannot have an anthropology without a biology. Science has had tremendous success and we can learn many things from it that are invaluable to an absolutely essential advance in theological enterprises.

Biological science is now the center of interest in science, in development, and in heavy funding, both governmental and industrial. This crucial scientific, techno-

logical, and industrial revolution is seen in such things as "test-tube babies," recombinant DNA, neuroscientific advances, as well as other biological developments which have *already* had a significant impact on society (the reproductive technologies, for example). It will have an even greater effect especially in the area of personal dignity, personal freedom and the "integrity" of the human form. Twice before in human history our scientific and technological genius has so radically redirected the course of human life and history as to merit from historians of culture the title of Revolution. A third scientific/technological revolution is already well begun. Its capacity to redirect the histories of peoples is *vastly* greater than that of its predecessors. Biological industrialization has begun on a significant scale.

We have a great need for a much more positive approach to scientific advance. We also need to be aware of where we are and what is happening. In about 30 years the life sciences, under a significant impulse from physics, have moved from an observational posture, through an intense and extraordinarily rapid analytic phase, to a synthetic capability. The life sciences have become experimental sciences linked to technological and industrial capability. The late Charles Frankel has summed up the power and revolutionary character of these new techniques: "Biomedicine has eliminated the insouciance with which most people have embraced technological progress. It forces consideration not simply of techniques and instrumentalities but of ends and purposes."¹⁰

The scientism that is abroad, as well as the increasing secularization of all aspects of contemporary living, along with new (even novel) capabilities, are going to cause significant opportunities for conflict. Take, for instance, statements, like these by scientist Edmund R. Leach::

The scientist can now play God in his role as a wonder worker, but can he – and should he – also play God as moral arbiter?... There can be no source for these moral judgments except the scientist himself. In traditional religion, morality was held to derive from God, but God was only credited with the authority to establish moral laws because He was also credited with supernatural powers of creation and

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destruction. Those powers have now been usurped by man, and he must take on the moral responsibility that goes with them.¹¹

Such statements used to mean relatively little. They made little practical difference. The same was true of the science-faith controversy in the past. The effort in the last century was directed primarily to win the minds and hearts of people, to win their allegiance. In that arena it made little practical difference whether one was a mechanist or a vitalist. Philosophy was very important in the realm of ideas, less important in the arena of the day to day living of people. *That has now changed.*

Carl Sagan, probably the most famous and popular of the new mechanistic prophets, has stated:

I am a collection of water, calcium, and organic molecules, called Carl Sagan....but is that all?...Some people find this idea somehow demeaning to human dignity. For myself, I find it elevating that our universe permits the evolution of molecular machines as intricate and subtle as we are.¹²

Now the model of man-as-machine is an intellectual force which can determine real alterations in real human beings. The model gives its blessing to *whatever* alteration someone may desire, so long as it seemed like a good idea at the time. In terms of practical results, it now makes a great deal of difference whether one views the human as a molecular machine or as a person whose dignity arises from within himself or herself. The essential issues turn on whether the human being is described in terms of intrinsic or extrinsic dignity (and hence is personally free or not free). After all, if Carl Sagan is a "collection of water, calcium and organic molecules called Carl Sagan," a little (or great) alteration of this collection can still be *called* Carl Sagan. It really makes no difference at all. It is this very fundamental understanding of the human being that lies beneath the surfaces of the faith-science conflict.

I believe that it is safe to say that we live in an age of alienation. As Vanek and Skalicky have noted:

The roots of alienation...are the consequence of all these false simplifications

which stand at the foundations of the industrial society: man as an absolutely autonomous and therefore absolutely self-sufficient (sic) individual, man as an entirely self-enclosed monad, knowledge conceived as power, creation of the mathematized and mechanized picture of the world, dehumanization of work and its reduction to the form of a commodity, the possibility of tremendous exploitation, all are such roots.¹³

The whole contemporary idea of autonomous man creates a real question. There is little doubt that the great thrust of the last couple of centuries has been toward an idea of the increasing autonomy of man. It is this movement that has replaced the idea of the Providence of God by human prevision. It is this movement that has promoted the notion of the perfectibility of the human being in human history. Science, historically, has been a part of this movement. We can argue (perhaps endlessly) whether this is the nature of science, whether or not science naturally grows from an idea of progress or naturally reinforces such an idea. What is certainly true is that historically that is the climate in which it developed.

So, there is a real question whether the notion of the autonomy of man makes inevitable a conflict between science and faith. Vatican II states in *Gaudium et Spes*:

If by the autonomy of earthly affairs we mean that created things and societies themselves enjoy their own laws and values which must be gradually deciphered, put to use, and regulated by men, then it is entirely right to demand that autonomy. Such is not merely required by modern man, but harmonizes also with the will of the Creator. For by the very circumstances of their having been created, all things are endowed with their own stability, truth, goodness, proper laws, and order. Man must respect these as he isolates them by the appropriate methods of the individual sciences or arts....

But if the expression, the independence of temporal affairs, is taken to mean that created things do not depend on God, and that man can use them without any reference to their

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Creator, anyone who acknowledges God will see how false such a meaning is.¹⁴

With this statement of Vatican II in mind, recall the statement of Julian Huxley quoted earlier: "The earth is not created, it evolved. The human body, mind, soul and everything it produced...is the result of natural selection." A mechanistic understanding of the world and of human beings clearly understands the "independence of temporal affairs" and the autonomy of man in the Council's second sense, i.e., that created things do not depend on God.

If, then, mechanistic philosophy of any kind takes over our understanding of ourselves and directs the applications of these tremendous new capabilities, conflicts between science and faith are inevitable and extremely serious

What makes this very difficult is that we have so very little to say. What alternative view do we have to give? Whom do we have to say it? Are there any of our prestigious theologians who are approaching these issues? Whither are our leaders leading us? What kind of response are we going to give and where is it going to come from? I'd like to propose that it's going to have to come from folks like you. After all, if the molecular biologists are going to be the architects of the new human, you are going to be the contractors. I am afraid the answers will have to come from you and from scientists who are devoted to both their sciences and their Christian faith. We can expect no help from the current generation of theologians or philosophers. We can't implant in them either a knowledge of or a love of science. Yet the response that the Church must have to these issues must be forged both in knowledge and love. If that is true, it's going to depend on us who have both the knowledge and love of science to face the conflicts that will (I'm afraid inevitably) arise.

At the 5th Synod of Bishops, September, 1977, the Bishops from the U.S. observed:

In this connection, evangelization and catechesis by scientists who are men and women of faith are extremely important. They should be encouraged by the church.

They constitute one of those small groups which will be responsible for so much of the mission of the church in years to come. Scientists who acknowledge the reign of God should be encouraged to form communities where they may grow in their own understanding, experience and response to their Catholic faith, and where they show their insight how the mysteries of redemption can be presented to their brothers and sisters who are seeking answers to the dilemmas posed by their scientific research.¹⁵

But at present there is no "organized" Catholic voice in the scientific community to raise and help answer the questions arising from scientific and technological advance. By and large individual Catholic scientists, even those who feel very deeply about their science and their faith, find themselves isolated and practically powerless to raise questions that will be heard in the scientific community. We have been ineffective, so far.

But St Jerome tells us that St. Athanasius woke up one morning to find out that the world was Arian. Somehow, bumbling along, the church survived – as she will now. But she'll survive because folks like us will finally get ourselves on track.

After all, St. Paul has assured us that we'll never be tried beyond our strength. These are extremely troublesome issues and the stakes are very high. So God must have tremendous confidence in our response to the church's need. After all, there is no one else around to do the job. Like St. Paul we can accomplish all things in him The One who sends us.

ENDNOTES:

- 1 Roger L. Shinn, *Faith and Science in an Unjust World*, Council of Churches: Geneva, Vol. 1, p.11.
- 2 Robert Hanburg Brown, "The Nature of Science," *Ibid*, p. 40.
- 3 Pope John Paul II, "Address to the Pontifical Academy of Sciences on the Centennial of the Birth of Albert Einstein," Fall, 1979, No. 5.
- 4 Teilhard de Chardin, *Phenomenon of Man*, New York: Harper and Bros., 1959, p. 218.
- 5 Julian Huxley, *Evolution after Darwin*, edited by

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- Sol Tax, University of Chicago Press, 1960, III, p. 253. *mentary*, 57, No. 3, March 19874, p. 27.
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The Ladder of Sciences

Thomas P. Sheahen, Ph.D.

Dr. Sheahen, Vice-Director of ITEST, submitted this short article as supplementary material to his formal paper written for the October, 2006 "Working Conference," Education for the Faith/Science Ministry. For some this will be a good review, for others it will be an expansion of their basic knowledge of how science builds from the simple to the complex)

Although there is a continuity to all of science, we have established somewhat useful borders between the various branches of science. Mathematics, physics, chem.-istry, etc., are all distinct branches. Each new science builds upon the foundation set by the level below it.

Physics is more than mathematics, although the boundary is certainly a blurry one in the vicinity of *superstring theory*. Pure mathematics can go off in any old direction, but physics demands that a theory correctly predict the results of experimental measurement. When science has to deal with a very large number of interacting particles, we start to call it chemistry instead of physics; and sure enough, there are subfields known as chemical physics and physical chemistry.

Complexity increases at each new stage, and it becomes necessary to focus on a limited field of view, or risk being overwhelmed by the diversity of topics. Chemicals of great complexity open new doors. The chemical DNA seems to be the blueprint for life, and the living cell is more than just the chemicals that make it up.

Again, there are border-straddling sciences like biochemistry. Within biology itself, statistical mechanics, energy balances, and probability still matter in a living organism, but people doing biol-ogy don't spend a lot of time at the level of mathematical physics.

Above biology is the science of behavior – again, built on a foundation of biology, but with much greater complexity, and therefore qualitatively different. Going up the ladder, we find the science of psychology, and much further up are cultural, aes-thetic, and spiritual qualities. At each new stage, complexity increases, and some new reality is introduced that wasn't there at the lower level. Teilhard de Chardin identified the successive levels with increasing consciousness.

If we climb back down the ladder, at each lower level we discard or rule out some characteristic that made (a thing different from the level below it. We strip away complexity, trying to reduce the system to something simpler. This process goes under the name of *methodological reductionism*. The higher levels contain sophisticated realities associated with greater consciousness, but those realities no longer can be identified at the lower levels where attention is confined to phenomena of lower complexity.

That's a very abstract way of phrasing it. Let's illustrate it via music, a high-level reality of great com-

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plexity. Suppose I start with Beethoven's fifth symphony, as played by the Boston Symphony Orchestra. I can reduce that down through the successive levels of science, all the way back to mathematics. All that is left is a string of billions of one's and zero's. At this level, the meaning, significance and beauty of the music is totally lost. How can you ever get it back?

Now suppose I store that lengthy string of one's and zero's in a very specific circular spiral on a piece of plastic known as a CD. You can have the symphony **back!** But *you* must supply the components of the successive levels of sciences that had been removed on the way down the ladder. First you step up to physics and engineering, using a CD player: a man-made invention that uses laser pulses to first convert one's and zero's to electrical signals, and then broadcasts the signals as sound through a loudspeaker. Next you add the biological device of the human ear. There nerve endings in the inner ear convert the sound into electrical signals going into the human brain. Stepping up to a still higher level, the signals are understood as music. At a still higher level, the sophisticated listener knows something about Beetho-

ven's compositions, knows that Boston has a Symphony Orchestra, and perhaps can recognize its distinctive sound caused by the acoustics of Symphony Hall.

The key point about the upward progression of the sciences is that new realities emerge at each higher level.

The erroneous viewpoint known as *philosophical reductionism* refuses to acknowledge this, and finds itself insisting that everything human is all just a bunch of molecules moving around. The people who think and talk that way have used the higher emergent properties (thinking and talking) to deny the reality of those properties. That lacks consistency, to say the least. We distinguish between *methodological reductionism* and *philosophical reductionism*. In *methodological reductionism* (commonly used by all scientists), as you climb down the ladder, looking closer at component parts, you acknowledge that you're discarding significant higher realities. In *philosophical reductionism*, you assert there is nothing real except the ever-smaller components.

SPACE EXPLORATION AND THE NATURE OF THE HUMAN

Joseph P. Kerwin, M.D.

(Born and raised in Oak Park, Illinois, Doctor Joseph Kerwin received his B.A. in philosophy from Holy Cross College, Worcester, Massachusetts in 1953. He earned his MD in 1957 from Northwestern University, a year before he was drafted into the U.S. Navy and designated a naval flight surgeon. Accepted into the Astronaut Corps in 1965. Dr. Kerwin subsequently flew on the SKYLAB 2 Mission in 1973 on a mission lasting 28 days. During his tenure as Director of Space and Life Sciences at the Johnson Space Center in Houston, Kerwin was responsible for direction and coordination of medical support to operational manned spacecraft programs. Dr. Kerwin, at the end of a very brief biographic introduction at the conference, noted that since SKYLAB, he has "lived happily ever after.")

(Father Bob Brungs invited Dr. Kerwin to address this October, 1985 conference on Space Exploration and Colonization, suspecting that he would receive a polite note of regret. Over the years we have found that "big" names sometimes think it beneath their dignity to address groups smaller than a thousand. That was not the case with Joe Kerwin. Whether it was "friendly Jesuit persua-

sion" that led Kerwin to graciously accept the invitation or the desire to share his knowledge, we were the beneficiaries of an extraordinary presentation. After a brief introduction about his topic, Dr. Kerwin mentioned that he would not be talking about the usefulness of space; rather, he would discuss "why" we explore space. Kerwin displayed a healthy dose of humility as he spoke in a poetic rather than prosaic style of his experiences in space. He quickly put to rest any stereotypes we might have had of an astronaut as a "space robot" controlled by the crew at the "nerve" center in Houston. Since this conference in 1985, NASA has launched a number of shuttles, explored Mars, installed the Hubble telescope and included women in the crew. How prophetic were the thoughts of this poet/scientist of the 80's!

I ordinarily spend a lot of time as a NASA representative talking about the usefulness of space, the spin-offs, and so on. But this is a theological encounter – let's talk about why we do it. So my references are Cyrano de Bergerac and Shakespeare and H.G. Well and C.S. Lewis, some of whom I quote.

SPACE EXPLORATION AND THE NATURE OF THE HUMAN

(cont.) Joseph P. Kerwin, M.D.

Most of the thoughts assembled here are not original; I've quoted the ideas of others extensively. The theory is that, like any explorer, my job is not to invent, but to discover.

To a first approximation, the exploration of space is simply exploration. Exploring the unknown is something we do because we can't help it. We were born curious – and curious about the whole world. Pope was wrong; the proper study of mankind is everything. Remember Kipling's poem? From memory, it goes like this:

These are the four that have never been filled
That have never been filled since the world began:
Racala's mouth and the gut of the Kite,
the hands of the ape, and the eyes of man.

Men always attribute wonders and transfer the mysterious to unknown places; and we will then undergo any hardships to explore those places. Fairies and witches lived in the deep forests; Africa was filled with temples of gold and prehistoric monsters; the fountain of youth was in Florida; other living beings (even Heaven, perhaps) were on the back side of the moon. Ultimately when we go to those places, we find out that those things are not really there. But the things that *are* there are usually interesting in their own right.

Reality doesn't necessarily disappoint; the forests and mountains were pretty wonderful places after all. Chesterton commented on the hippopotamus as being "a creature that looked as though it ought not to exist, but does." But the myths move out beyond the next frontier. Space is just today's version of the frontier.

But, unless we're all wasting our time this weekend, there must be some "flavor" to the exploration of space that makes it unique and worth thinking about.

let me dispose of an objection. I've heard NASA's program criticized on the basis that it's elitist, only for the few. I don't think that's a significant flaw. Exploration has always been only for the few. Tourism comes later. It's become less elitist very fast. True, we've flown a Saudi Arabian prince. But we've also flown individuals from McDonnell-Douglas, Hughes and so on. We have a school teacher a congressman, a senator, all kinds of people. We've opened it up. What is different about this exploration is that it's less individual and more corporate – an effort mounted by the whole country rather than a rest-

less few. That is an opportunity for cooperation, but it's also something of a flaw. But it's necessary because everything is so expensive. I'm curious as to whether it will become inexpensive enough for individuals or small groups – private enterprise, if you will – to get back into the game of real exploration. I hope it happens.

But the uniqueness is in the quality of the places explored. I think there are three different kinds or stages of space voyaging, each with its own flavor. These are:

1. "Having a look around"; the earth orbital flights, and brief excursions to the Moon and perhaps to Mars.
2. "Homesteading"; finding places to settle and raise families away from our home planet. The Space Station will not be homesteading, but it's a beginning.
3. "Meeting the natives"; the search for extraterrestrial life.

We've only explored at the first stage so far; but the impact of that on our imaginations has been great. The key decision was to send *people* up, not just machines. That issue has been the center of controversy in NASA since the beginning of the program, many of the physical scientists claiming that we could find out more, more cheaply, if we dispensed with kitchens and bathrooms and just sent instruments aloft. But at an emotional level, that's like saying you can play baseball better with robots. Maybe you could – but if you did, you'd have to build a bunch more robots to go to the games.

C.S. Lewis says it better: ✱

"When we learn from the sciences the probable nature of places or conditions which no human being has experienced, there is, in normal men, an impulse to attempt to imagine them. Is any man such a dull clod that he can look at the moon through a good telescope without asking himself what it would be like to walk among those mountains under that black crowded sky? The scientists themselves, the moment they go beyond purely mathematical statements, can hardly avoid describing the facts in terms of their probable effect on the senses of a human observer."

And the experience is certainly worth the trip.

✱ from "Of Other Worlds: Essays & Stories"

SPACE EXPLORATION AND THE NATURE OF THE HUMAN

(cont.) Joseph P. Kerwin, M.D.

When I flew in Skylab, it was our first long-duration mission, and our people were concerned that the confinement and isolation would result in our coming down with "cabin fever." So they spent a considerable amount of time thinking about that and invented some things to bring up with us to keep us amused. We had music tapes which we played as background music. It was very nice. Each crew member selected his own tapes. That gave rise to some questions about which tapes got played when. One wanted classical, one country-western and one pop music. We decided that whoever was the subject for the medical experiments got to pick the tape, and the other person had to change it for him. It worked out very well. We had books. We had a dart game with little feathered darts, which didn't work. They went end over end in the reduced pressure. We even had a deck of cards, each card having a little patch of Velcro on the back so you could stick it down to the table.

We broke out the darts once and played with them for ten minutes, and put them away again. We broke out the cards once just to see if they'd work. It was a mess. Try and shuffle a deck of cards with Velcro on the back! What did we do for amusement? We looked out the window. We looked out the window all the time, every spare moment we had: ten minutes between jobs, after lunch, late at night. We looked especially late at night, because we were on Houston day-night cycle. That means we went to bed – at least, Houston told us to go to bed – at ten o'clock every night Houston time and got up at six in the morning Houston time. If you think about that, that means that, when you are up and working and looking out the window, it's day in America and night in the Eastern hemisphere. That's no fun, because you want to see the Eastern hemisphere too. So you stay up late or get up early and you see some marvelous sights.

We had an orbital map with a line showing where the orbit was. By checking on your trajectory and the time since you last crossed the equator, you could figure out where you were. You grabbed the map, the binoculars, the camera. Three heads at the window, three bodies going out in three different directions. It was marvelous! It was a real trip! All the places there! We'd look for our home towns, for places we'd been or wanted to visit and never had the chance: London, Switzerland, Japan, atolls in the Pacific – even just clouds and ocean were fascinating. Sunrise followed sunset at forty-five minute intervals; and every orbit was different. I'll sketch one of a hundred images that I remember: as the spacecraft passed

over the Crimea late one night (Houston night; bright morning on the middle east), the view south and west included the Black Sea, the Tigris and Euphrates Rivers, south to the Holy Land and southwest to Greece; and in the distance the Red Sea, the Suez Canal and Africa disappearing over the horizon. Five thousand years of history in one glance. That was typical. I never tired of that view. That's why just going up to have a look around will be a worthwhile trip, whether you're the first or the 101st or the 1001st.

The other thing we did was learn to fly. Weightlessness is a weird environment, and even after you're "used" to it you never tire of experimenting. Going from here to there is just a matter of pushing off with a finger and floating. That soon became too dull, and the trick was to see how many somersaults you could do en route, or whether you could fly the entire length of the Skylab (a good 90 feet) without touching the walls. You could, with help, stabilize yourself carefully in the middle of the open space in the "workshop," which was 20 feet in diameter – and then, try as you might, you couldn't reach a wall! Someone would have to come get you.

And there was no sense of up or down apart from your own body. If you turned "upside down" there'd be a brief moment of confusion, then the clear impression that *you* were right side up but the world was inverted; the lights were growing out of the floor and the table hanging from the ceiling. Looking out that window, the earth wasn't really "down there" – it was just "over there." We had a lot of fun with that. In fact, the famous poet, Kerwin, wrote a poem about it during the mission, which I quote with his permission and despite its literary defects:

We're getting used to knowing how to fly.
When I was young I used to fly in dream,
Up ways so high and easy it would seem
As if earth wheeled and slanted, and not I.

And now it's real. We move that way at will,
Like dust motes in a sunbeam. Push away,
Drift down your own trajectory, tumble, play,
And who can tell which moves and which is still?

In this high sunlit ship, the laws of space –
Height without vertigo, mass without weight –
Entrain our nerveways to their easy pace
As if this rhythm were our native state.

SPACE EXPLORATION AND THE NATURE OF THE HUMAN

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What if man were an exile from the sky?

Are we, perhaps, remembering how to fly?

Now, that was trying to capture the fact that somebody, around day 25, said: "I don't remember what it's like to climb steps." It seemed as if we had been up there so long that this floating-around business was the natural state of existence. We couldn't imagine what gravity was like. That was just a passing sensation. We were really very anxious to get home, but the feeling was so interesting, I wanted to capture it. Well, so much about wanting to "look around."

The second stage – homesteading – is one we talk about a lot. But space has a character we must not overlook. It's more like the ocean than the forest (or maybe it's like New York); you can visit it, but you can't *live* there. Space is hostile to life, and as long as we're there we'll have to wrap ourselves in systems made by human beings to protect us. And even then, weightlessness may gradually transform us into a physically different species, no longer capable of surviving on earth. I don't mean genetically different. But I mean that we've seen such interesting and relatively profound changes in adult human beings in 1/300th of a lifetime – (approximately 3 months?) that we have no idea how the basic plasticity of our material will be expressed when we have raised a whole generation of mammals. We hope to do that in the Space Station – not starting with people, but with guinea pigs or something. When they've been conceived, born, grown, reproduced and died all in zero-G, we may find not a genetic change, but a morphological change so profound that they will no longer be capable of living in gravity and will die if they return to Earth. It's a possibility that may prove true.

The need for protection is also true of living on the surface of the Moon or Mars. You need an atmosphere. You need protection from radiation, because the atmosphere and the magnetic fields that protect us here are absent from those places. To me, that's not true homesteading. This is just a personal point of view. I think we are still engaged in looking for a real new home away from Earth, and we haven't found one yet. We really haven't a clue whether one exists.

But that's our dream, and so is the topic of stage three: meeting with the natives. There is absolutely no evidence that they're out there (although it's scientifically fashionable to think so nowadays), but we can't help suspecting that they are. In that case the implications would be truly revolutionary. It would be revolutionary if we

found intelligent life, or any life indeed which is not founded on our DNA. Having seen the ITEST film, *Lights Breaking: A Journey Down the byways of Genetic Engineering*, I heard Father Brungs' remark on "...how exciting it is that all life is connected at the basic physical level, that of the nucleotides which make up DNA. It tells us that amoebae and elephants, mosquitoes and even university professors, are built from the same four nucleotides." True, and how exciting it would be to find out if there's a second way to do it, to find just one instance of life that sprang up truly independent of terrestrial life. I remember waiting for the experiment results to come in from the Viking lander on Mars in 1976 – wondering if any real evidence of life would be found – even in a single cell would prove we weren't alone.

How would we handle a meeting with other beings? I can't find the reference in Lewis to his remarks about "God's Quarantine," so I shall have to reconstruct them from memory. His comments followed a discussion of the possibility of our encountering intelligent life elsewhere; of the curious tendency in speculative fiction to assume that such life would be evil and hostile (the "Bug-Eyed Monster" of older science fiction), and his own assumption, on theological grounds, that most probably they would be no such thing.

He then noted that man has an unfortunate tendency to carry his internal flaws and weaknesses with him when he travels. We seem to be incapable of NOT exporting vice and conflict, and of avoiding suppression of more primitive peoples. And he hypothesized that, in a meeting with non-human intelligent species it's entirely possible that we, not they, would be the "bad guys." In view of the apparent absence of such life in the solar system, and the extreme improbability of our present technology being able to carry us to other stars, he speculated that the vast and apparently unbridgeable gulfs of space constituted God's Quarantine – a protection of the universe from this morally diseased race, until we are cured.

Even though our search for other life has so far been fruitless, the search is valid; it enriches our imaginations and guides our speculations about the possible. The moon is dead, but the nearest star may still possess planets, life, civilization, stories. The best science fiction makes this kind of story. Lewis again:

"Work of this kind gives expression to thoughts and emotions which I think it is good that we should sometimes entertain. It is sobering and

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cathartic to remember, now and then, our collective smallness, our apparent isolation, the apparent indifference of nature, the slow biological, geological and astronomical processes which may, in the long run, make many of our hopes (possibly some of our fears) ridiculous. If 'memento mori' is sauce for the individual, I do not know why the species should be spared the taste of it."

"Thinking about these things is sometimes criticized as 'escapism'. I never fully understood it until my friend, Professor Tolkien, asked me the very simple question, 'What class of men would you expect to be most preoccupied with, and most hostile to, the idea of escape?' and gave the obvious answer: jailers."

All this is just our effort to understand. Understanding the Universe may not be as much fun as understanding the human being next door, but it's valid, too. And we make landscapes of it in our minds, and tell stories about them; and the stories, the myths, almost always have enough in common to stir a sort of recognition in our minds. It is as though, both in our travels and in our tales., we are trying to catch in our net of successive moments

something that is not successive. Is the landscape of the imagination a map of something real? Is it plausible that "what is myth in one world might always be fact in some other"? What would Plato think?

That's speculation; but the drive to explore is fact. Here is Shakespeare on that quality of the human spirit. It's quoted slightly out of context – Hamlet (*Act IV, Scene 4*) was steeling himself to a different sort of enterprise – but I believe the words will stand up to this application:

"What is man,
If his chief good and market of his time
Be but to sleep and feed? A beast, no more.
Sure he that made us with such large discourse,
Looking before and after, gave us not
That capability and God-like reason
To fust in us unused. Now, whether it be
Bestial oblivion, or some craven scruple
Of thinking too precisely on the event,
A thought which, quartered, hath but one part
wisdom,
And ever three parts coward, I do not know
Why yet I live to say 'This thing's to do';
Sith I have cause and will and strength and means
To do't."

NEW BOOK NOTICE

Father Benedict Ashley, OP

The Way Toward Wisdom: An Interdisciplinary and Intercultural Introduction to Metaphysics
(Notre Dame, IN: Univ. of Notre Dame, Press, 2006), 618 pp.

Through many years ITEST has vigorously promoted interdisciplinary discussions. The necessity for this becomes more and more evident with the knowledge explosion. Our universities are turning out narrow specialists without a common language. This book proposes a fundamental solution to this problem.

At the very beginning of modern science Aristotle recognized and defended a plurality of autonomous disciplines, each with its own principles and criteria of truth.

He then asked which of these disciplines might serve to interrelate these without prejudice to their autonomy. His answer was what he called "First Philosophy," first not in the sense of an epistemologically first, but in the sense of a supreme critically synthesizing discipline. This came to be known as "metaphysics" but today metaphysics is scorned as empty talk or taken for granted without proof of its validity.

Ashley defends the validity of metaphysics as the "way toward wisdom" by grounding it in natural science, which in spite of postmodern criticism, is rightly respected as objective truth by our culture. Oddly, the fact that St. Thomas Aquinas also accepted

this position is usually ignored by Thomists whether of the transcendentalist or the Gilsonian persuasion.

Consequently this book first carefully establishes the thesis that natural science when understood not merely as a mathematical dialectic but as a genuinely empirical science, establishes the existence of a non-material First Uncaused Cause of all changing, becoming reality known to our senses. This fact both defines the scope of natural science and opens the way to critical logic, mathematics, ethics, and a valid metaphysics that compares and contrasts all the others.

After proposing this solution the author then goes on to show in great detail how the analogical concepts of the one and the many, the true and the false, and the good and the bad have different but interrelated senses in the different disciplines. He argues that in this way many confusions in the various disciplines as currently formulated can be cleared up and how they can better engage in interdisciplinary and intercultural communication. Finally, he shows how this relates to theology as a discipline and thus saves the harmony of faith and reason insisted on by the late John Paul II. The book is not addressed simply to philosophers, but to all current specialists.