

THE SECOND MEETING

- A) The Atomic Theory of Matter
- B) Science and Morality

Scene: A lecture hall at Cheverus College. The large audience is composed of faculty and students from Cheverus and from Cabot University.

Dean Smalley

Good evening. I would like to express first my thanks to Father Rector and to all our friends at Cheverus College for their gracious hospitality. As I mentioned the last time, we will alternate the meetings between Cabot and Cheverus. Our first meeting was intended primarily to get acquainted with our four speakers and our somewhat unusual format, but tonight we will begin in earnest with *The Six Days of Creation*.

The first day of creation deals with the origin of "light," or as we have chosen to phrase it, the origin of matter and energy. Our discussion will begin with the atomic theory of matter, and since this theory led directly to the development of the atomic bomb, we thought this would be a good place to discuss the moral responsibility, if any, of the scientists who developed the bomb, and of the scientific community in general.

So let me begin our meeting tonight by reading again the Scriptural account of the first day of creation:

In the beginning God created the heavens and the earth. The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. And God said, "Let there be light," and there was light. And God saw that the light was good; and God separated the light from the darkness. God called the light Day, and the darkness he called Night. And there was evening, and there was morning one day (Gen 1:1-5).

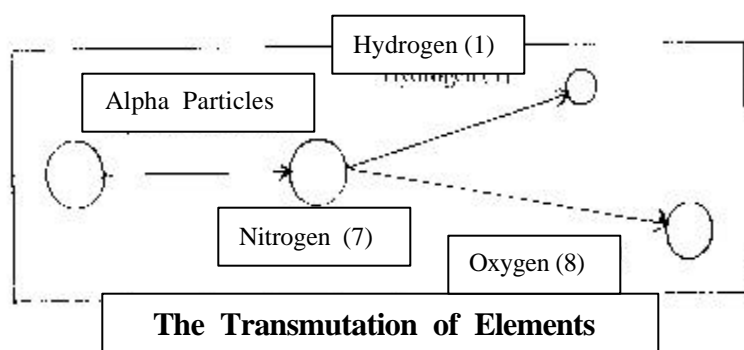
Dr. Arthur Schonfield

Our main topic for this evening is the Origin of Matter and Energy, but the humanist, of course, since he cannot accept the existence of a God who created matter and energy out of nothing, has to hold that matter and energy have existed from all eternity. Carl Sagan my spokesman for humanism at our last meeting, does not discuss directly the atomic theory of matter, so let me turn to another prominent humanist, the late Jacob Bronowski. I am sure that many of you watched his remarkable television series, *The Ascent of Man*, which ran a few years ago. Dr. Bronowski, a mathematician and physicist, was one of the Directors of the

British Humanist Association, and during World War II he worked on the atomic bomb. But after the war he deliberately abandoned physics and took up the study of biology. At the time of his death in 1974, he was engaged in research work in biology at the Salk Institute in La Jolla, California.

Let me begin with a little historical background. The modern atomic theory of matter began in 1897 at the University of Cambridge in England, with J.J. Thomson's discovery of the electron, that tiny particle of matter which carries a negative charge of electricity. The discovery proved that the atom was not the smallest particle of matter as its Greek name atom, "indivisible," had implied, but that it could itself be broken down into still smaller parts.

In 1911 Ernest Rutherford, also at the University of Cambridge, discovered a more massive subatomic particle, the proton, which carries a positive charge of electricity. Rutherford then proposed the planetary model of the atom, with the proton in the center like the sun, and the electrons in orbits like planets.



In 1919 Rutherford achieved for the first time the alchemist's dream, the transmutation or the changing of one element into another. You can see from the diagram on the blackboard that Rutherford was bombarding nitrogen with alpha particles. He had discovered that the alpha particles given off by radioactive bismuth, are the nucleus of the helium atom which has two protons. As these protons struck the nitrogen atom which has seven protons, one bounced off becoming hydrogen, which has one proton, while the other remained in the nucleus, thus converting it into oxygen, which has eight protons.

Then in 1932 James Chadwick, also of the University of Cambridge, discovered another subatomic particle, the neutron, which has no electrical charge. The physicists had been trying to split the nucleus of the uranium atom but without success, because the electrical field of the atom repelled electrically charged particles. But now with the neutron, and no electrical charge, they had a particle which could penetrate to the very core of the atom.

Uranium has 92 positively charged protons in its nucleus, and since like charges repel, the nucleus should be flying apart, so it must be held together by a tremendous amount of energy. It was Enrico Fermi in 1934, who, unknowingly at the time, first achieved nuclear fission, actually splitting the atom. Using a stream of neutrons, he split uranium 92 into barium 56 and krypton 36. You can see that from the numbers that barium and krypton, $56 + 36$, add up to 92. This fission released some of the energy which was holding the nucleus together. Here is Dr. Bronowski's summary of this golden age of atomic physics in his *The Ascent of Man*:

"...Physics in the twentieth century is an immortal work. The human imagination working communally has produced no monuments to equal it, not the pyramids, not the *Illiad*, not the ballads, not the cathedrals. The men who made these conceptions one after another are the pioneering heroes of our age...J.J. Thomson, who overturned the Greek belief that the atom was indivisible; Rutherford who turned it into a planetary system..Chadwick, who discovered the neutron; and Fermi who used it to open up and transform the nucleus."¹

Finally in 1934, the Hungarian, Leo Szilard, pointed out that nuclear fission could set off what he called a "chain reaction," which he realized could be developed into a bomb. In 1939 Szilard wrote a letter to President Roosevelt which he got Albert Einstein, because of his tremendous prestige, to sign, urging the development of an atomic bomb. Bronowski reproduces a photograph of the letter in *The Ascent of Man*:

"F.D. Roosevelt
President of the United States...
Sir:

"...It has been made probable - through the work of Joliot in France as well as Fermi and Szilard in America - that it may be possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

"This new phenomenon would also lead to the construction of bombs, and it is conceivable - though much less certain - that extremely powerful bombs of a new type might thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port with some of the surrounding territory...

Yours very truly
Albert Einstein." ²

Roosevelt soon launched the Manhattan Project, which six years later produced the first atomic bomb. The question now naturally arises - what was the moral responsibility of the scientists who were involved in the production of the bomb - Einstein, Szilard, Fermi, and so on,

and of the scientific community in general? Bronowski, who himself worked on the bomb, faces the question squarely, and answers it about as well as it can be answered:

"But Szilard did not stop. When in 1945 the European war had been won, and he realized that the bomb was now about to be made and used on the Japanese, Szilard marshalled protest everywhere he could. He wrote memorandum after memorandum. One memorandum to Roosevelt failed only because Roosevelt died during the very days that Szilard was transmitting it to him. Always Szilard wanted the bomb to be tested openly before the Japanese and an international audience, so that the Japanese should know its power and should surrender before people died.

"As you know Szilard failed, and with him the community of scientists failed. He did what a man of integrity could do. He gave up physics and turned to biology - that is how he came to the Salk Institute - and he persuaded others too [including Bronowski]. Physics had been the passion of the last fifty years, and their masterpiece. But now we knew that it was high time to bring to the understanding of life, particularly human life, the same singleness of mind that we had given to understanding the physical world.

"The first atomic bomb was dropped on Hiroshima in Japan on 6 August 1945 at 8:15 in the morning. I had not been long back from Hiroshima when I heard someone say, in Szilard's presence, that it was the tragedy of scientists that their discoveries were used for destruction. Szilard replied, as he more than anyone else had the right to reply, that it is not the tragedy of scientists: 'It is the tragedy of mankind.'" ³

Let me conclude by returning to our main topic, the origin of matter and energy. I repeat, that since the humanist cannot accept the existence of God, and therefore the concept of creation out of nothing, he has to hold that matter and energy have existed for all eternity.

Fr. Robert A. Staats

At our last meeting I said that, once it is clearly understood that the literary form of the Hexameron is not history, but rather myth, a concord or harmony between contemporary science and the Hexameron is obviously impossible. This does not mean, however, that a harmony between science and theology concerning the origin of the world and so on is impossible. In fact such a harmony or synthesis has been worked out by the French Jesuit, the late Teilhard de Chardin, whose work, it seems to me, provides a providential bridge between secular humanism and liberal Christianity. Now it is impossible to understand Teilhard's work without knowing a little about his life; so in the course of this dialogue, I would like to insert whenever appropriate, a few comments on his life.

He was born Pierre Teilhard de Chardin in 1881, and when he was eighteen years old he entered the Jesuit Seminary at Aix en Provence. Now, this was the time of the anticlerical governments in France and the Jesuits were obliged to leave the country, Teilhard's group going

to England, where he was ordained in 1911. In 1914 Teilhard went off to war. As you know the French government drafted all priests and religious, many of them serving as combat troops. Teilhard became a brancardier, a stretcher-bearer, in the Eighth Tunisian Regiment, a colonial unit composed of Moslem troops but with a French cadre.

Teilhard participated in most of the major engagements of the war, and it is a miracle he ever survived. Among his many decorations for bravery was one he was awarded during the battle of Verdun, when he volunteered to go alone at night to within a few yards of the German trenches to recover the body of his dead captain. Yet Teilhard considered these four terrible years the most formative of his life. The image of the infantry on the attack was his favorite metaphor to describe the onward rush of humanity towards Omega or God.

Let me give a little sample of some of Teilhard's theological speculations on the topic of this evening's discussion, the origin of matter and energy. Teilhard did not think the Thomistic notion of creation *ex nihilo* (out of nothing), appropriate for our time. Let me read a few excerpts from a fellow Jesuit, Robert Faricy, in his *Teilhard de Chardin's Theology of the Christian in the World*:

"He calls his theory of creation "creative union" (*l'union créatrice*). 'Creative union' is not exactly a metaphysical doctrine. It is much better described as a sort of empirical and pragmatic explanation of the universe."...He does not consider creation strictly in terms of being, as would be the case if his approach were traditionally metaphysical. Rather, he describes being in terms of union. For him, being in its active sense means to 'unite oneself or to unite others'; in its passive sense, being means 'to be united or unified by another.' As we shall see, 'to create' means 'to unite,' and 'to be created' means 'to be united.'" It seems well to point out too that he does not think of creation 'as an instantaneous act, but in the manner of a process or synthesizing action.'" ⁴

Our subtopic for this evening is Science and Morality, especially as regards the moral responsibility of the scientific community for the development of the atomic bomb, but Teilhard, who was an incurable optimist, did not regard the atomic bomb and the subsequent development of nuclear power as a great moral disaster. Let me read from a superior biography of Teilhard by the English writer, Robert Speaight, entitled simply *Teilhard de Chardin*:

"The present writer recalls one occasion in the summer of 1946, Teilhard had only just returned from China and...the conversation turned on the atomic bomb. If the gas chamber and the Gestapo were one challenge to his optimism, the atomic bomb was another. His essay on the subject had recently appeared in *Études* (Sept 1946). Whereas hitherto man had used the natural forces of matter - fire, steam, and electricity - he now had his hands on the levers of matter itself. He was 'a new being' who hardly yet 'recognized himself,' conscious of a power capable of indefinite development. Teilhard believed that the 'spectre of bloody conflicts' would be exorcised by the 'rays of mounting unanimity,' and that the effect of the atomic bomb might well be that war would 'be doubly and definitively put an end to.' The excess of power in our

hands make all strife impossible; in comparison with the possibilities of conquest opened up by science, the romantic trappings of war would seem tedious and old-fashioned; and men would grow together by 'looking passionately, and together at the same thing.'" ⁵

Let me turn now from science to the Bible. Since I come after Mrs. Stepan, I will have to wait until the following meeting to offer any comments on her presentation. At our last meeting she stated that the Biblical Commission in 1906 and 1909 had condemned the Documentary Theory of Wellhausen and the Mythical Theory of Gunkel. Yet Mrs. Stepan herself acknowledged that decrees of a commission of Cardinals, even if approved by a Pope, are not infallible, and therefore could be revised at a later date. Now this, in fact, is just what has happened. Let me read from perhaps the foremost biblical scholar in the country today, the Sulpician Raymond Brown, who is the President of the American Biblical Society, and a consultant of the new Biblical Commission. This is from his superb *Biblical Reflections on Crises Facing the Church*, which appeared in 1975. He is quoting from a statement by Athanasius Miller, O.S.B., the secretary of the Biblical Commission, concerning the publication of a new edition of the *Enchiridion Biblicum*, "Handbook of the Bible," a collection of Roman documents dealing with Holy Scripture.

"...The *Enchiridion* renders great service first of all to the history of dogmas. It reflects clearly, moreover, the fierce battle that the Church at all times has had to fight, though with varying degrees of intensity, to maintain the purity and truth of the Word of God. Especially in this respect the decrees of the Pontifical Biblical Commission have great significance. However, as long as these decrees propose views which are neither immediately nor mediately connected with truths of faith and morals, it goes without saying that the scholar may pursue his research with *complete freedom* [Brown's emphasis] and may utilize the results of his research, provided always that he defers to the supreme teaching authority of the Church.

"Today we can hardly picture to ourselves the position of Catholic scholars at the turn of the century, or the dangers that threatened Catholic teachings on Scripture and its inspiration on the part of liberal and rationalistic criticism, which like a torrent tried to sweep away the sacred barriers of tradition. At present the battle is less fierce; not a few controversies have been peacefully settled and many problems emerge in an entirely new light, so that it is easy enough for us to smile at the narrowness and constraint which prevailed fifty years ago."⁶

Our present Pope, John Paul II, is himself a firm believer in all the latest developments in biblical criticism. He has recently given a series of allocutions on the first three chapters of Genesis. Let me read a few excerpts from an allocution given by him on September 12, 1979:

"From the point of view of biblical criticism, it is necessary to mention that the first account of man's creation is chronologically later than the second. The origin of this latter is much more remote. This more ancient text is defined as Yahwist because the term Yahweh is used to denominate God. It is difficult not to be struck by the fact that the image of God presented there has quite considerable anthropomorphic traits (among others we read in fact

that "...the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life" (Gen 2:7).

"In comparison to this description, the first account, that is, the one held to be chronologically later, is much more mature both as regards the image of God, and as regards the formulation of the essential truths about man. This account derives from the priestly and Elohist tradition, from Elohim the term used in that account for God." ⁷

Now this is identical to what I gave from Bruce Vawter and to which Mrs. Stepan objected. Let me read another excerpt from an allocution delivered by the Pope the following week, September 19, 1979: (The second and third chapters of Genesis tell the story of Adam and Eve).

"The second chapter of Genesis constitutes, in a certain manner, the most ancient description and record of man's self-knowledge; and together with the third chapter...the whole archaic form of the narrative...manifest its primitive *mythical* character."⁸

So Pope John Paul II clearly holds that the first three chapters of Genesis are a composite of sources, one older and less developed, and the literary form of these chapters is the myth. That is all I have been trying to say.

I think the basic fallacy on which the concordist and fundamentalist interpretations of the Hexameron are based is a false notion of the inerrancy or freedom from error of the Bible. Does the Bible really give us absolute truth, or like everything else does it present a mixture of truth and error? To answer this question, I will have to go back once more to the Documentary Theory of Julius Wellhausen. Wellhausen built his theory on an examination of the so-called "doublets" or repetitions in the Pentateuch, a characteristic of Semitic literature. For example, there are two creation stories in Genesis, two Flood stories, and so on. Let us examine just one of these doublets, a story about the patriarchs:

"From there Abraham journeyed toward the country of the Negeb and dwelt between Kadesh and Shur; and he sojourned in Gerar. And Abraham said of Sarah his wife, 'She is my sister.' And Abimelech king of Gerar sent and took Sarah. But God came to Abimelech by night..."(Gen 20:1-3a).

The Hebrew word for God is Elohim, so Wellhausen reasoned that this story must have been written by the Elohist or E author, who preferred that name for God. Now here is the doublet, or repetition of the story:

"So Isaac dwelt in Gerar. When the men of the place asked him about his wife, he said, 'She is my sister'; for he feared to say, 'My wife,' thinking, 'lest the men of this place should kill me for the sake of Rebekah'...So Abimelech warned all the people, saying, 'Whoever

touches this man or his wife shall be put to death.' And Isaac sowed in that land, and reaped in the same year a hundredfold. The Lord blessed him..."(Gen 26:6-8,11,12).

The Hebrews substituted the word Adonai, "Lord," out of reverence for the sacred name Yahweh, "I am who am," so Wellhausen concluded that this version of the story was by the Yahwist or J author. Here is Bruce Vawter's analysis of these two stories, and their implication with regard to the kind of truth we find in the Bible:

"What is Genesis? Like any other book it is the expression of its author's mind. If that author is inspired, then the expression is of a mind enlightened by grace, which will therefore be unerring. How did the author of Genesis intend to express his mind in including the 'doublets, repetitions, and discordances' of his sources in the book which he produced? He was as well aware as we that it was not likely that a striking event which E has associated with Abraham had taken place once more down to the last detail with Isaac, as J had it. Neither was he in any better position than we to decide which version was correct. What is more important is that he could not have cared less. The fact that he included both versions, not only here but countless other times, is eloquent testimony that verifying details of this sort was of no concern to him whatever. If he had included rival traditions that clash over the 'who' or 'when,' he could not have told us better that to him the 'who' and the 'when' were not important, and that he had a purpose that transcended these trivialities. What that purpose was, we must try to find when we read Genesis. All we need say for the moment is that it is this use of his sources, this purpose that he had, that is the expression of the author's mind. It is this, therefore, that is the inspired meaning of Genesis, and whatever is foreign to this purpose is not the meaning of Genesis. What the author intended to teach is the meaning of Genesis; that is the word of God which is free from error. We can say, therefore, that while Genesis undoubtedly contains errors, it teaches none."⁹

Bruce Vawter is saying that the inspired authors were evidently confused as to just who was involved in this story, Abraham or Isaac. But the authors in this particular case have no intention of teaching us historical truth, but rather religious truth, namely, God's providential care of a chosen soul.

Let me conclude my presentation tonight with another reading from Raymond Brown on the latest developments in the problem of the inerrancy of the Bible. This is again from his *Biblical Reflections on Crises Facing the Church*:

"The final decree of Vatican II on Divine Revelation (the Constitution *Dei Verbum*) ...in many...biblical matters...repeated the status quo achieved under Pius XII, and in regard to the inspiration of the Scriptures it simply reiterated past positions. But one can detect a significant movement with regard to inerrancy. Inerrancy is a corollary of inspiration: it has been repugnant for Christians to posit error in the Bible for which God has an author's role and responsibility. Only gradually have we learned to distinguish that while all Scripture is inspired, all Scripture is not inerrant. The first step in narrowing the scope of inerrancy is to recognize that the concept is

applicable only when an affirmation of truth is involved. In the Bible there are passages of poetry, song, fiction, and fable where the matter of inerrancy does not even arise. A second step is to recognize that not every affirmation of truth is so germane to God's purpose in inspiring the Scriptures that He has committed Himself to it. Already in *Providentissimus Deus* (1893) Pope Leo XIII acknowledged that the scientific affirmations of the Bible were not necessarily inerrant, since it was not God's purpose to teach men science. Eventually the same principle was applied to historical affirmations, but the last frontier had been religious affirmations. Job's denial of an afterlife (Job 14:14-22) makes it difficult to claim that all religious affirmations in the Bible are inerrant. Vatican II has made it possible to restrict inerrancy to the essential religious affirmations of a biblical book made for the sake of our salvation." ¹⁰

In conclusion let me repeat Bruce Vawter's statement on the inerrancy of Scripture: "What the author intended to teach is the meaning of Genesis, this is the word of God which is free from error. We can say therefore, that while Genesis undoubtedly contains errors, it teaches none." This principle will be crucial for our understanding of the Hexameron.

Mrs. Maria Stepan

I would like to begin tonight by giving a little outline of the method I will be following during the course of this dialogue. First I will offer comments on Dr. Schonfield's then on Fr. Staatz's presentations from this particular meeting, than on Rev. Swezey's presentation from the preceding meeting, and finally I will conclude with my own comments on the topics of the day.

Dr. Schonfield refused to speculate on the origin of matter and energy, saying that since the humanist finds no compelling evidence for the existence of God, he is forced to conclude that matter and energy have existed for all eternity. But this attitude is not scientific to say the least.

Let me begin with Dr. Bronowski's treatment of our subtopic of Science and Morality, especially as regards the development of the atomic bomb. The Benedictine, Fr. Stanley Jaki, who holds doctorates in both theology and physics, gave the Gifford Lectures at the University of Edinburgh from 1974 through 1976, which he entitled *The Road of Science and the Ways to God*. Here is his comment on Dr. Bronowski's claim that the scientific community was not responsible for the tragedy of Hiroshima:

"For the past three hundred years science, or rather the method of science, has been presented as bringing utopia to earth, but it was only during the last generation that utopia seemed to have been delivered to everyone's doorstep in the form of sophisticated gadgets that even the most sanguine scientists never dreamed of half a century before. Yet at the same time, science increased man's destructive capabilities in a measure which brought a sense of horror to every doorstep. The decade of bewilderment, which the 1960's became, was the product between a heavenly promise and a hellish threat both coming largely from the very same source. Worshippers of science gladly swallowed J. Bronowski's claim that science was not responsible

for Hiroshima, and they applauded the words of retiring Nobel laureate physicist, I.I. Rabi, that 'science is the only valid underlying knowledge that gives guidance to the whole human adventure and that those who are not acquainted with science do not possess the basic human values that are necessary in our time.' Those who did not worship science, to say nothing of those who were ignorant of it, could only be made antagonistic by such sophomoric encomiums heaped upon it."¹¹

I come now to Fr. Teilhard de Chardin, Fr. Staatz's "bridge" between secular humanism and liberal Christianity. Now Fr. Teilhard's "synthesis" between science and theology has been rejected by both the scientific community and the Church. Speaking for the scientific community, let me read from *This View of Life* by the late George Gaylord Simpson, a professor of paleontology at Harvard University, who was a close friend of Teilhard, and one of his literary executors:

"Teilhard's beliefs as to the course and causes of evolution are not scientifically acceptable, because they are not in truth based on scientific premises and because, to the moderate extent that they are subject to scientific tests, they fail those tests. Teilhard's mystic vision is not thereby invalidated, because it does not in truth derive from his beliefs on evolution - quite the contrary. There is no possible way of validating or testing Teilhard's mystic vision of Omega [God]. Any assurance about it must be an unsupported act of mystic faith...The attempt to build an evolutionary theology mingling mysticism and science has only tended to vitiate the science. I strongly suspect that it has been equally damaging on the religious side, but here I am less qualified to judge."¹²

During his life Teilhard was forbidden to publish by the Church, but in his will he left his manuscripts to his secretary who turned them over to his humanist friends, like Professor Simpson and Sir Julien Huxley who promptly published them. In 1962 during the reign of Pope John XXIII, the Holy Office responded with a *Monitum* or warning against these works, which has never been withdrawn:

"Several works of Fr. Pierre Teilhard de Chardin, some of them were published posthumously, are being edited and are gaining a good deal of success.

"Prescinding from a judgment about those points that concern the positive sciences, it is sufficiently clear that the above mentioned works abound in such ambiguities, and indeed serious errors as to offend Catholic doctrine.

"For this reason, the most eminent and most reverend Fathers of the Supreme Congregation of the Holy Office exhort all Ordinaries, as well as superiors of Religious Institutes, rectors of seminaries, and presidents of universities, against the dangers presented by the works of Teilhard and his followers."¹³

Fr. Staatz went on to give a rebuttal of my presentation at our first meeting in which he quoted Fr. Raymond Brown to the effect that the decisions of the Biblical Commission issued during the reign of St. Pius X had been abrogated in 1955. Fr. Brown gave the impression that this had been done in an official Vatican document which was signed by the secretary of the Biblical Commission, Fr. Athanasius Miller, O.S.B. Actually Fr. Miller made these remarks in an unauthorized magazine article!

It is true, as Fr. Staatz stated that Fr. Brown was made a consultor of the Biblical Commission, which indicates that something is wrong in Rome both Scripturally and theologically. This is probably why Pope Paul VI took away the Magisterial status of the Biblical Commission, and it is now merely a consultative body under the Congregation for the Doctrine of the Faith. So to be a consultor now does not mean what it used to mean.

Let me turn again to Msgr. Steinmueller who was a consultor of the old Biblical Commission, when it really meant something, for over twenty years. This is from his *Sword of the Spirit*:

"I was a consultor of the first Pontifical Biblical Commission from 1947 (after the publication of *Divino Afflante Spiritu*) to 1971, and I never heard any intimation that the decrees of the Commission were ever revoked. At the most they were clarified (cf. Letter to Cardinal Suhard of Paris, 1948). Recently some Catholic scholars have asserted that these decrees were implicitly revoked by *Divino Afflante Spiritu* (1943), and that this is confirmed by two articles written in 1955 by A. Miller and A. Kleinhans, who seemed to restrict the scope of the decrees to matters of faith and morals...The articles referred to were unauthorized and were condemned by the voting Cardinal members of the Commission. A. Miller and A. Kleinhans were to be brought before the Holy Office because of the articles, but were saved from this ordeal through the personal intervention of Cardinal Tisserant before the Holy Father. It was my friend Fr. Miller, O.S.B., who told me the whole story before his return to Germany."

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Fr. Staatz also claimed in his rebuttal of my first presentation, that Pope John Paul II rejected the Mosaic authenticity of the Pentateuch and quoted from an allocution of the Holy Father in which he used the term "Elohism" in speaking of the first chapter of Genesis, the Hexameron, and the term "Yahwism" in speaking of the second and third chapters, the story of Adam and Eve. Now this in no way denies the substantial Mosaic authorship of those texts.

I should mention here in passing, for whatever it might be worth, that Israeli scientists have recently completed a computer study of the book of Genesis, and concluded that it was written by one author, not the three or four claimed by the liberals.

Now the Mosaic authenticity of the Pentateuch is not just a minor literary dispute. Msgr. Steinmueller says that it is also a serious theological problem, leading directly to the question of

the inerrancy of the Bible, and even to the claim by some liberal Catholics that Our Lord did not know that He was the Messiah, or even that He was God!

"The Mosaic authenticity of the Pentateuch is not merely a literary and purely historical or archaeological problem; it is also to a certain extent a theological question. Those passages which are directly ascribed to Moses by Sacred Scripture must be believed by divine faith to have Moses as their author, and the substance of the other parts of the Pentateuch is theologically certain to be of Mosaic origin. Hence it would be an error in faith to deny the Mosaic origin of those passages of the Pentateuch which are directly attributed to him, and it would be at least temerarious to deny the Mosaic origin of those parts which constitute the substance of the Pentateuch.

"Some of these passages are spoken by Christ Himself: Matt 8:4 (cf. Lev 14:2-32 on leprosy), Matt 19:8 (cf. Deut 24:1-4 on divorce), Mark 7:10 (cf. Ex 20:12, 21:17, Lev 10:9, Deut 5:16 on honoring parents), Mark 12:26 (cf. Ex 3:2,6 on God of the patriarchs). Christ explicitly asserts that Moses in his writings wrote of Him (John 5:45-47). These words of Christ cannot mean His accommodation to the general opinion of His contemporaries, which held that the entire Pentateuch was composed by Moses, for the admission of any such accommodation implies that Christ tolerated error."¹⁵

Fr. Staatz then went on to read from another allocution of Pope John Paul II, in which the Holy Father referred to the "mythical" aspect of the story of Adam and Eve. Fr. Staatz claimed that the Holy Father was therefore denying the historicity of the story. The term "myth," in the popular sense, means an extravagant story that is certainly not historical, but when the term is used in its technical sense, as the Holy Father is using it here, it does not mean something that denies history, but rather something that transcends it. The Holy Father appends a series of footnotes to the allocution, giving several of the current technical definitions of myth, none of which deny the historicity of a particular story. Actually, the Holy Father uses the term "mythical" only once in referring to Adam and Eve, and then uses the term "prehistory," which Msgr. Steinmueller also prefers to myth. In the succeeding allocution (*L'Osservatore Romano*, Oct 1, 1979), the Holy Father explains just what he means by "theological prehistory." He uses the term to refer to Adam and Eve as they were in the state of innocence, because, he says, "history" proper did not begin until after the Fall. This is because "history" is inseparable from *Heilsgeschichte*, "salvation History." After Adam and Eve fell, God immediately promised them a future Redeemer: "I shall put enmities between thee and the woman, and thy seed and her seed; she shall crush thy head, and thou shalt lie in wait for her heel" (Gen 3:15, Douay-Rheims).

Fr. Staatz continued with Fr. Vawter's treatment of the inerrancy of the Bible. We saw that Julius Wellhausen had built his Documentary Theory on what are called "doublets" or repetitions, a characteristic of Semitic literature. Now just because two stories are somewhat similar does not necessarily mean that they are a doublet. The two stories of Abraham and Isaac, referred to by Fr. Vawter, are two similar but separate incidents. It is completely

gratuitous to say that they are the same incident with the names confused. Fr. Vawter went on to say that what was important in inspiration was not what the author actually said, but what was in his mind - what was his purpose or intention in writing - this was what was inspired and did not contain error, while what he actually said might contain error. Pope Leo XIII in his encyclical *Providentissimus Deus* long ago warned us of the dangers of this method of limiting inspiration:

"Inerrancy of Holy Scripture. It may also happen that the sense of a passage remains ambiguous, and in this case good hermeneutical methods will greatly assist in clearing up the obscurity. But it is absolutely wrong and forbidden either to narrow inspiration to certain parts of Holy Scripture, or to admit that the sacred writer has erred. As to the system of those who, in order to rid themselves of these difficulties, do not hesitate to concede that divine inspiration regards the things of faith and morals, and nothing beyond, because (as they wrongly think) in a question of truth or falsehood of a passage we should consider not so much what God has said as the reason and purpose which he had in mind in saying it - this system cannot be tolerated." ¹⁶

Fr. Vawter writing in 1956 claimed that the Bible contained historical errors, though no religious errors, but he left the door wide open. Fr. Brown writing only twenty years later in 1975, confidently asserted that the Bible contained not only scientific and historical errors, but religious errors as well. Let me begin with his so-called scientific errors. Fr. Brown used as his authority for this statement, believe it or not, the encyclical *Providentissimus Deus* of Pope Leo XIII. Pope Leo had actually said that the Bible does not teach us the essential nature of the visible universe, but rather describes it as it "sensibly appears." Now just because the Bible uses popular expressions hardly means that it contains scientific errors. Even Fr. Vawter recognized this in *A Path Through Genesis*, when he said that anyone who claimed he denied the heliocentric theory because he said "the sun set," rather than "the earth set," would be "three times a fool."

We have heard what Fr. Vawter would consider an historical error - the completely gratuitous assertion that the Yahwist and Elohist authors were confused as to whom the incident at Gerara had actually happened, Abraham or Isaac. I have already dealt with this claim.

Fr. Brown also said that the Bible contained religious errors, and used as an example Job's doubt about the after-life. Job said, "If a man die, shall he live again?" (Job 14:4) But Job had said this in the midst of his terrible trials, when he was on the verge of despair. He later repented of these utterances and made a beautiful profession of faith in the Redeemer to come and in the resurrection of the body. To use this as an example of a religious error in the Bible is just ridiculous. Fr. Brown might as well have used the high priest Caiphas' statement, "He has uttered blasphemy" (Matt 26:65).

Fr. Brown gave as his authority for the statement that the Bible contains scientific, historical, and religious errors, the Second Vatican Council. He said: "Vatican II has made it possible to restrict inerrancy to the essential religious affirmations of a biblical book made for the

sake of our salvation." This is a paraphrase of a statement that was the subject of a long and bitter dispute among the Council Fathers, because some of them feared that this statement would be misused in exactly the way that Fr. Brown has misused it. Fr. John McKee tells the story of this dispute in his excellent *The Enemy Within the Gate*:

"...The original text was not 'for the sake of our salvation' but 'pertaining to our salvation' and 184 Council Fathers asked that the phrase be dropped for the precise reason that it might be taken as restricting inerrancy to faith and morals. The Theological Commission dragged its feet, and on October 8, 1965, a group delivered a memorandum to the Pope, claiming openly that the phrase had been deliberately inserted to restrict inerrancy in a way contrary to Catholic teaching. After an investigation, the Pope sent observations on this and other matters to the Theological Commission. He said that the matter involved 'great responsibility for him towards the Church and towards his own conscience.' The Commission was asked to drop the expression 'truth pertaining to salvation' from the text. After the discussion and voting, the Commission adopted the text as we now have it.

"To see what had, or had not, been effected we compare the two texts:

Early Text

"The books of Scripture must be acknowledged as teaching...without error the truth pertaining to salvation."

Final Text

"The books of Scripture firmly, faithfully and without error, teach that truth which God for the sake of our salvation, wished to see confided to the Sacred Scriptures."
[Flannery translation]

"When one compares the two versions, one sees that a tightening has taken place to placate the Pope and the traditionalist section of the Council, but one detects still some foot-dragging on the part of the liberals. The text could have been sharper and met more fully the wish of the Vicar of Christ. If the Council had dropped the dangerous phrase as requested, instead of replacing it with an improved one, there could have been no misrepresentation. As it is, we know in what sense the Bishop of Rome gave his seal to this decree...any phrase which may seem ambiguous must be interpreted in line with tradition."¹⁷

So much for the presentations of Dr. Schonfield and Fr. Staatz. I would also like to make a few comments on Rev. Swezey's presentation during our first meeting. I will be running a meeting behind in whatever comments I might have on Rev. Swezey's presentation since he always comes after me. I must confess that I am also at a loss to explain the position of the Catholic bishop and the appearance of Fr. Vawter in behalf of the evolutionist cause. I

personally see nothing wrong with the case for scientific creationism intended for use in the public schools which Rev. Swezey presented. Surely the First Amendment of the Constitution was never intended to exclude God and creation from the public schools. I also fail to see what the bishop and Fr. Vawter hoped to gain in terms of the current ecumenical movement with Protestants. To date this movement has largely been between liberal Catholics such as Fr. Brown, and liberal Protestants, and has borne very little fruit. Perhaps the ecumenical movement would be more fruitful, if it were between conservative Catholics and conservative Protestants, who both believe, at least, that the Bible is free from error.

However I agree with the change of tactics which Rev. Swezey described, from trying to get equal time with the evolutionists, to getting the subject of origins banned from public schools altogether, since it is basically a religious topic. This is also the opinion of the Franciscan theologian, Fr. Peter D. Fehlner, in his excellent position paper, *In the Beginning*:

"There are those who maintain that however plausible an evolutionary hypothesis might seem, it does not stem from any scientific character of the theory, but rather from the religious-philosophic assumptions employed in such a theory as the matrix for the organization of a great deal of disparate phenomena. Similarly there are those who maintain the difficulty, indeed the impossibility of separating 'creation science' as a scientific hypothesis from the dogma of creation, a truth whose certainty is on revealed grounds beyond doubt and not to be confused with the merely hypothetical. The Church cannot agree that a revealed truth may be taught on the same footing as a hypothesis which in fact is false, for such in fact would amount to a tacit acceptance of religious indifferentism. It may well be that the only workable solution is to eliminate the treatment of origins from a 'neutral' school, since once the subject is introduced, it may become difficult or impossible for a public school to remain neutral." ¹⁸

Let me go on now to my own comments on this second meeting of the first day of creation. Catholics believe that the Church has been appointed by God to be the official interpreter of the Bible, and that this is done through Tradition, the teachings of the Fathers and Doctors, and through the Magisterium of the Church, that is, the pronouncements of the various Popes and Councils. So accordingly let me begin with the Magisterium of the Church. For the title of our meeting tonight we chose The Origin of Matter and Energy. The Church teaches that matter and energy have not existed from all eternity as the humanists claim, but were created by God out of nothing at the very beginning of time. This teaching is what is called a "defined doctrine of the faith," and it was so defined at the First Vatican Council in 1870:

"If anyone does not admit that the world and everything in it, both spiritual and material, have been produced in their entire substance by God out of nothing, let him be anathema." ¹⁹

And from Tradition here is St. Thomas Aquinas in his *Summa Theologica* commenting on the first day of creation:

"It is said (Gen 1:2a) The earth was void and empty or invisible and shapeless according to another version [Greek Septuagint], by which is understood the formlessness of matter, as Augustine says...on account of its being impossible for Moses to make the idea of such matter intelligible to ignorant people, except under the similitude of well-known objects. Hence he used a variety of figures in speaking of it, calling it in very truth water or earth. At the same time it has so far a likeness to earth, in that it is susceptible of form and to water in its adaptability to a variety of forms...

"By the words Spirit of God Holy Scripture ususally means the Holy Ghost, who is said to move over the waters...that is to say, over the formless matter signified by water, even as the love of the artist moves over the materials of his art, that out of them he may form his works."²⁰

So St. Thomas thinks that all the matter in the universe was created by God out of nothing on the first day, but in a formless state, and on succeeding days He made all the creatures of the world from this primordial matter. We will see when we come to our discussion of the second day of creation, that this interpretation can easily be harmonized with some of the contemporary scientific theories on the origin of the universe. St. Thomas concludes with the Holy Spirit brooding over that formless matter, because one day from that same matter will come Mary, His bride, whom He will overshadow making her fruitful with the Word of God.

Rev. De Verne Swezey

When I first began my campus ministry some years ago, I found that I had very little success in trying to interest students in biblical Christianity, so overwhelmed were they by the continuous barrage of secular humanism. But after I discovered creationism, that is, that there is a viable scientific alternative to evolutionism, I have had a little more success. But more recently I have taken advantage of the split in the humanist camp, that is, the split between what is usually called establishment humanism and what used to be called counter-culture humanism, but now New Age humanism, or what I prefer to call secular humanism and sacral humanism. It is not generally realized that the counter culture, or New Age movement is a religious movement, though unfortunately not a Christian one. It is caught up in all kinds of religions - Hindu, Buddhist, American Indian, etc., which could be summarized simply as pantheism. This movement was briefly described by Dr. Bronowski in his *The Ascent of Man* and castigated as a "contemptible failure of nerve."

However, New Age humanism has an excellent critique of establishment humanism, which I think all Christian apologists should take advantage of, in somewhat the same way that St. Paul took advantage of the split between the Sadducees and the Pharisees concerning the resurrection of the body. Liberal Christians subject the Bible to intense criticism and then take the teachings of science on faith, that is simply on the word of the scientists. It should be the other way around. The Bible should be taken simply on faith, and science subjected to critical analysis, especially when it pretends to give answers to "ultimate questions" such as the existence of God and the origin of religion.

Let me read a few excerpts from one of the most prominent spokesmen for the counter-culture movement, Theodore Roszak (unfortunately a lapsed Catholic), the author of the very influential *The Making of A Counter-Culture*. This is from his *Where the Wasteland Ends* which came out in 1972.

"The religious renewal we see happening about us - especially among disaffiliated young people, but by no means only among them - seems to me neither trivial, nor irresponsible, neither uncivil nor indecent. On the contrary, I accept it as a profoundly serious sign of the times, a necessary phase of our cultural evolution, and - potentially a life-enhancing influence of incalculable value. I believe it means we have arrived, after long journeying, at an historical vantage point from which we can see at last where the wasteland ends and where a culture of human wholeness and fulfillment begins. We can recognize that the fate of the soul is the fate of the social order; that if the spirit within us withers, so too will the world we build about us. Literally so. What, after all, is the ecological crisis that now captures so much belated attention but the inevitable extroversion of a blighted psyche? Like inside, like outside. In the eleventh hour, the very physical environment suddenly looms up before us as the outward mirror of our inner condition: for many, the first discernible symptom of advanced disease within."²¹

With that little introduction to the counter-culture movement itself, let us see what Theodore Roszak says about our subtopic of Science and Morality. Bronowski's *The Ascent of Man* and *Where the Wasteland Ends* both came out in 1972, and yet amazingly Roszak has an almost exact prediction of Bronowski's position regarding the moral responsibility of the scientific community for the atomic bomb:

"Those who begin to desert scientific culture in disgust at its incorrigible reductionism are correct to believe that the scientific community is incapable of eradicating the vice. Ethical resolutions and passionate appeals to principle can have little effect. They will always seem to compromise the 'freedom of inquiry' and 'intellectual adventure' scientists have been taught to prize above all else...Most scientists will find it simpler (and more advantageous to their careers) to resort to Pilate's strategy and wash their hands, vaguely laying the blame for any 'misuse' of knowledge on the technicians, the state, the public, on everyone in general...and no one in particular. Do not discussions of social responsibility in science always finish, after much ritualistic soul-searching, in such quandries? In any event, a timid cry for prudence will never drown out the bravado of the 'quest for truth.'"²²

While the counter-culture offers an excellent negative critique of contemporary scientism, it has little to offer in a more positive way. For a more positive approach I will go first to the creationist movement and then to the Bible itself. Let me turn now to the creationist model for the origin of matter and energy. This is again from Dr. Henry Morris' *Scientific Creationism*, and from the section intended for use in the public schools:

"...The creationist utilizes the scientific laws of cause and effect. This law, which is universally accepted and followed in every field of science, relates every phenomenon as an effect to a cause. No effect is ever quantitatively 'greater' or qualitatively 'superior' to a cause. An effect can be lower than its cause but never higher.

Using causal reasoning, the theistic creationist notes that:

<i>The First Cause of limitless Space</i>	<i>must be infinite</i>
<i>The First Cause of endless Time</i>	<i>must be eternal</i>
<i>The First Cause of boundless Energy</i>	<i>must be omnipotent</i>
<i>The First Cause of universal Interrelationships</i>	<i>must be omnipresent</i>
<i>The First Cause of infinite Complexity</i>	<i>must be omniscient</i>
<i>The First Cause of Moral Values</i>	<i>must be moral</i>
<i>The First Cause of Spiritual Values</i>	<i>must be spiritual</i>
<i>The First Cause of Human Responsibility</i>	<i>must be volitional</i>
<i>The First Cause of Human Integrity</i>	<i>must be truthful</i>
<i>The First Cause of Human Love</i>	<i>must be loving</i>
<i>The First Cause of Life</i>	<i>must be living</i>

"We conclude from the law of cause and effect that the First Cause of all things must be an infinite, eternal, omnipotent, omnipresent, omniscient, moral, spiritual, volitional, truthful, loving, living Being! Do such adjectives describe Matter? Can random motion of primeval particles produce intelligent thought or inert molecules generate spiritual worship? To say that Matter and its innate properties constitute the ultimate explanation for the universe and its inhabitants is equivalent to saying that the law of cause and effect is valid only under present circumstances, not in the past."²³

Let me conclude by turning to the final section of the General Edition of *Scientific Creationism*, which is intended for use only in Christian schools. Here are Dr. Morris' comments on the Scriptural account of the first day of creation which deals with the origin of "light," or as we have it, the origin of matter and energy:

"Another point important to recognize is that creation was 'mature' from its beginnings. God formed it full-grown in every respect, including even Adam and Eve as mature individuals when they were first formed. The whole universe had an 'appearance of age' right from the start. It could not have been otherwise for true creation to have taken place. "Thus the heavens and the earth were finished and all the host of them (Gen 2:1).

"This fact means that the light from the sun, moon, and stars was shining upon the earth as soon as they were created, since their very purpose was '...to give light on the earth' (Gen 1:17). As a matter of fact, it is possible that these light-waves traversing space from the

heavenly bodies to the earth were energized even before the heavenly bodies themselves in order to provide light for the first three days." ²⁴

Now of course the classic objection to the Scriptural account of the origin of light is - "But where did the light on the first day come from, if the sun, moon, and stars were not created until the fourth day? Here is Dr. Morris' reply to this objection:

"The light for the first three days obviously did not come from the sun, moon, and stars, since God did not make them until the fourth day (Gen 1:16-19). Nevertheless, the light source for the first three days had the same function ('to divide the light from the darkness') as did the heavenly bodies from the fourth day onward (Gen 1:14,18). This 'division' now results from the sun and moon's axial rotation. For practical purposes, therefore, the primeval light must essentially have come from the same directions as it would later when the permanent light sources were set in place." ²⁵

In conclusion let me repeat a point I would like to emphasize frequently during the course of our dialogue: Liberal Christians subject the Bible to intense criticism, and then take the teachings of science on faith, that is, simply on the word of the scientists. It should be the other way around. The Bible should be taken simply on faith, and science subjected to critical analysis, especially when it pretends to give answers to the "ultimate questions."

Dean Smalley

Let me conclude our meeting tonight by again making a brief summary of our four presentations. If you remember from the last time, I decided in view of my liberal Protestant bias, to refrain as much as possible from giving interpretations or commentaries, but to confine myself to brief summaries.

The first day of creation deals with the origin of matter and energy, and our two topics for this evening were: The Atomic Theory of Matter, and Science and Morality.

Dr. Schonfield used the late Jacob Bronowski, one of the directors of the British Humanist Association, to present his position regarding our two topics. After a brief review of the history of the atomic theory Dr. Bronowski concluded that the scientific community was not responsible for the tragedy of Hiroshima.

Fr. Staatz considers the famous scientist-theologian, Teilhard de Chardin, a "providential bridge" between secular humanism and liberal Christianity. Teilhard refused to accept the current pessimistic views regarding science and morality. Concerning the inerrancy of the Bible, Fr. Staatz claimed that the Bible, like everything else, contains a mixture of truth and error. He said that the Second Vatican Council had limited the inerrancy of the Bible to only "those essential religious affirmations...made for the sake of our salvation."

Mrs. Stepan began by reading a rebuttal of Jacob Bronowski's disclaimer of responsibility for Hiroshima on the part of the scientific community by the physicist theologian, Stanley Jaki. She also claimed that Teilhard de Chardin's "synthesis" between science and theology had been rejected by both the scientific community and by the Church. She then stated that Pope Leo XIII in his encyclical *Providentissimus Deus* had long ago condemned Fr. Vawter's method of limiting the inerrancy of the Bible, and that contrary to Fr. Brown, Vatican II had not endorsed this limitation.

Rev. Swezey used the social critic Theodore Roszak to attack Dr. Bronowski's position regarding the atomic bomb in particular, and the lack of moral responsibility in general, on the part of the scientific community. Rev. Swezey concluded with a strictly literal interpretation of the biblical phrase "let there be light," saying that the light of the first day could have come miraculously from the same places that would later be occupied by the sun, moon, and stars on the fourth day.

Our next meeting will be held at Cabot University, and we will go on to discuss the second day of creation.

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THE SECOND DAY

The Origin of the Universe

THE THIRD MEETING

- A) The Oscillating Universe
- B) The Law of Entropy

Scene: Cabot University

Dean Smalley

Good evening and welcome again to Cabot University. We begin tonight our discussion of the second day of creation, which deals with the origin of the universe. We have scheduled two meetings for this day, the first dealing with the Oscillating Universe and the Law of Entropy, and the second with the age of the universe. I will begin our meeting tonight by reading the Scriptural account of the second day:

And God said, "Let there be a firmament in the midst of the waters, and let it separate the waters from the waters." And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And it was so. And God called the firmament heaven. And there was evening and there was morning a second day. (Gen 1:6-8).

Dr. Arthur Schonfield

The origin of the universe is another of Carl Sagan's "ultimate questions," and the chapter in *Broca's Brain* dealing with this great issue is entitled "Gott and the Turtles." Sagan, characteristically, begins his presentation with a funny story:

"Some ancient cosmological views are close to the idea of an infinite regression of causes, as exemplified in the following apocryphal story: A Western traveler encountering an Oriental philosopher asks him to describe the nature of the world:

"It is a great ball resting on the flat back of the world turtle.'

"Ah yes, but what does the world turtle stand on?'

"On the back of a still larger turtle.'

"Yes, but what does he stand on?"

"A very perceptive question. But its no use, mister; it's turtles all the way down.'" ¹

In 1913 the American Astronomer Vesto Slipher discovered that the light coming to the earth from the distant galaxies was shifted to the red end of the spectrum. By means of an instrument called a spectrometer, Slipher broke up the incoming light into the colors of the rainbow. Scattered through these colors are dark lines known as Fraunhofer lines, which indicate the chemical makeup of a particular star. If the dark lines are at the red end of the spectrum, this is known as a "red shift," and if they are the blue end, a "blue shift." The shift is indicative of a phenomenon known as the "Doppler Effect" which is more familiar to us from the physics of sound. If a truck approaches blowing its horn, the notes sound high, but as it passes, they become low. So too if the dark lines are shifted to the blue end of the spectrum (equivalent to the high notes), the star is approaching, and if to the red end (equivalent to the low notes), the star is receding.

In 1927, after extensive confirmation of Slipher's discovery, the American astronomer Edwin Hubble proposed his Expanding Universe Theory. Since the galaxies in the universe, including our own Milky Way Galaxy, are moving further and further apart as indicated by the red shift, there must have been a time in the distant past when all the galaxies were together in one solid mass. This mass must have exploded, an event which the English astronomer, Fred Hoyle humorously referred to as "The Big Bang," a phrase which has become part of our vocabulary.

Einstein's famous equation, $E = mc^2$, states that energy equals mass times the speed of light squared, or in other words, that mass can be converted into energy. But equations can be reversed, so energy can be converted into mass, and at the birth of our universe there was energy alone from which all the mass in the universe was formed.

One popular explanation for the phenomenon of the expanding universe was the Steady State Theory of Sir Fred Hoyle. Hoyle maintained that, as the universe expanded, the matter at its outer limits was annihilated but was continuously replaced by new matter created at the center; so the universe was always in a "steady state," the total amount of matter neither increasing nor decreasing. The universe then, had no beginning, and would never end. Our own galaxy would one day disappear over the edge of the universe, but would eventually be replaced by a new galaxy being formed at the center.

But in 1965 two American astronomers, Arno Penzias and Robert Wilson, discovered what is known as the "background radiation" of the universe. Outer space instead of being absolute zero as astronomers had predicted, was actually about three degrees above absolute zero. This infinitesimal "heat" is thought to be a remnant of the energy left over from the Big Bang, and this discovery forced even Sir Fred Hoyle, who had maintained that there was no Big Bang, to abandon the Steady State Theory.

Now there are two possibilities for the future of our expanding universe. Either the universe will continue to expand forever, and eventually die what is called a "heat death," or it will one day fall back on itself and end in a Big Crunch. After this Big Crunch will there be another Big Bang? Indeed, will the universe go Bang, Crunch, Bang, for all eternity? This possibility was first proposed as a serious scientific theory in 1931 by two astronomers, the Englishman Sir James Jeans and the American Robert Milikan. Here is Carl Sagan:

"...An observer would see expansion eventually replaced by contraction, and galaxies slowly and then at an ever increasing pace approaching one another, a careening, devastating smashing together of galaxies, worlds, life, civilizations, and matter until every structure in the universe is utterly destroyed and all the matter in the cosmos is converted into energy: instead of a universe ending in a cold and tenuous desolation, a universe finishing in a hot and dense fireball. It is very likely that such a universe would rebound, leading to a new expansion of the universe and if the laws of nature remain the same, a new incarnation of matter, a new set of condensations of galaxies and stars and planets, a new evolution of life and intelligence. But information from our universe would not trickle into the next one and, from our vantage point, such an oscillating cosmology is as definitive and depressing an end as the expansion that never stops." ²

Despite the gloomy end lying in wait for an oscillating universe, it is still preferred by the majority of scientists, to the expanding-forever version. If there were just one Big Bang, it would make no sense, at least scientifically speaking, since science cannot study a singular event.

Now whether the universe will end in a "heat death" or a Big Crunch depends on the total amount of matter in the universe. If the total mass is below a certain critical amount, the universe will continue to expand forever, but if above that amount, it will one day contract.

"In a remarkable scientific paper published in the December 15, 1974 issue of the *Astrophysical Journal*, a wide range of observational evidence is brought to bear on the question of whether the universe will continue to expand forever (an "open" universe) or whether it will gradually slow down and recontract (a "closed" universe), perhaps as part of an infinite series of oscillations. The work is by J. Richard Gott III and James E. Gunn, then both of the California Institute of Technology, and David N. Schramm and Beatrice M. Tinsley, then of the University of Texas. In one of their arguments, they review calculations of the amount of mass in between galaxies in "nearby" well-observed regions of space, and extrapolate to the rest of the universe; they find that there is not enough matter to slow the expansion down...

"The amount of missing matter required to make the universe ultimately collapse is substantial. It is thirty times the matter in standard inventories such as Gott's. But it may be that dark gas in the galactic outskirts, and the astonishingly hot gas glowing in X-rays between the galaxies, together constitute just enough matter to close the universe, prevent an expansion forever- but condemn us to an irrevocable end in a cosmic fireball 50 billion or a hundred billion

years hence. The issue is still teetering...Our inventories of mass are still far from complete. But as new observational techniques develop, we will have the capacity of detecting more and more of any missing mass; and so it would seem that the pendulum is swinging towards a closed universe.

"It is a good idea not to make up our minds prematurely on this issue. It is probably best not to let our personal preferences influence the decision. Rather, in the long tradition of successful science, we should permit nature to reveal the truth to us. But the pace of discovery is quickening. The nature of the universe emerging from modern experimental cosmology is very different from that of the ancient Greeks who speculated on the universe and the gods. If we have avoided anthropomorphism, if we have truly and dispassionately considered all the alternatives, it may be that in the next few decades we will, for the first time, rigorously determine the nature and fate of the universe. And then we will see if Gott knows." ³

Sagan, again characteristically, couldn't resist concluding with a pun on the name of Gott (God). Let me go on now to our second topic for this evening, the Law of Entropy. It has been claimed that the Law of Entropy precludes an Oscillating Universe. This law as it was originally formulated by Rudolf Clausius stated that the amount of available energy in the world was growing less and less. But Clausius based his theory on a false notion of the nature of heat. It is now realized that the Law of Entropy is not an absolute, but rather a statistical law, which means it is not applicable in every situation. Now Carl Sagan does not discuss entropy, so let me turn back to Jacob Bronowski and his *The Ascent of Man*:

"In 1850 Rudolf Clausius...said that there is energy which is not available, and there is also a residue of energy which is not accessible. This inaccessible energy he called entropy, and he formulated the famous Second Law of Thermodynamics: entropy is always increasing. In the universe, heat is draining into a sort of lake of equality in which it is no longer accessible.

"That was a nice idea a hundred years ago, because then heat could still be thought of as a fluid. But heat is not material any more than fire is, or any more than life is. Heat is a random motion of the atoms. And it was Ludwig Boltzman in Austria who brilliantly seized on that idea to give a new interpretation of what happens in a machine, or a steam engine, or the universe.

"When energy is degraded, said Boltzman, it is the atoms that assume a more disorderly state. And entropy is a measure of disorder: that is the profound conception that came from Boltzman's new interpretation. Strangely enough, a measure of disorder can be made; it is the probability of the particular state - defined here as the number of ways it can be assembled from its atoms...

"Of course, disorderly states are much more probable than orderly states, since almost every assembly of the atoms at random will be disorderly: so by and large any orderly arrangement will run down. But 'by and large' is not 'always.' It is not true that orderly states constantly run down to disorder. But statistics do not say 'always.' Statistics allow order to be

built up in some islands of the universe (here on earth, in you, in me, in stars, in all sorts of places) while disorder takes over in others." ⁴

As you know, the idea of a universe continuously creating and destroying itself is common to many Eastern religions, most familiarly to Buddhism. The Englishman, Nigel Calder, is another fine popularizer of science lore; and shortly before Bronowski's series *The Ascent of Man*, he put on an excellent TV production entitled *Violent Universe* - some of you might remember it. Let me conclude with Calder's interesting and humorous presentation of the Oscillating Universe:

"In the Far East, as an historian of astronomy tells me in Tokyo, there is really little interest in the origin of the universe, because of the pervasive Buddhist belief in cyclical patterns of events...

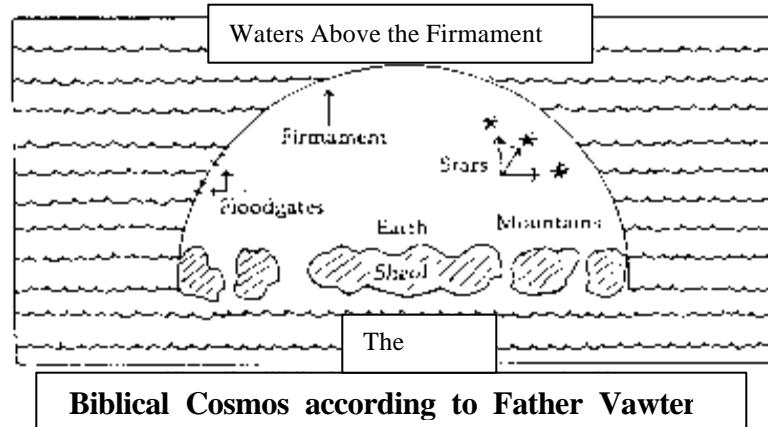
"The questions scientists ask and the hypotheses they entertain are influenced by philosophical attitudes of their society, but their discoveries can be iconoclastic. Especially in research into the origins of things - of the universe, of the earth, of life, and of man - the scientist intrudes into the domain traditionally proper to the Divine Creator. There is a well-known formula for a stand-off: science deals with facts, religion with faith, and never the twain shall meet. It is a simplification that saves a good deal of argument in the still hours of the night. Scientists rarely claim expertise in theology, and churchmen have learned by hard experience not to do so in science. When they picked fights with Galileo and Darwin, they were bound to come off worse. The historical trend is nevertheless unmistakable. Science has progressively eroded the area in which divine intervention is necessary or even admissible. Religions that once offered to explain everything, and claimed commonplace phenomena as deliberate acts of God, are now confined in their mundane scope to those areas wherein scientists are still groping for understanding - particularly the workings of the human mind. Even there the prospect is plain enough: before the end of the century we should know in detail how the brain works, how we think and why we feel.

"The evidence grows that everything after the creation of our Galaxy - including the origin of the earth and of life - is explicable as a chancy but not mysterious series of physical and chemical processes. Any opportunity for supernatural explanations of the material world is therefore driven back to the creation of the matter of the universe - to be literal, out at least eight billion light years from here, where we lose sight of events. Is there a constructional job for God, so far away, so long ago?

"If...the universe goes through an endless cycle of explosion, collapse and explosion, creation as such can be pushed infinitely far back in time - bad for Moses, but bully for the Buddha." ⁵

Fr. Robert A. Staats

I have copied the illustration on the blackboard from Bruce Vawter's *A Path Through Genesis*. Let me begin my presentation tonight with his commentary on the Scriptural account of the second day of creation:



“If you look at the illustration...You will see how an ancient Semite thought of the world in which he lived, and understand therefore the description of v.6ff. The earth was of course flat, with a mountain here or there, and rather large ones at the end of the earth. The sky was a firmament, a solid bowl set over the earth. It had to be solid: how else would the waters above it fail to pour down and entirely flood the earth? That there were waters above the solid firmament was an easy deduction: how else explain the rain, which happened when water made its way through windows in the firmament (the 'floodgates of the heavens' in 8:2) to fall on the earth?...Because of these ideas, the author has pictured the beginning of the world as a separation of the waters by means of the great firmament which God has raised above the earth. Scientifically speaking this is obviously a pathetic notion of the universe. As we can see, it is based entirely on appearances. The earth does look flat, it does appear to meet the sky at the horizon. The sky does seem like an inverted blue bowl overhead. All this was enough for the Hebrew, who never thought it worthwhile to inquire much further, even if he had the means of doing so...

"Everything the author intended to tell us is true. God did create the sky, the seas, and the dry land...The sky is not a solid bowl, as the author believed; but it looks like one, and that is all he has said." ⁶

So obviously there can be no concord or harmony between the Scriptural and scientific account of the origin of the universe. But again this does not mean that a harmony cannot be made between theology and science concerning the origin and evolution of the universe - which brings me again to the subject of Teilhard de Chardin. Teilhard, however, rejects the popular

oscillating or closed universe, because he considers such a universe meaningless. Let me read again from Robert Faricy, a fellow Jesuit in his *Teilhard de Chardin's Theology of the Christian in the World*:

"Toward the end of his life Teilhard writes that the more the years pass, 'the more I recognize in myself and around me the great secret preoccupation of modern man; it is not so much to dispute possession of the world as to find some means of escape from it. The anguish of feeling, inside this bubble of the universe, not just spatially but ontologically shut in!' Fear of being lost in a world so vast...that man seems to have lost all significance. Fear of being reduced to immobility. Fear of being unable to find a way out.' A universe that is closed, hermetically sealed, is a universe that is meaningless for man, bewildering and menacing and finally stifling of enthusiasm for life and action. A world that is closed and meaningless is a world in which human endeavor has no lasting value. A man needs to be sure that something of his endeavor is lasting, that something in all that he does has some truly permanent value."⁷

Teilhard well knew that the idea of an oscillating universe was common to both secular humanism and to Buddhism. Because of this he considered these religions less relevant for modern man, and therefore less true, than the Christian religion, rightly understood:

"...The truth of a religion is how well that religion harmonized with the view of a universe that is progressing along a path of increasing complexity-consciousness toward an autonomous and transcendent Center of convergence. The religion that best fits this perspective, the 'truest' religion, will be the religion the most relevant to human existence and to human endeavor, the religion that gives a maximum of meaning to life and action.

"Teilhard finds inadequate the oriental religions and modern neo-humanist 'religions of progress' (including Communism). Very briefly, neither of these two groups of religions is really activating; neither adequately activates man in the direction of evolution, toward God-Omega. The oriental religions tend to remove man from an active participation in evolution; they tend not to encourage human endeavor but to discourage and even eliminate it. Neither are the 'religions of progress' really activating in the long run; they leave no 'way out' for the universe. They are closed systems and regard the universe as a closed system; they do not give assurance against the possibility of total death for mankind. The 'religions of progress' are hollow with the 'sickness of the dead end,' and so - finally - they too, in spite of their claims, discourage human endeavor."⁸

Let me go on now to Teilhard's own views on the origin and evolution of the universe, which seem to me to combine the best of both contemporary science and modern theology. If you remember from our last meeting, Teilhard did not think the Thomistic notion of creation *ex nihilo* relevant for our scientific age. He preferred to think of creation as an ongoing process of unification. Correlative to God's existence is a void, which he calls "infinite multiplicity." This concept gives Teilhard some completely new insights into the famous "problem of evil." Here again is Robert Faricy:

"...If creation is seen as a long process of unification, beginning with an infinite multiplicity and proceeding through the ages along an axis of increasing organization toward a final synthesis in Christ, then, according to Teilhard, the problem of evil is no longer a real problem. In the ancient cosmos that was thought to have come ready-fashioned from the hands of the Creator, it is natural that the reconciliation between a partially bad world and the existence of a God who is both good and all-powerful appeared difficult. But in a cosmos in a state of evolution, of becoming, the problem disappears. It is not because He lacks omnipotence, but by the very structure of the void itself - considered as an infinite multiplicity - that God in creating, can proceed in only one manner: by a progressive unification. Through a gradual process of attracting elements to Himself, by arranging and unifying little by little through a utilization of the random combinations that occur in quantities of large numbers, God draws things toward greater unity and toward Himself. At first these elements are almost infinitely numerous, very simple, and with negligible consciousness. Gradually, units appear that, although less numerous, are more organized. Finally, man appears, highly complex and gifted with human consciousness. In a process of this kind, it is inevitable that every success be paid for by a certain amount of failure or waste. In pre-life, this waste takes the form of disharmony or decomposition. Among living things, it takes the form of suffering and death. And in the moral order, in the realm of human freedom, this waste and failure appears as sin. There is no order in the process of formation that does not imply disorder at every stage of the process. There is nothing in Teilhard's idea of the inevitability of waste, failure, disorder, that would imply a less than omnipotent Creator. The fact is simply this: because unorganized multiplicity is subject to the play of chance in the arrangements that lead to greater unification, it is absolutely impossible that its progress toward unity be unaccompanied by failure and disorder. Evil occurs by statistical necessity."⁹

It is on this notion of "infinite multiplicity" that Teilhard bases his interpretation of the difficult doctrine of hell; an interpretation with which I heartily concur. This is from Teilhard's biographer, Robert Speaight:

"He did not shrink from the doctrine of eternal punishment. The aggregation of souls and the consummation of matter composing the tissue of the *terre nouvelle* was also a segregating process. Matter which had not overcome its multiplicity would be rejected and men might be rejected with it. Hell was not only below; we had the word of Christ himself that its darkness was also beyond. Teilhard clung to his right to believe that it was eternally uninhabited. But the Christian choice presupposed the Christian risk; and Hell however we conceived it, might be considered a structural element of the universe."¹⁰

Teilhard thought of the universe as a great cone, with a base he called "infinite multiplicity" converging to an apex of "Omega" or God. As the universe converges it becomes more complex and as a result more conscious, until finally in man, matter becomes self-conscious. Teilhard called this progress, the "law of complexity-consciousness." The

evolutionary progress of the universe only makes sense in terms of the goal to which it is being drawn - Omega. This is again from Robert Faricy:

"We can consider the total process of evolution to be in the form of a cone; the evolutionary process, then, is moving, converging, to the summit of the cone, the Omega point. The Omega point, according to Teilhard's analysis, is the final point in the evolutionary process and so necessarily a part of that process, somehow within it. On the other hand, the Omega point is autonomous and transcendent, somehow divine. For Teilhard the Omega point, insofar as it is transcendent of evolution, is God. Omega is not in his view a simple point of future convergence, but a now-existing God. This modifies our conception of evolution. Before, all that was evident was a seemingly spontaneous progress of evolution toward higher levels of consciousness; the cause of evolution's progress along the curve of complexity-consciousness was not at all apparent. We can see now that the universe makes evolutionary progress because it is drawn by a transcendent God." ¹¹

Some of Teilhard's jargon such as "infinite multiplicity" and "complexity-consciousness" is admittedly difficult but necessary, since he was venturing into an area where no one had been before. To Teilhard there was no such thing as "brute matter." Beginning with the unpredictability of a subatomic event, Heisenberg's principle, to the ability of chemical molecules to "recognize" one another, to the playfulness of a cat, finally to man's self-consciousness, matter progressed from greater degrees of complexity to greater degrees of consciousness.

Let me go on now to our second subtopic, the so-called Law of Entropy. Teilhard's ideas on entropy are a good illustration of his synthesis of the best of modern science and the new theology:

"...Teilhard often describes sin as a return to multiplicity, as a movement away from unity and organization. He obviously does not mean that sin is something quantitative; he is using an analogy taken from the scientific concept of entropy, the gradual movement of a more organized system to a lower state of organization and energy." ¹²

I am sure that Rev. Swezey will bring out that the creationists think that the idea of entropy (from order to disorder) and of evolution (from disorder to order), are contradictory concepts. But it was Teilhard's great genius to see how these two notions could be successfully harmonized. Let me turn again to his biographer Robert Speaight. *Le Phénomène Humain* is considered Teilhard's most important work:

"...Teilhard's 'fundamental pioneering achievement' - codified, so to speak, in *Le Phénomène Humain* - was to have made sense 'out of the two most famous, but apparently contradictory, scientific ideas to come out of the nineteenth century...the theory of biological evolution on the one hand and the second law of thermodynamics' - or the law of increasing entropy - 'on the other.' The latter held out no better prospect to mankind than ultimate annihilation. Against this, Teilhard's law of increasing complexity-consciousness - his

perception of an alternative trend in evolution - was 'far more than unreasoned hope for the future'; it was scientifically verifiable - and its verification from a strict observation of phenomena was the theme of *Le Phénomene Humain*. "¹³

In conclusion, let me say again, that the description of the origin of the universe in the Bible cannot be taken in the strictly literal sense, nor can it be harmonized with current scientific ideas on the origin and evolution of the universe. But it is possible, as Teilhard has so convincingly shown, to harmonize the new theology and contemporary scientific theory.

Mrs. Maria Stepan

Let me begin tonight with Dr. Schonfield's presentation of the origin of the universe. Dr. Schonfield mentioned that science cannot study a singular event like one Big Bang, and therefore prefers an infinite series of Big Bangs, the so-called Oscillating Universe. But this is not the whole story, since the fact that the universe began in time, no matter how long ago, that it is therefore not eternal, points irresistably to God, a fact that the secular humanists refuse to acknowledge.

The Oscillating Theory maintains that the universe has been expanding since the so-called "Big Bang," but that one day it will turn around and eventually go "Crunch," and then go Bang again, and this Bang, Crunch, Bang, will continue for all eternity. Sagan sees the universe as a cosmic perpetual motion machine that will never run down - a physical impossibility! Now, I have a wonderful analysis of the irrationality of this theory by Dr. Arno Penzias. Dr. Penzias received the Nobel Prize for astronomy in 1978 for his discovery of the back-ground radiation of the universe. St. Thomas says that you can't convincingly prove from reason that the universe was created out of nothing, this must rather be taken on faith, but the Expanding Universe Theory at least postulates that the universe had a beginning in time, the "Big Bang," and that one day it will end. Either the universe will continue to expand forever and die a "heat death," or else it will turn around and eventually go "Crunch," never to expand again. For this reason the humanists prefer the Oscillating Theory, which claims that the universe had no beginning and will never end. Dr. Penzias, however, a believing Jew, thinks that the Expanding Universe can easily be harmonized with the story of creation as told in the book of Genesis. Of course, we know from our faith and from Holy Scripture that the universe will end in neither a "heat death" or a Big Crunch, but rather will perish by fire. (cf. II Peter 3:7-10) But here I am deliberately confining myself mainly to arguments from reason rather than from authority.

Let me read briefly from the *World of Science, 1979*, an annual supplement put out by the *Illustrated World Encyclopedia*. This is from an article by Malcolm W. Brown entitled "Scientists Expect New Clues for the Origin of the Universe":

"The thing that I am most interested in now,' Dr. Penzias said in an interview, 'is whether the universe is open or closed. If it is open - and the data seems to indicate that it is open - this is precisely the universe that organized religion predicts, to put it in crude terms.' A closed

universe, one that explodes, expands, falls back on itself and explodes again, repeating the process over and over eternally would be a pointless universe.

"The astronomer continues: 'A theologian friend of mine who is a priest told me once he could not conceive of Calvary happening twice. He said his faith as a Christian would be shaken if it could be proved to him that the universe, with its finite number of particles, could be reconstituted an infinite number of times. It would mean that every event - the creation of man, this conversation we are having, everything - would be repeated again and again an infinite number of times, simply by random chance. That is the meaning of infinity. In other words a closed universe would be as pointless as the throw of dice. But it seems to me that the data we have right now clearly show that there is not nearly enough matter in the universe, not enough by a factor of three, for the universe to be able to fall back on itself ever again.'

"My argument,' Dr. Penzias concluded, 'is that the best data we have are exactly what I would have predicted had I nothing to go on but the five books of Moses, the Psalms, the Bible as a whole.'" ¹⁴

Remember Dr. Schonfield began with Carl Sagan holding Broca's brain and pondering the meaning of life. If the Oscillating Universe is true, he is doomed to hold that brain an infinite number of times and ponder the meaning of life for all eternity. The finite number of particles in the universe will be reshuffled in continuous Bangs and Crunches an infinite number of times. This also means that the particular assembly of a relatively few particles called Carl Sagan will turn up again by chance an infinite number of times. This is what you get, if all that exists is a finite amount of matter, plus an infinite amount of time, plus chance. So Sagan answers his own question: What is the meaning of life? If there is no God, life is as meaningless as an Oscillating Universe.

Let me turn now to Fr. Staatz and his picture on the blackboard of the universe as he claims it is presented in the Bible. It never seems to occur to any of these liberal scholars like Fr. Vawter that an expression like the "floodgates of heaven," for example, could be used in the metaphorical sense. Usually the liberals don't want to take anything in Genesis, Adam and Eve, for example, in the literal sense, but suddenly everything becomes strictly literal. One of the great weaknesses of the liberals is that they seem to think that the Bible was written only for the men of ancient times; but the Bible is not only a human but also a divine Book, and it was written for our own as well as ancient times. It was written both for men who judged the world by appearances only, and also for those who probe more deeply into the nature of things.

So I completely disagree with the liberal claim that it is impossible to make a harmony between legitimate contemporary science and the Bible. We have just heard Dr. Schonfield and Carl Sagan say that at the birth of our universe, the so-called Big Bang, there was at first just energy which was then converted into mass, the reversal of Einstein's famous equation $E = mc^2$. Isn't this exactly what the Bible says about the first day of creation? "Let there be light," or in other words, "Let there be energy." Indeed Sheldon Glashow, a professor of physics at

Harvard University, claims in his "Grand Unified Theory," that in the few first split seconds after the Big Bang all there was in the cosmos was photons, light particles. The Bible is meant to be relevant for the men of all ages, not just for the men for whom it was originally written. This point is well made by Fr. P.J. Flood, a Professor of Scripture at St. Peter's College in Glasgow:

"As has been well said, God tempered the expressions in the Hexameron that they should always be true, both when men judge from appearance only and when they inquire into the ultimate nature of things. Since there is truth in both of these views of the world's formation. God was unwilling to forestall by revelation the natural development of the human mind, but wished that at no period of intellectual discovery should his inspired Scripture be convicted of error."¹⁵

Let me go on to Fr. Teilhard de Chardin's ideas on the origin and evolution of the universe. We heard that Teilhard thought of the universe as a great cone with a base of "infinite multiplicity" converging to an apex, which he called "Omega" or God. In other words the universe, according to Teilhard, is not expanding but rather contracting. Let me repeat briefly Dr. Schonfield's explanation of the so-called "red shift" and its implications with regard to our universe. Here is an excerpt from a book entitled *The Red Limit: The Search for the Edge of the Universe*, by a young science reporter, Timothy Ferris:

"The historical scaffolding under Hubble's discovery dated back to the early nineteenth century, when Christian Doppler, a physicist teaching in Vienna, found that the wave-length of lines in the spectrum of a light source ought to shift if the source were moving toward or away from the observer, just as the pitch of an automobile horn sounds higher - shorter wavelength - if the car is approaching and lower - longer wavelength - if it is speeding away. The spectrum is said to be "Doppler shifted" by velocity. Spectral lines could be measured with considerable accuracy, so this meant the velocities of remote, bright objects, namely stars, could be too. James Keeler at Lick Observatory quickly succeeded in finding a Doppler shift in the spectrum of the bright star Arcturus; it had a blue shift, indicating it and the sun were drawing closer in the course of their common sweep of our galaxy."¹⁶

So, since as Slipher discovered, the light from the distant galaxies (not the nearby stars in our own galaxy), is shifted to the red end of the spectrum, this indicates that these galaxies are moving away from us. In Teilhard's cone universe, on the other hand, all the galaxies are converging and should therefore be shifted to the blue end of the spectrum. I suppose Teilhard's disciples will claim that his "cone" is only a metaphor, but the whole appeal of his so-called "synthesis" is that it is supposed to be based on hard, not metaphorical science.

I have said before, the Church has been appointed by God to be the official interpreter of the Bible, and she does this through her Tradition and Magisterium. So let me begin my own interpretation of the second day with Tradition, namely from St. Thomas Aquinas. First here he is in his *Summa Contra Gentiles*, rejecting the ancient pagan notion of an oscillating universe:

"The effect is like its cause. But the resurrection of Christ is the cause of our resurrection; and Christ rising from the dead dieth now no more (Rom 6:9). Hence it is said: The Lord shall cast out death forever (Isa 25:8): Death shall be no more (Rev 21:24).

"Hereby entrance is denied to the error of certain Gentiles of old, who believed that times and temporal events recurred in cycles. For example, in that age one Plato, a philosopher in the city of Athens, and in the school that is called Academic, taught his scholars thus, that in the course of countless revolving ages, recurring at long but fixed intervals, the same Plato, and the same city, and the same school, and the same scholars would recur, and so would be repeated again and again in the course of countless ages." ¹⁷

And here is St. Thomas' own interpretation of the second day of creation from his *Summa Theologica*:

"Whether then, we understand by the firmament the starry heaven, or the cloudy region of the air, it is true to say that it divides the waters from the waters, according as we take waters to denote formless matter, or any kind of transparent body, as fittingly designated under the name of waters." ¹⁸

We have seen, that St. Thomas understands by "waters" formless matter, which God created on the first day and from which on succeeding days He formed all the creatures of the earth. We have also seen how the first day can be easily harmonized with the Big Bang. Could not this separation of the waters of the second day, the separation of the formless matter, also be harmonized with the Expanding Universe? I am not claiming that the Bible is teaching science, or that the Expanding Universe is necessarily true, but rather that the Bible is susceptible of a variety of interpretations, and is intended by God to be relevant for the men of all ages.

As for the Magisterium of the Church, I have already stated that is a defined dogma of the faith, from the First Vatican Council that the universe was created by God at the very beginning of time, and therefore not eternal, as the Oscillating Theory claims. Let me turn now to an allocution of Pope Pius XII entitled *The Proofs of God in the Light of Modern Natural Science* which he delivered to the Pontifical Academy of Science in 1951. Pope Pius is speaking here of our second topic the Law of Entropy, and in the process rejecting both the Oscillating and Steady State Theories:

"But not only has modern science broadened and deepened our knowledge of the reality and extent of the mutability of the universe; it offers us precious indications also about the directions according to which natural processes work. While only one hundred years ago, especially since the discovery of the Law of Conservation, it was thought that natural processes were reversible, and consequently, according to the principles of strict causality - or better, determination - of nature an ever-recurring renewal and rejuvenation of the universe was thought

possible; with the Law of Entropy discovered by Rudolf Clausius, man was led to know that spontaneous natural processes are always coupled with a decrease of free and available energy; that is to say, that in an enclosed material system, it must lead finally to a stoppage of all processes at the macroscopic level. This fatal destiny, that only perhaps too-gratuitous hypotheses like that of continual supplementary creation [the Steady State Theory] endeavor keep from the world, but which on the contrary leaps out of positive scientific experimentation, eloquently postulates the existence of a Necessary Being." ¹⁹

The fact that the universe will one day end illustrates its complete contingency or dependency, and points to a Necessary Being - to God. If the universe will one day end, it must therefore have had a beginning. Here is Pope Pius speaking of that beginning:

"One cannot deny that a mind which is enlightened and enriched by modern scientific knowledge and which calmly considers the problem is led to break the circle of matter which is totally independent and autonomous - as being either uncreated or having created itself [the Oscillating and Steady State Theories] and rise to a creating Mind. With the same clear and critical gaze with which it examines and judges the facts, it discerns and recognizes there the work of creative Omnipotence, whose strength raised up by the powerful *fiat* uttered billions of years ago by the creating Mind, has spread through the universe, calling into existence, in a gesture of generous love, matter teeming with energy. It seems truly that modern science, leaping back over millions of centuries, has given witness to that primordial *Fiat lux* ["Let there be light."], when out of nothing erupted matter and a sea of light and radiations until the particles of the chemical elements formed and clustered into millions of galaxies." ²⁰

Fr. Fehlner comments on the Pope's mentioning here the age of the world in terms of billions of years:

"In the above address Pius XII mentions the age of the world in terms of milliards of years. The question of the age of the world was, however, merely incidental to the theme he was discussing, and in no way constitutes magisterial resolution of the question bearing on the age of the world or the meaning of 'day' in the Genesis account of the work of God." ²¹

Pius XII is not endorsing the Big Bang or the Expanding Universe Theory, nor the fantastic age of the world built into those theories - that is not his function. The Expanding Universe Theory is certainly far from being a proven fact. The Pope is merely showing that a reasonable scientific theory - and I see no harm in granting that to this theory - should lead an unbelieving scientist of good will to God. Now, this is apparently just what has happened in the case of Dr. Robert Jastrow, the head of NASA's Goddard Institute for Space Studies, who had previously identified himself as an agnostic. Here is the conclusion of his discussion of the Expanding Universe Theory in his *God and the Astronomers*, which appeared in 1978:

"This is an exceedingly strange development, unexpected by all but theologians. They always accepted the word of the Bible: In the beginning God created heaven and earth. To

which St. Augustine added, 'Who can understand this mystery or explain it to others?' But we scientists did not expect to find evidence for abrupt beginning because we have had until recently extraordinary success in tracing the chain of cause and effect backward in time.

"Now we would like to pursue that inquiry farther back in time, but the barrier to progress seems insurmountable. It is not a matter of another theory. At the moment it seems that science will never be able to raise the curtain on the mystery of Creation. For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries."²²

Rev. De Verne Swezey

The creationist Dr. Henry Morris begins his presentation on the origin of the universe with a discussion of the First and Second Laws of Thermodynamics, which he says are violated by the various evolutionary models of the universe. This is again from the public school section of *Scientific Creationism*:

"It is well to note at this point the implications of the First and Second Laws of Thermodynamics with respect to the origin of the universe. It should be stressed that these two laws are proven scientific laws, if there is such a thing. They have been experimentally tested, measured and confirmed thousands of times, on systems both extremely large and extremely small, and no scientist today doubts their full applicability to the space-time coordinates accessible to us. Therefore the cosmic implications of these two laws are profound.

"1) The First Law (Law of Energy Conservation) states that nothing now is either 'created' or destroyed. It therefore teaches quite conclusively that the universe did not create itself; there is nothing in the present structure of natural law that could possibly account for its origin.

"2) The Second Law (Law of Energy Decay) states that every system left to its own devices always tends to move from order to disorder, its energy tending to be transformed into lower levels of availability, finally reaching the state of complete randomness and unavailability for further work. When all the energy of the cosmos has been degraded to random heat energy, with random motion of molecules and uniform low-level temperature, the universe will have died a 'heat death.'

"3) The fact that the universe is not dead yet is clear evidence that it is not infinitely old. Since it will die in time, if present processes continue, time cannot have been of infinite duration. Our present universe is a continuum of space, mass, and time, so if one of these entities has a beginning the other two must have begun concurrently.

"4) The Second Law requires the universe to have had a beginning; the First Law precludes its having begun itself. The only possible reconciliation of this problem is that the universe was created by a Cause transcendent to itself."²²

It is obvious then that both the Steady State and Oscillating Theories are in violation of these two basic laws. The Steady State Theory, in violation of the Law of Conservation, maintains that matter can create itself out of nothing, and can annihilate itself, while the Oscillating Theory in violation of the Law of Entropy, maintains that matter can go from a state of maximum disorder, the Big Crunch, to one of increasing order, the Expanding Universe.

The length to which some of these humanists go to get away from a God who creates the universe out of nothing is fantastic. A typical example of this is the latest variation of the Expanding and Steady State Theories, a combination of them both, the Inflationary Theory of MIT's Alan Guth. In this so-called "theory," all the matter in the universe before the Big Bang creates itself out of nothing. Let me read a few excerpts from a review which appeared in the June 1983 issue of *Discovery* magazine entitled *The World according to Guth* by science reporter Dennis Overbye:

"...More radical theorists are ready to create the universe out of nothing. Their inspiration comes from quantum theory, in which the uncertainty principle predicts that random fluctuations in empty space can produce real particles; theorists suspect that, in the yet-to-be-discovered theory of quantum gravity, space-time itself can arise from random fluctuations in a primordial nothingness. This requires the universe to be, in some sense, nothing...

"Guth finds this idea intriguing. In his theory as the universe inflates with a nearly constant energy density, its total energy (from which the stars and galaxies are eventually made) increases. The universe, concludes Guth, got its mass-energy for free. 'It is tempting,' he says, 'to imagine creating the universe from literally nothing. Such ideas are speculation squared, but on some level they are probably right.'...

"Coleman and Guth were in a Harvard lecture hall one afternoon as a young Tuft's professor, Russian *émigré* Alexander Vilenkin, presented his version of genesis. According to him the universe as a young bubble had tunneled like a metaphysical mole from somewhere else to arrive in space and time. That someplace else was "nothing." Afterward the three physicists sat in the hall and had a conversation that Lewis Carrol might have enjoyed about nothing. 'What is nothing?' asked Coleman, pressing his fingers together in front of his face. 'Nothing,' said Vilenkin, 'is no space, no time.' Coleman pondered that for a while. 'There is an epoch without time; it is eternity,' he said finally. 'So we make a quantum leap from eternity into time.' His words hung unchallenged in the darkening air until it was time to go home. Guth, a fan of nothing, congratulated Vilenkin, put on his bicycle helmet, went outside to pedal home. There he received the ultimate comeuppance for a man who had inflated the universe. His tire was flat."²⁴

Well I am glad that at least Overbye has a sense of humor, but men like Guth *et al.*, are certainly not practising science, but rather doing harm to their God-given intellects by such irrational speculations.

Let me go on now to the counter-culture movement. I have explained how I like to take advantage of this movement in my campus ministry, since it has such an excellent critique of establishment humanism. I would like to read a few paragraphs from another popular spokesman for the counter-culture, the environmental activist Jeremy Rifkin, in his *Entropy: A New World View*. If you remember, we just heard Dr. Bronowski claim that Ludwig Boltzman had successfully disproved the universal applicability of the Law of Entropy:

"Adding embarrassment to fantasy, Ludwig Boltzman jumped into the fray, determined to rescue classical physics from the steady encroachment of the Entropy Law. Boltzman's 'h-Theorem' s a remarkable sleight-of-hand designed to accommodate the Second Law while at the same time undermining its clout. Boltzman acknowledged the validity of the second law up to a point. He was willing to admit that in a closed system entropy increases, but was unwilling to claim that it was an absolute certainty. He preferred the word probably to certainty and in doing so attempted to turn the second law into a probability or statistical law. What Boltzman was saying is that while it's unlikely that energy would move from a colder to a hotter state, it was not impossible. It's important to be clear on what Boltzman was arguing because it is taken seriously by so many scientists. Sir Arthur Eddington is right to the point about the likelihood of Boltzman's probability theorem working, even once in the real world. He proposes a vessel with two equal parts separated by a partition. The first compartment contains air, the second compartment a vacuum. The partition between the two compartments is opened, allowing the air to spread evenly through the vessel. Eddington allows that at some future time there is always the chance that all those billions upon billions of molecules of air diffused through the entire vessel will in their individual random movements all end up in the right hand side of the compartment once again at exactly the same time. As to how probable such an occurrence is, Eddington concludes:

"If an army of monkeys were strumming on typewriters they 'might' write all the books in the British Museum. The chance of their doing so is decidedly more favorable than chance of the molecules returning to one half of the vessel."²⁵

Jeremy Rifkin says that the Law of Entropy is not just a mathematical abstraction but something we all experience every day, and to deny its universality is unreasonable, to say the least:

"This conforms to our everyday sense of the world around us. Left on their own, things do not tend spontaneously to move to more and more ordered states. Anyone who has ever had to take care of a house, or work in an office, knows that if things are left unattended they soon become more and more disorderly. Bringing things back into a state of order requires the expenditure of additional energy. For example, consider a deck of playing cards that is

organized by number and suit. The deck is in a state of maximum order or minimum entropy. Flung the deck to the ground and the cards will scatter into a random disordered state. Picking each card off the floor and then arranging them one by one into their original ordered state will take the expenditure of more energy than was used to scatter them in the first place

"Albert Einstein once mused over which of the laws of science deserved to be ranked as the supreme law. He concluded by making the following observation:

"A theory is more impressive the greater is the simplicity of its premises, the more difficult are the kinds of things it relates, and the more extended its range of applicability, therefore, the deep impression which classical thermodynamics [the First and Second Laws] made on me. It is the only physical theory of universal content which I am convinced, that within the framework of applicability of its basic concepts will never be overthrown."²⁶

Let me turn once again to the final section of *Scientific Creationism*, which we have seen is intended only for use in Christian schools. Here is Dr. Morris' own interpretation of the biblical account of the second day of creation:

"The World That Then Was (II Pet 3:6)

"It must be recognized that this primordial-created world was different from the present world in many ways. There were in that world 'waters which were above the firmament' (Gen 1:7), and this corresponds to nothing in the present world. The word 'firmament' (Hebrew *raqia*, meaning 'stretched-out thinness') is essentially synonymous with heaven (note Gen 1:18), and thus means simply 'space,' referring to space in general or to specific space, as the context requires. In this case, the firmament was essentially the atmosphere, where the birds fly (Gen 1:20). The waters above it must have been in the form of a vast blanket of water vapor, translucent to the light from the stars, productive of a marvelous greenhouse effect which maintained mild temperatures from pole to pole, thus preventing air-mass circulations and the resultant rainfall (Gen 2:5). It would certainly have had the further effect of efficiently filtering harmful radiations from space, markedly reducing the rate of mutations in living cells, and as a consequence, drastically decreasing the rate of aging and death."²⁷

This vast water canopy then, was the occasion of the great longevity of the patriarchs from Adam to Noah. But during the time of Noah this canopy fell at God's command, causing the great Flood. Dr. Morris then goes on to interpret the First and Second Laws of Thermodynamics in biblical terms:

The Fall, the Curse and the Laws of Thermodynamics...

"Sin came into the world when man first doubted, then rejected, the Word of God, in the garden of Eden. And death came into the world when sin came into the world. God was forced to tell Adam '...cursed is the ground for thy sake...for dust thou art and to dust thou shalt return'

(Gen 3:17-19). The basic physical elements ('dust of the ground') were thus placed under the Curse, and all flesh constructed from these elements was also cursed.

"The classic passage of the New Testament on this subject is Romans 8:20-22:

"For the creation was made subject to vanity, not willingly, but by reason of him who hath subjected the same in hope. Because the creation itself also shall be delivered from the bondage of corruption [or more literally, 'decay'] into the glorious liberty of the children of God. For we know that the whole creation groaneth and travaileth in pain until now.'

"This universal 'bondage of decay' can be nothing less than the universal principle which scientists have finally formalized as the Second Law of Thermodynamics. By the same token God's 'rest' at the end of his work of creating and making all things (Gen 2:1-3), together with the providential sustenance of His creation ever since (Neh 9:6), must constitute the universal principle now known as the First Law of Thermodynamics, the Law of Conservation of Mass-Energy.

"Scientists have demonstrated the universality of the two laws, but they are unable to discover why they work. The answer to the question - why should energy always be conserved and entropy always increase? - can only be found in these Biblical records. There are numerous other Biblical allusions to the First Law (Colossians 1:16,17; Hebrews 1:2,3; II Pet 3:5,7; Psalms 148:5,6; Isaiah 40:26; Ecclesiastes 1:9,10; 2:14,15 etc.) and to the Second Law (Psalm 102:25-27; Isaiah 51:6; I Pet 1:24,25; Hebrews 12:27; Romans 7:21-25; Revelation 21:4; 23:3 etc.). It is significant that these two universal (and all-important) principles, discovered and formally recognized little more than a century ago, have been implicitly in the Biblical revelation for thousands of years."²⁸

In conclusion let me say again that the various evolutionary models of the origin of the universe conflict with two of the most basic laws of physics, the First and Second Laws of Thermodynamics, while the creation model not only conforms to, but actually predicts these two laws.

Dean Smalley

It is time again for me to give a brief summary of our four presentations. The second day of creation deals with the origin of the universe, and our two subtopics were the Oscillating Universe and the Law of Entropy.

Dr. Schonfield said that Carl Sagan considers the origin of the universe one of the "ultimate questions," and its most likely answer is the Oscillating Universe. However since this theory is in apparent conflict with the Law of Entropy, Dr. Schonfield explained how this law is not now considered an absolute, but rather a statistical law, which means it is not applicable in all circumstances.

Fr. Staatz said that the Oscillating Universe is a dead end and thus gives no incentive for progress, as does Teilhard de Chardin's notion of a universe evolving toward Omega or God. Fr. Staatz once again claimed that the concordist interpretation of the Hexameron by Mrs. Stepan (harmonizing the Bible and contemporary science), and the fundamentalist or literalist interpretation of Rev. Swezey were unacceptable since the literary form of the Hexameron is the myth.

Mrs. Stepan said that Fr. Staatz's denial of the possibility of a harmony between contemporary science and the Bible was based on a false notion of the Bible. The Bible, she said, was not written for the men of ancient times alone, but for the men of modern times as well. She proposed her own harmony between contemporary science and the first and second days of creation, saying that the Big Bang could easily be harmonized with the "Let there be light (energy)" of the first day, and the Expanding Universe with the "And God...separated the waters" (considered by St. Thomas a metaphor for "formless matter") of the second day. Mrs. Stepan, however, stated that she was not saying that the Bible was teaching science, or that the Big Bang and Expanding Universe were necessarily true, but only that Genesis was susceptible of a variety of interpretations, and thus relevant for the men of all ages.

Rev. Swezey maintained that the evolution model of the universe violates two of the most basic laws of physics, the First and Second Laws of Thermodynamics, while the creation model actually predicts these two laws. He said that while science tells how these two laws work, the Bible tells us why they work, the First Law because of God's conservation of the universe, and the Second because of God's curse placed on the world after the Fall of our first parents. Mrs. Stepan tries to harmonize the Bible and science, while Rev. Swezey seems to claim that the Bible is actually teaching science.

This concludes our discussion for the evening, and we will meet again next week at Cheverus College.

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