Georges Lemaître and Einstein

A Day with No Yesterday

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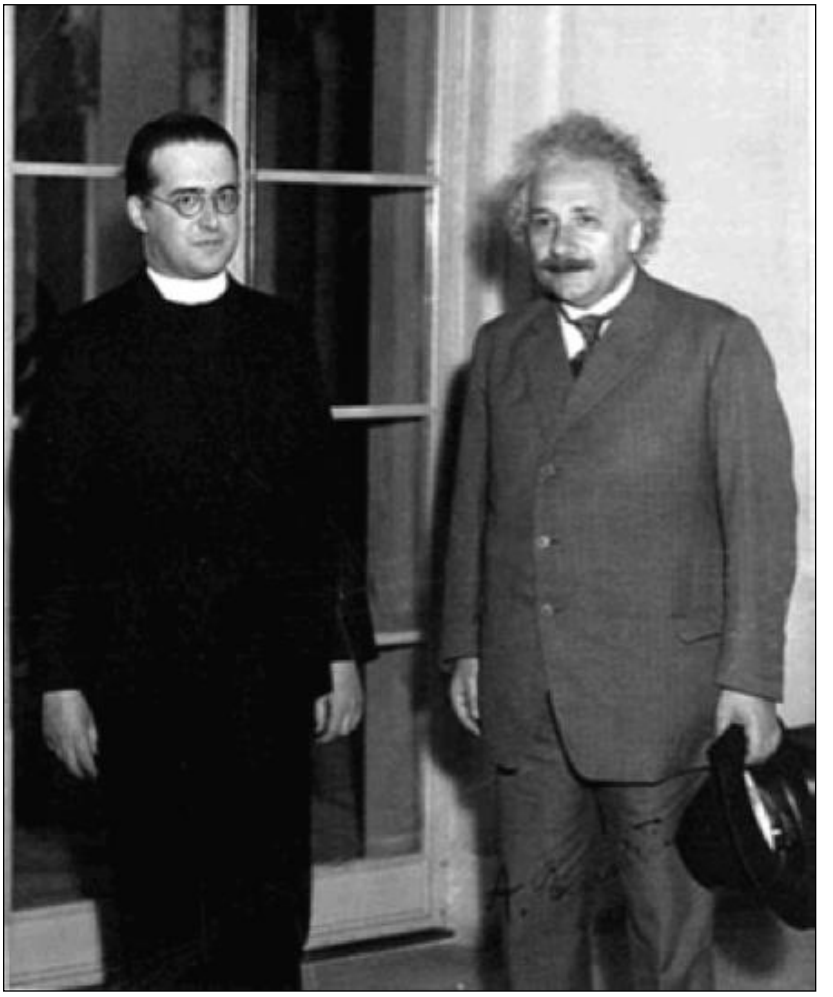
January 30, 2017



Georges Lemaître, born 1894, Belgium, died 1966 (age 71), Belgium.
Albert Einstein, born 1879, Kingdom of Wurttemberg, German Empire,
died 1955 (age 76), New Jersey, U.S. [photo c. 1933]

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Einstein and Lemaitre: A Day with No Yesterday, 1st ed.

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Abstract: This paper examines Lemaître's view of cosmogenesis, which contributed significantly to our modern understanding of our universe origins in time and space. It has become necessary for the sake of scientific history to decouple his findings from the labyrinth of theories under the heading of "the Big Bang" that have since layered over his postulates. Lemaître's positions are reviewed in his own words.

With each passing year of new and astounding astronomical discoveries, explanations of universe formation are under rapid and constant revision in order to account for the observed large-scale structure of the universe. Lemaitre's and Einstein's foundational views and writings on space and emergent energy, the friendship and collaboration between these two men, and the astute philosophies that informed their research are reviewed anew in light of current research.

(This paper has been informally peer-reviewed [1] and is available to interested reviewers for journal publication.)

Georges Lemaître and Albert Einstein were associates in the fields of mathematics and cosmology. This paper explores the timing and relationship of their converging views on the origin of our universe of time and space.

For centuries preceding Lemaître, the view of the material universe held by astronomers, and early on by Einstein, was "steady-state"—that the physical universe is of a relatively constant unchanging size—past, present, and future. Some scientists held that it was infinite in size. Father Lemaître saw problems with Einstein's Cosmological Constant and steady-state view. Einstein admitted that his 1917 concept of a relatively unchanging universe was an error: "The Cosmological Constant was my greatest mistake." [Gamow, George. *My World Line*. New York: Viking Press; 1970. p. 44.] The veracity of this quotation made by physicist Gamow has been debated, but Einstein's acceptance, by 1929, of an expanding universe is clear and well known.

From his chair in science at the Catholic University of Louvain in Belgium (1925–1931) Lemaître put his formidable mind to work, and in 1927 published his assertions regarding a cosmological beginning, which would bring him international fame. This was published in French in the *Annals of the Scientific Society of Brussels*, and was translated into English with the help of Arthur Eddington in 1931. Later that year, Lemaître was invited to London to participate in a meeting of the British Association, where he proposed the idea that the universe expanded from a single quantum, which he called the

"Primeval Atom"; this hypothesis was reported by him in 1931 in *Nature* magazine. [Lemaître, G. “The Beginning of the World from the Point of View of Quantum Theory.” *Nature*; 1931. 127 (3210): 706.]

Hubble made his famous announcement in 1929 also showing an expanding universe. Einstein then quickly endorsed both Hubble’s research and Lemaître’s earlier conclusions. Hubble, Einstein, and virtually the entire scientific community came to view the universe as having a beginning place in dimension (an isotropic center), and a starting point in time.

Millikan, Lemaître, and Einstein. California Institute of Technology, Pasadena. January 10, 1933

In January 1933, Lemaître and Einstein traveled together to California to deliver a series of lectures. When Lemaître finished his lecture on the nature and origin of the universe, Einstein stood and applauded, and said, “This is the most beautiful and satisfying explanation of creation to which I have ever listened.” [Kragh, Helge. *Cosmology and Controversy*. New Jersey, U.S.A.: Princeton Press; 1996. p. 55.] Reporter Duncan Aikman covered these seminars for the *New York Times Magazine*. An article about Lemaître appeared on February 19, 1933, featuring a photo of Einstein and Lemaître standing side by side. The caption read, "They have a profound respect and admiration for each other."

Einstein and Lemaître, Pasadena, California, c. 1933

Lemaître returned the accolade, we might say, by spending the better part of his academic career working with Einstein's relativistic theories regarding space, motion, time, gravity, energy, and matter.

Space

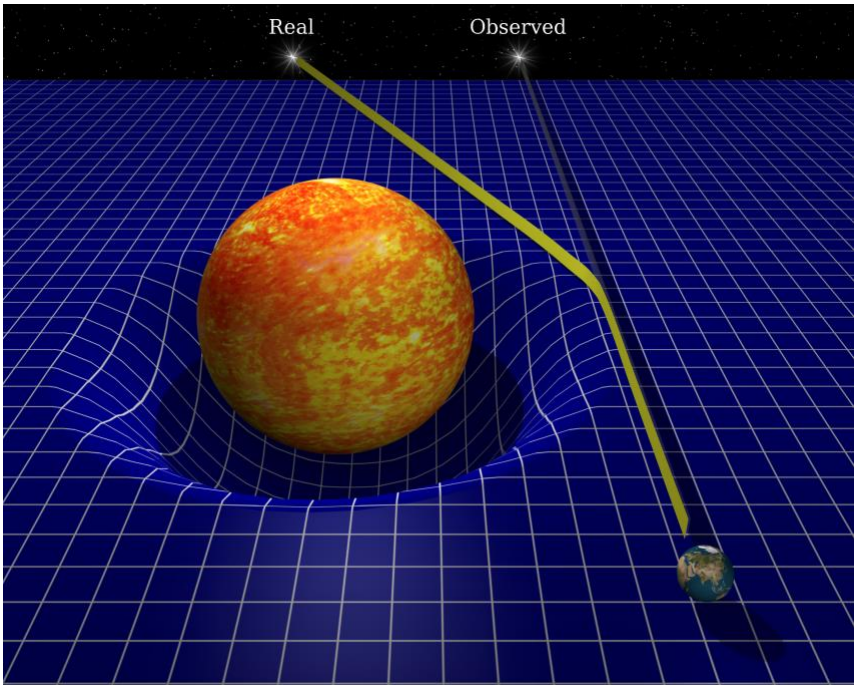
Physicists have learned much about particles and energy, but they know little about the characteristics of space. Yet it is the study of space that holds the keys to understand energy and particle physics—regarding their ultimate nature and origin. Einstein became famous when his proposition about the ability of space to bend around a massive object was satisfactorily observed by expeditions during the 1922 solar eclipse: The trajectory of light from a star was observed to curve around the sun.

This theory and its proof were pivotal, not so much because of what they revealed about light, but rather what was demonstrated about space. Energy and matter are two interchangeable phases of material reality, as shown in Einstein's famous equivalence equation. But space has as its fundamental property a nonmaterial reality that contains and conditions motion.

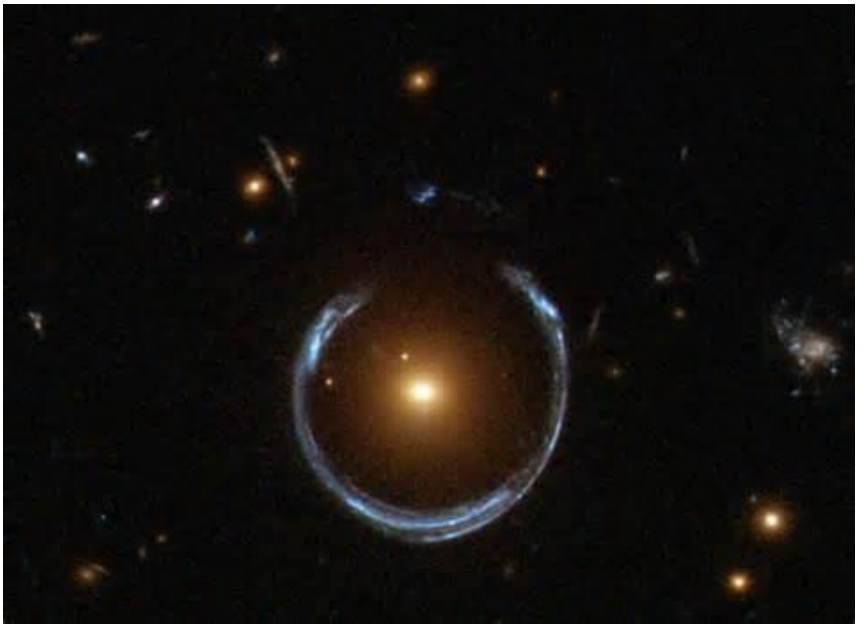
Space is real, not a negation of anything. While material bodies exist in space, space also exists in these same material bodies, even within atoms, and moves with them. Space is not merely a concept showing relatedness of universe objects; it cushions space bodies and equilibrates linear gravity. Space is not material, but is rather the womb of material energy-matter, and precedes them.

Free space is not empty. The material universe of time evolves in space, the ultimate foundation of all material reality.

The images below, one a graphic rendering and the other an actual photograph, depict the warping of space around mass objects. Such warping of space creates a gravitational lens that alters the path of light streaming from its stellar source to the place of observation.



Gravitational lensing (depiction); curved space is shown in blue.
[Source: http://davidjarvis.ca/dave/gallery/lg/gravitational-lens-01.jpg]



Gravitational lensing (photo). Light from a star behind object bends and appears as a ring.
[Source: Lensshoe_hubble.jpg: ESA/Hubble & NASA]

The Big Bang–or the Big, Cold Pour

Scientist Fred Hoyle (1915–2001) did not agree with Lemaître's idea of a universe emerging from a cosmic egg or primeval atom, and pejoratively termed Lemaître's idea of the universe's origin "The Big Bang." Hoyle held to his disagreement for the rest of his life. Although the term was meant to be disparaging, it caught on, stuck, and remains today. The name itself has spawned pop-science theories and even much science fiction, but it was not Lemaître's conception. Out from the cosmic egg emerged *force*, which pervaded unqualified space; during this inscrutable transaction, space was pervaded with force presence throughout. We can think of this as the force blanket of space. Scientist Michael Faraday coined the term "lines of force" to refer to that which underlies all physical reality phenomena. This primordial force charge is antecedent to the emergence of what is observable as material energy. Cold temperatures, such as near-absolute zero, are conducive to the accretion of ultimate particles, electrons, subatomic particles, wave radiation, and the assembly of atoms, beginning with the simplest—hydrogen and helium. Conversely, heat is conducive of matter and energy disruption.

However, the popularizations of the Big Bang concept are ones that imagine at the beginning the most extreme heat and pyrotechnic, explosive display, and this conceptualization has been unfortunate.

Yet, this was not Lemaître's description. Lemaître referred to the Cosmic Egg, as he called it, as the locus of a high-mass "quantum" from or through which all "quanta" must come.[2] Those terms have very specific meanings in physics and refer to exact amounts of force-energy that can be released or absorbed.

In this cosmology the following appear, in this order:

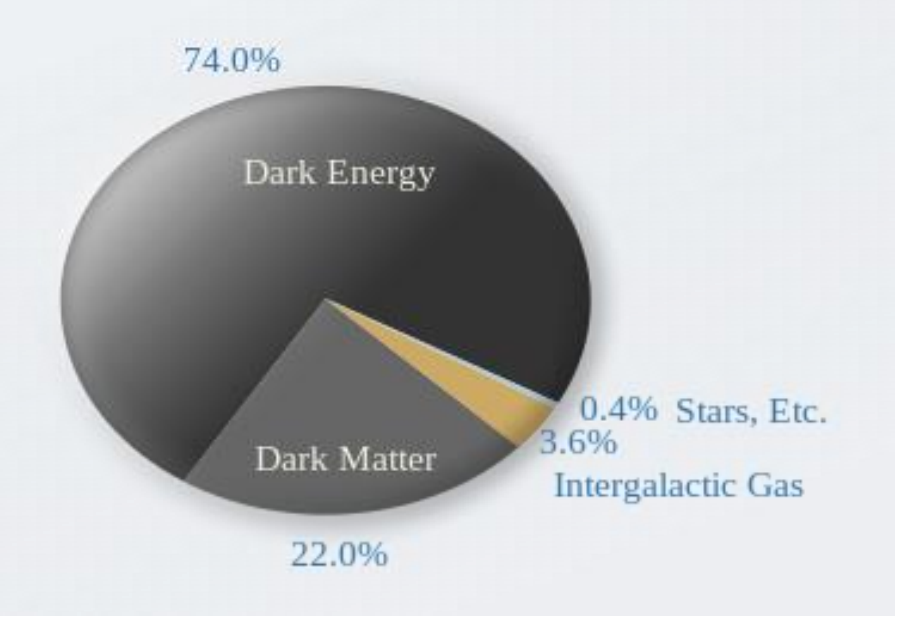
1. The Cosmic Egg, surrounded by undifferentiated space.

2. Space pervaded by primordial force (pre-energy, pre-electronic, and pre-gravity; that is, not responsive to gravity.) Nonmaterial. Cold.

3. Energy, then matter, accreted in the womb of space, out of the primordial force blanket of space. Motion and heat appear as energy and matter respond to gravity.

In this model, I prefer to consider the origin of the universe as a big, cold pour. The fiery galaxies, the mother-wheels of stars, evolved later, through eons of time. No matter emerged from Lemaître's Cosmic Egg, only primordial force laid out upon the matrix of ultimate nonmaterial space. Such an incomprehensible release of quanta could rightly be termed an explosion, isotropically spreading out in all horizontal directions from a center; but it was silent—there was not yet matter-energy. The use of the term "primordial force" is one that refers to the antecedent *potential* of energy yet to be metamorphosed or realized. This primordial force charge has been postulated as "dark energy": "In physical cosmology and astronomy, dark energy is an unknown form of energy which is hypothesized to permeate all of space." ["Dark Energy," accessed Nov. 24, 2015, https://en.wikipedia.org/wiki/Dark_energy]

The amount of dark energy, judging from the estimate below, suggests sufficiency for incredible and greater galactic formation in the far-distant regions of outer space (past the Andromeda galaxy). These regions comprise the hundreds of billions of galaxies seen so far by the Hubble Deep Space Telescope and regions beyond—vast stretches mobilizing and yet to be mobilized as the ellipse enlarges exponentially.



Estimated distribution of matter and energy in the universe
[Source: https://commons.wikimedia.org/wiki/File:UniverseComposition.svg]

This distinction is vital: that energy-matter is composed in the force-charged womb of space. As the goal of this article is to expound upon Lemaître's idea of the origin of the universe, we must consider his ideas of "before time" and "before energy-matter" in order to segue to their emergence. Consideration of such an eternity-moment stretches our minds to the limits of human comprehension. A concise version of the above three levels of development is as follows:

a. The Absolute "pre-"condition ("before" beginnings)

b. Space pervaded with ultimate primordial force charge

c. Energy-matter

Let us look at a short but potent encapsulation of Lemaître's concept of the beginning, in his own words:

> *"If the world has begun with a single quantum, the notions of space and time would altogether fail to have any meaning at the beginning; they would only begin to have a sensible meaning when the original quantum had been divided into a sufficient number of quanta. If this suggestion is correct, the beginning of the world happened a little before the beginning of space and time."*

> [Lemaître, G. "The Beginning of the World from the Point of View of Quantum Theory." *Nature;* 1931. 127 (3210): 706.]

Such an *absolutum* origin would need be a unique and homogenous organization of space potency along the lines of physicist David Bohm's "implicate order" regarding what he calls "pre-space," described by pregeometry as the source underlying the explicate, unfolded order of space and time. [See: https://en.wikipedia.org/wiki/Implicate_and_explicate_order]

Redshift

It is important to note that Lemaître's mathematics and original theory allowed for both expansion *and* contraction of the universe, but no steady-state. Some scientists today conceive that the universe will always expand; others hold that the universe will alternately expand and then contract. Among the latter are those who predict that the universe will expand and then contract to its original starting point. But there are those, such as P. Calabrese, C. Halvorson, and A. Ashtekar [Ashtekar, Abhay. "Loop Quantum Cosmology: An Overview." November, 2008. *Gen. Rel. Grav.* 41 (4): 707–741], and including this writer, who hold that the universe repeatedly expands and contracts to a limited degree in multibillion-year respiration cycles—space respiration.

In order to further consider space respiration, the reader should note the recent discoveries regarding so-called "dark matter" of enormous gravity:

> *Dark matter is a hypothetical kind of matter that cannot be seen with telescopes but accounts for most of the matter in the universe. The existence and properties of dark matter are inferred from its gravitational effects on visible matter, on radiation, and on the large-scale structure of the universe. Dark matter has not been detected directly, making it one of the greatest mysteries in modern astrophysics.*
>
> ["Dark Matter," accessed Nov. 24, 2015. https://en.wikipedia.org/wiki/Dark_matter]

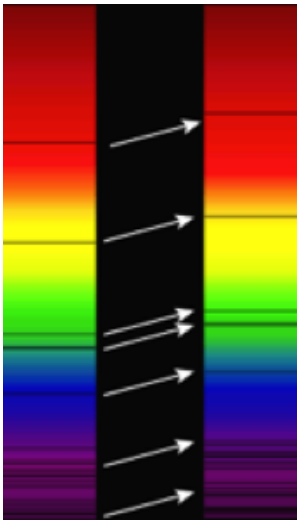
Such *dark gravity bodies* and *black holes*, of mass in excess of all other types of matter combined, are not observable telescopically because they would not reflect light; yet their enormous presence has been observed by way of the effects of gravitational lensing. These islands of cold dark matter, great concentrations of mass, function as powerful balance wheels, holding

neighboring systems in effective leash. Their incredible gravity is adequate, by orders of magnitude, to counterbalance all extant ordinary matter and much more to come.

Einstein's early mathematical equations requiring his *lambda* gravitational effect, a force resisting and equilibrating unchecked universe expansion, is proving, though in revised form, to be reasonable after all. Science continues to struggle with harmonizing the ideas of an expanding universe *and* a gravitationally balanced universe. The Lambda cold dark matter (Lambda-CDM) cosmological model deals with the observation of the effects of dark energy and cold dark matter and is frequently referred to as a standard. It has achieved dramatic success in its predictions, most recently in 2015 by a Planck collaboration group of researchers. [https://en.wikipedia.org/wiki/Lambda-CDM_model]

Space respiration could be the answer to these seemingly competing ideas of gravity balance *and* expansion. We must note that Lemaître never did diverge from his calculations allowing for both universe expansion *and* contraction, and that Einstein's original lambda coefficient provided for the attraction of gravity balancing outward movement—both men were quick to recognize redshift observation as indicative that the universe is indeed *now* expanding.

A star heading away from us will show a changing shift in its visible spectrum of light toward the red or long end of the light spectrum; a star heading toward us will show a shift toward the violet. The observation of redshift in receding galaxies in the late 1800s, and the confirmations of this made between 1912 and 1922, caused a stir among astronomers, and presaged Lemaître's, Einstein's, and Hubble's subsequent postulates of an expanding universe.



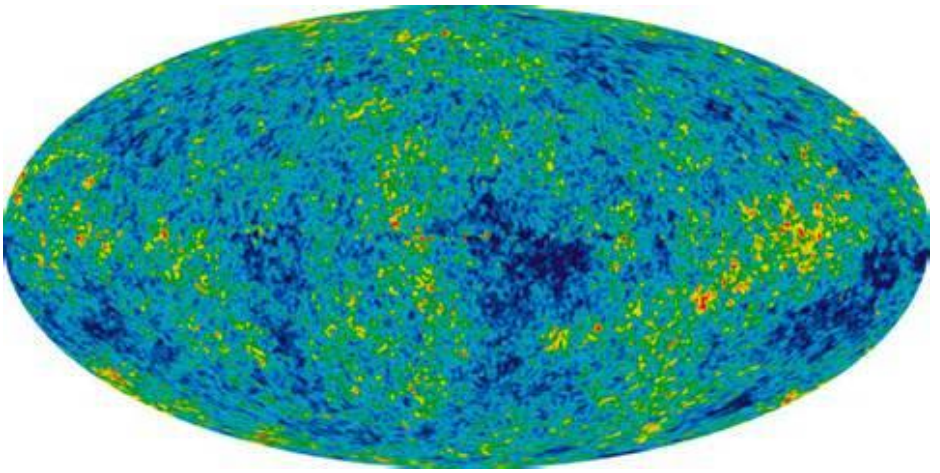
Lines in the optical spectrum of a supercluster of distant galaxies (right), compared with absorption lines in the optical spectrum of the sun (left). Arrows indicate redshift. Wavelength increases up toward the red. [Source: https://commons.wikimedia.org/wiki/File:Redshift.svg]

However, there can be a wide gap between demonstration and *conclusive* demonstration. To be scientifically honest, there are problems with these observations, even for those who hold to the expanding-universe concept. Although spectroscopic estimations of velocity are fairly reliable in more nearby nebulae, the far-distant ones can exhibit apparent velocities of incredible and increasing speed that are distorted by numerous factors of error involving angles of observation and other time-space distortions. These include very complex co-movements and the possibility that entire universe levels may, en masse, be moving in a counterclockwise direction while another section may be moving clockwise, thus amplifying the sense of recession speed from what is actual.

Lemaître was the first to propose an expanding universe as the explanation of redshift phenomena. The observation of redshift is real, but relying on our present level of astronomic expertise to deduce that the rate of recession is greatly increasing in the far-distant galaxies should rightly be held suspect.

Background Cosmic Radiation

A momentous discovery made by chance in 1965—the presence of a ubiquitous distribution of background cosmic radiation—was promptly interpreted as support for Lemaître's idea of a universe beginning. The Lambda-CDM model views the existence of this very short-wave radiation that fills the universe as evidence of an initial release of energy occurring near its beginning. This is an important and informative phenomenon to consider closely. If force was initially dispersed or pervaded into space, then any of this force as it matures to the energy stage would first radiate a very short-wavelength phenomenon of energy, which is descriptive of background cosmic radiation. The universe is evolving.



WMAP data of the Cosmic Microwave Background. Credit: NASA
[Image: https://commons.wikimedia.org/wiki/File:WMAP_image_of_the_CMB_anisotropy.jpg]

In 1949, Lemaître wrote a paper laying out his hypotheses and predictions concerning the origin of cosmic rays, followed by their condensation into clouds, and then the formation of nebulae and clusters of nebulae. He offered an explanation of the prevalence of hydrogen and helium as *materialization of kinetic energy.* [Lemaître G. "Cosmological Application of Relativity." 1949. Revs. Modern Phys.; Vol: 21.] This presents Lemaître's view of matter and energy in our universe as descending from the primeval atom-origin of space potency (pure energy), to space force, to puissant energy, to emergent material energy, to cosmic radiation and light, then condensing into the first thinnest clouds of atomic matter materialized from now *kinetic* energy, then to nebulae, and beyond to our present state of universe evolution.

Lemaître hypothesized about the origin of the extragalactic cosmic rays that fill the universe. But today's science has no knowledge either by way of observation or retrogressive analysis regarding their origin. In *Astrobiology Magazine*, April 23, 2012, we read, "Although cosmic rays were discovered 100 years ago, their origin remains one of the most enduring mysteries in physics." [*Astrobiology Magazine*. "Origin of Cosmic Rays a Mystery." NASA. April 23, 2012. http://www.astrobio.net/topic/deep-space/cosmic-evolution/origin-of-cosmic-rays-a-mystery/ - sthash.yqL5VxYO.dpuf]

A Closer Look

Lemaître's and Einstein's universe is finite—neither an infinite plane, nor a boundless cube, nor a limitless circle. It certainly has dimensions. But it is essential that we notice that their concepts of origins indeed have to do with that which is before, beyond, or transcendent of time and space, and antecedent to force-energy-matter. I think Lemaître is quite right when he says, "The notions of space and time would altogether fail to have any meaning at the beginning. . . ." and "The beginning of the world happened a little before the beginning of space and time."

Philosophers have thought of the idea of eternity variously as all time, timeless, or a very long time. The reader is not enjoined at this moment to "believe" in Lemaître's Cosmic Egg or the concept of *a day with no yesterday*, but only to recognize that these are indeed the concepts that Lemaître (his name translates as "the master") grappled with and explained in mathematical and scientific concepts sufficient to convince nearly all of his fellow theoreticians.

The inquiry into the nature of space is central to this article. When Lemaître refers to space, he refers to that nonmaterial matrix pervaded by primordial force—"quanta," as he called it. This is the space we know of, that is all around and within us, and that is observable in its properties to a limited degree by scientists. We can observe no other. But we can also consider, and we should, the concept of the earliest space condition—an initial, undifferentiated, absolutely unqualified space, forever existent, with the *potential* of force but absent the subsequent *actualization* and emergence of force and emergent energy that occurred at Lemaître's postulated "beginning."

We may prefer to eliminate the "timeless" antecedent from our conception of the beginning of our universe, but Lemaître, with his references to what could be hypothetically termed an eternity event or eternity moment, will not let us off so easily. We should consider the idea that undifferentiated space had forever existed surrounding Lemaître's Cosmic Egg, and that what emanates

through this nucleus of great potential is primordial *force*, the potentizer of primeval, ever-existent space. The dead vaults of space were astir. That was our beginning in our finite, delimited evolutionary universe of space, time, and energy-matter.

Current Universe Concepts

The focus of this article has been Georges Lemaître's contributions to our understanding of universe beginnings, with emphases on space and the earliest periods of universe formation. Much discovery has transpired in the years since Lemaître's era of active research. Current textbook mappings of universe evolution are regularly contested within academic circles, and therefore I would like the reader to have ample opportunity to formulate his or her own opinions in that regard. Below is a basic cosmological timeline available from NASA. Please note that the successive periods span billions of years; take special note of the period in this model called the "dark ages," a long period *after* the appearance of background radiation and *before* the appearance of the first stars. This is consistent with my description above of the "big, cold, pour" followed by the subsequent, later accretion of energy-matter. However, the details of these time periods and the nature of what is postulated to occur in those time frames are under intense scrutiny. I list the periods below as a reference point, and also as an example of astronomers and physicists overlaying Lemaitre's findings with theories not to be found in Lemaitre's writings, except perhaps in the most generalized sense. The timeline has been revised frequently, and alternately praised, vilified, apologized for, and in many academic circles all but abandoned as failing to account for observed large-scale universe structure.

Universe Expansion

Quantum Fluctuations

Inflation

Afterglow Cosmic Radiation Pattern

Dark Ages

First Stars

Development of Galaxies, Planets, etc., and Further Expansion

Through improvements in astronomy we have learned, only recently, that the grand universe is flat, not spherical. The Friedman-Lemaître-Robertson-Walker (FLRW) model, describing the shape of the universe as flat, is the one used by most astronomers. ["Shape of the Universe," accessed January 3, 2016, https://en.wikipedia.org/wiki/Shape_of_the_universe_-_Curvature_of_Universe] This shape is somewhat similar to that of the whirling Milky Way, a disc, except that the master universe disc thickens toward its periphery. The FLRW model provides that the large-scale universe expands isotropically in all horizontal directions. A cross-sectional view of the entire universe would therefore look somewhat like the right and left arms of a Maltese cross.

Lemaître and Einstein on Philosophy and Religion

Gleaning from his writings, it appears that Lemaître considered the emergence of the universe as a nonpersonal and natural reality, but with divine upholding. In 1951, Pope Pius XII declared that Lemaître's theory provided a scientific validation for the Catholic Church's theology and cosmology. However, Lemaître was not accepting of the pope's declaration; he stated that there was neither a connection nor a contradiction between his religion and his theory. [Landsberg, Peter T. *Seeking Ultimates: An Intuitive Guide to Physics*, 2nd ed.; CRC Press. 1999. p. 236.] When Lemaître and Daniel O'Connell, the pope's science advisor, endeavored to persuade the pope not to mention this view of creationism publicly anymore, the pope agreed. Lemaître, as a priest and devout Roman Catholic, was of the opinion that these two fields of human experience were not in conflict. [Crawley, William. "Father of the Big Bang" BBC program, 2012. Access date: December 23, 2014.]

In Lemaître's words:

> *"As far as I see, such a theory remains entirely outside any metaphysical or religious question. It leaves the materialist free to deny any transcendental Being. He may keep, for the bottom of space-time, the same attitude of mind he has been able to adopt for events occurring in non-singular places in space-time. For the believer, it removes any attempt to familiarity with God . . . It is consonant with the wording of Isaiah speaking of the "Hidden God" hidden even in the beginning of the universe. Science has not to surrender in face of the Universe; and when Pascal tries to infer the existence of God from the supposed infinitude of Nature, we may think that he is looking in the wrong direction."*

[Lemaitre, Georges. "The Primeval Atom Hypothesis and the Problem of Clusters of Galaxies," R. Stoops, ed., La Structure et l'Evolution de l'Univers *(1958), pp. 1–32. Translated by Kragh, Helge in* Cosmology and Controversy: The Historical Development of Two Theories of the Universe. *1996. p. 60.]*

G. Lemaitre, c. 1933
[Image: https://en.wikipedia.org/wiki/Georges_Lemaître#/media/File:Lemaitre.jpg]

Lemaître believed that the universe is knowable, even the physical nature of the very early universe. This optimism may have helped him in formulating the "first scientific creation cosmology." [Gillispie, Charles C., editor in chief. *Dictionary of Scientific Biography*. New York: Charles Scribner's Sons, 1970–1980. 16 vols. ISBN 0-684-10114-9. Citation from Lemaitre, G., p. 542]

Lemaître explained that:

"Man's highest activity is searching for the truth. It is the factor which distinguishes us from animals, and our specific activity is to grasp the truth in all its forms. Scientific research remains a task for a certain elite which has been exempted from the main concern of providing daily bread, and has laboriously acquired a special formation. This elite disposes of enormous assets collected by others, and uses them in laboratories, observatories, and so on, in order to fulfill, in the human collectivity, the truly human goal, namely the search for truth."

[Godart, O., Heller, M. Cosmology of Lemaitre. *Tucson, AZ: Pachart Pub. House; 1985. p. 171.]*

On March 17, 1934, Lemaître received the Francqui Prize, the highest Belgian scientific distinction, from King Léopold III. His proposers were Albert Einstein, Charles de la Vallée-Poussin, and Alexandre de Hemptinne. The members of the international jury were Eddington, Langevin, and Théophile de Donder.

Lemaître had been ordained a priest in 1923. In 1936, he was elected member of the Pontifical Academy of Sciences. He took an active role there, becoming its president in March 1960 and remaining so until his death in 1966. He was named prelate (Monsignor) in 1960 by Pope John XXIII.

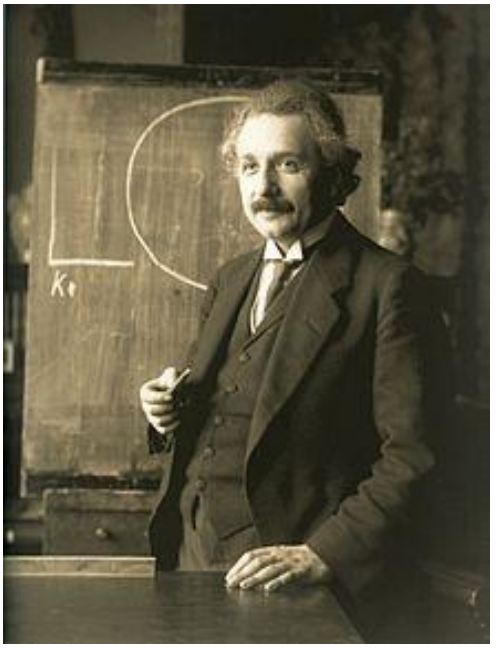
Lemaître played the piano, and Einstein played the violin and piano:

"Life without playing music is inconceivable for me," [Einstein] declared. "I live my daydreams in music. I see my life in terms of music. . . . I get most joy in life out of music." His second wife, Elsa, gives a rare glimpse of their home life in Berlin. "As a little girl, I fell in love with Albert because he played Mozart so beautifully on the violin," she once wrote. "He also plays the piano. Music helps him when he is thinking about his theories. He goes to his study, comes back, strikes a few chords on the piano, jots something down, returns to his study." [Brian Foster. "Einstein and His Love of Music." Physics World*: January, 2005. http://www.pha.jhu.edu/einstein/stuff/einstein&music.pdf]*

Einstein also had a religious side to him, as can be seen in these quotes:

"I want to know how God created this world. I'm not interested in this or that phenomenon, in the spectrum of this or that element. I want to know His thoughts, the rest are details."[E. Salaman. "A Talk with Einstein." The Listener, *54. BBC, London, England; (1955): 370-371]*

"Speaking of the spirit that informs modern scientific investigations, I am of the opinion that all the finer speculations in the realm of science spring from a deep religious feeling, and that without such a feeling they would not be fruitful." [Interview with J. Murphy and J. W. N. Sullivan (1930), in Max Jammer. Einstein and Religion: Physics and Theology *(1999), p. 68.]*



Albert Einstein,1921. Photo by Ferdinand Schmutzer,

"The religious geniuses of all times have been distinguished by this cosmic religious sense, which recognizes neither dogmas nor God made in man's image. Consequently there cannot be a church whose chief doctrines are based on the cosmic religious experience. It comes about, therefore, that we find precisely among the heretics of all ages men who were inspired by this highest religious experience; often they appeared to their contemporaries as atheists, but sometimes also as saints. Viewed from this angle, men like Democritus, Francis of Assisi, and Spinoza are near to one another." [Einstein, A. Ideas and Opinions. *New York: Wings Books; 1954]*

"As a child, I received instruction both in the Bible and in the Talmud. I am a Jew, but I am enthralled by the luminous figure of the Nazarene."

"Jesus is too colossal for the pen of phrasemongers, however artful. No man can dispose of Christianity with a bon mot."

"No one can read the Gospels without feeling the actual presence of Jesus. His personality pulsates in every word. No myth is filled with such life." [Saturday Evening Post. *"What Life Means to Einstein: An Interview by George Sylvester Viereck." (26 October 1929), p. 17] [As reported in: Brian, Denis.* Einstein: A Life. *New York: J. Wiley; 1996. "When asked about a clipping from a magazine article reporting his comments on Christianity as taken down by Viereck, Einstein carefully read the clipping and replied, 'That is what I believe.' " p. 17.]*

The philosopher that Einstein admired most was Baruch Spinoza for his belief in "a God who reveals himself in the harmony of all that exists…" [Isaacson, Walter (2008). *Einstein: His Life and Universe.* New York: Simon and Schuster, pp. 388-389]

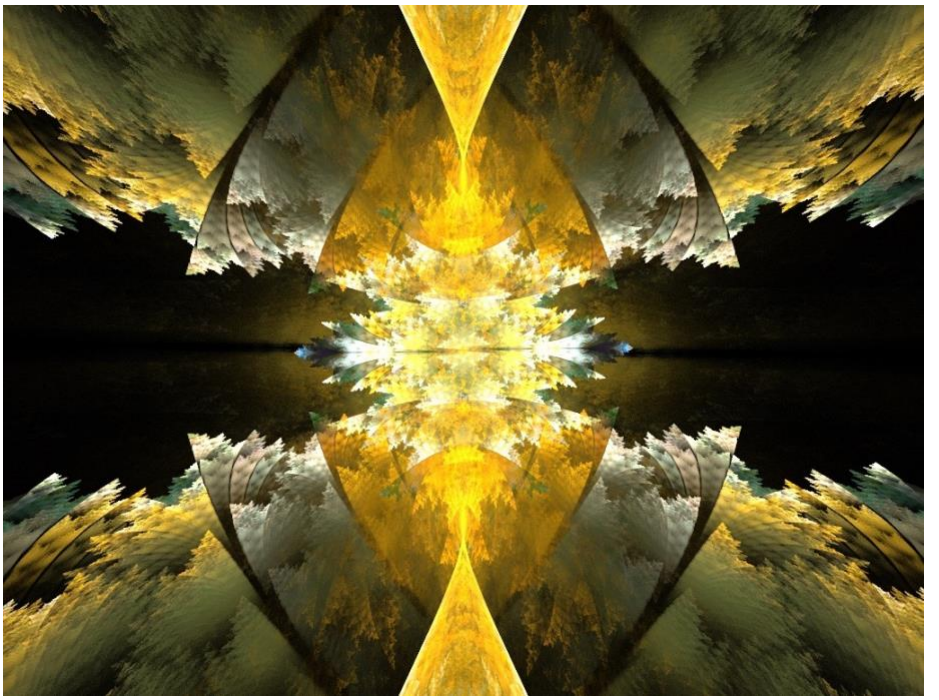
Albert Einstein's office and desk a few hours after his death
Photo by Ralph Morse, 1955

In Lemaître's and Einstein's views of universe formation we see the same basic components of evolution encountered everywhere—in living cells, atoms, solar systems. First there appears primordial undifferentiated plasm, then differentiation, then simple structure, then larger and more complex structure.

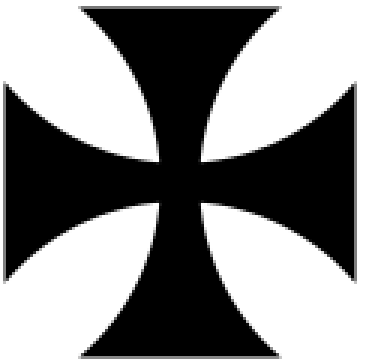
These two luminaries had such balanced and harmonized sensibilities about their science and their religion, and their sense of wonder; and this seems to be the case with the most intelligent and profound thinkers. Since their time, the scientific community, even though building upon such prescient foundations, has grown more secular. The astrophysics popularizer Carl Sagan typified the new cadre of cosmologists who indulged in expressing more materialistic sentiments to their audiences, widening the gulf between science and religion instead of narrowing it, substituting awe of nature in place of the deepest superpersonal (to use Einstein's term) sentiments, sentiments that seem beyond knowing yet are becoming more and more within the grasp of rationality and discovery.

Lemaître and Einstein felt the universe was "cognizable," knowable, even as they considered its transcendent origins and its luminous destiny, even as they postulated *a day with no yesterday*. Let us take a moment to acknowledge their

great efforts to help us understand our stellar home and its marvelous beginnings.



[Cracking the Cosmic Egg, by Amorina Ashton. Used by permission]



Maltese cross, right and left arms depicting vertical cross-section of the large-scale universe

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Notes:

[1] Informally Peer Reviewed by R. Kelly Tippett, President/Inventor, GANID Corporation.

[2] It should be noted that the casual student might think of “mass” as referring only to density of matter. Using the principles of *mass-energy equivalence*, physicists view energy as likewise having mass. Einstein wrote, “The mass of a body is a measure of its energy content.”

> *["Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig?"* ("Does the inertia of a body depend upon its energy content?"), *Annalen der Physik* 18 (1905), pp. 639–641. Quoted in Max Jammer, *Concepts of Mass in Classical and Modern Physics* (1961), p. 177.]

Note: This article's subtitle refers to a concept of Lemaitre’s; the phrase is respectfully borrowed in paraphrased form from the magazine article entitled "A Day without Yesterday" by Midbon, Mark. *Commonweal Magazine* Vol. 127 No. 6 (March 24, 2000) pp. 18–19.

ABOUT THE AUTHOR

Joshua J. Wilson is an educator, writer, and composer who lives in the Phoenix, Arizona, metro area. He holds a graduate science degree in Decision Information Systems with emphasis on Human Behavior in Organizations. He began work in the publishing industry in 1999 as project consultant with major clients in that industry. His writings center on the harmonization of philosophy and science. Hobbies include camping and hiking.