The Beginning of the Universe, Super Earth and Bios

The term "evolution" usually suppose to the biological evolution of Bios. But the processes by which planets & other mysterious object of the universe form and varying over time are also types of "evolution." In all of these cases there is change over time, although the processes involved are quite different.

In the late 1920s the American astronomer Edwin Hubble made a very interesting and important discovery. Hubble made observations that he interpreted as showing that distant stars receding from Earth in every direction. Moreover, the velocities of recession increase in proportion with distance, a discovery that has been confirmed by uncountable and repeated measurements since Hubble's time. The implication of these findings is that the universe expansion is continuous processs .

Hubble's hypothesis of an expanding universe expose certain deductions. which direction of the universe was more condensed at a previous period . From this deduction came the suggestion that all the currently observed object and energy in the universe were initially condensed in a tiny and infinitely hot mass. A huge explosion, known as the Big Bang, then sent matter and energy expanding in all directions.

https://bsatorg.wordpress.com/2021/01/31/the-beginning-to-the-end-of-the-universe-looking-for-life-in-the-universe/

This Big Bang hypothesis led to more testable deductions. One such deduction was that the temperature in internal space today should be several degrees above absolute zero temperature . Observations showed this deduction to be correct. In fact, the Cosmic Microwave Background Explorer (COBE) satellite launched in 1991 confirmed that the background radiation

field has exactly the spectrum predicted by a Big Bang origin for the universe.

As the universe expanded, according to current scientific understanding, matter stored into clouds that began to condense and circulate , forming the forerunners of galaxies. Within galaxies, including our own Milky Way galaxy, changes in pressure caused gas to form distinct clouds. In some of these clouds, where there was sufficient mass and the right forces, gravitational attraction caused the cloud to collapse. If the mass of material in the cloud was sufficiently compressed, nuclear reactions began and a star was born.

Some proportion of stars, including our sun, formed in the mid of a flattened spinning disk of matter. In the case of our sun, the gas and dust within this disk collided and aggregated into small grains, and the grains formed into larger bodies called planetesimals . some of which reached diameters of several hundred kilometers . In successive stages these planetesimals coalesced into the nine planets and their numerous satellites. The rocky planets, including Earth, were near the sun, and the gaseous planets were in more distant orbits.

The ages of the universe, our galaxy, the solar system, and Earth can be estimated using modem scientific criteria . The age of the universe can be derived from the observed relationship between the velocities of and the distances separating the galaxies. The velocities of distant galaxies can be measured very accurately, but the measurement of distances is more uncertain. Over the past few decades, measurements of the Hubble expansion have led to estimated ages for the universe of between 7 billion and 20 billion years, with the most recent and best measurements within the range of 10 billion to 15 billion years.

A disk of dust and gas, appearing as a dark band in this Hubble Space Telescope photograph, bisects a deregatory nebula around a very young star in the constellation Taurus. Similar disks can be seen around other nearby stars and are thought to provide the raw material for planets.

The age of the Milky Way galaxy has been measured in two ways. One involves studying the observed stages of evolution of different-sized stars in globular clusters . Globular clusters occur in a faint halo surrounding the center of the Galaxy, with each cluster containing from a hundred thousand to a million stars . The very low amounts of ingredients heavier than hydrogen in these stars indicate that they must have formed early in the history of the Galaxy, before huge amounts of heavy materials were created inside the primary generations of stars and later distributed into the interstellar medium through supernova explosions . Estimates of the ages of the stars in globular clusters fall within the range of 10 billion to 15 billion years.

A second method for estimating the age of our galaxy is based on the present abundances of several long-lived radioactive elements in the solar system. Their abundances are set by their rates of production and distribution through exploding

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supernovas. According to these calculations, the age of our galaxy is between 10 billion and 15 billion years. Thus, both ways of estimating the age of the Milky Way galaxy agree with each other, and they also are consistent with the independently derived estimate for the age of the universe.

Radioactive elements occurring naturally in rocks and minerals also provide a means of estimating the age of the solar system and Earth. Several of these elements decay with half lives between 695 million and more than 100 billion years (the half life of an element is the time it takes for half of the element to decay radioactively into another element). Using these time-keepers, it is calculated that meteorites, which are fragments of asteroids, formed between 4.49 billion and 4.49 billion years ago (asteroids are small "planetoids" that revolve around the sun and are remnants of the solar nebula that gave rise to the sun and planets). The same radioactive time-keepers applied to the three oldest lunar samples returned to Earth by the Apollo astronauts yield ages between 4.39 billion and 4.46 billion years, providing minimum estimates for the time since the formation of the moon.

The oldest known rocks on Earth occur in northwestern Canada (3.96 billion years), but well-studied rocks nearly as old are also found in other parts of the world. In Western Australia, zircon crystals encased within younger rocks have ages as old as 4.3 billion years, making these tiny crystals the oldest materials so far found on Earth.

The best estimates of Earth's age are obtained by calculating the time required for development of the observed lead isotopes in Earth's oldest lead ores. These estimates yield 4.48 billion years as the age of Earth and of meteorites, and hence of the solar system.

The origins of life cannot be dated as precisely, but there is evidence that bacteria-like organisms lived on Earth 3.46 billion years ago, and they may have existed even earlier, when the first solid crust formed, almost 4 billion years ago. These early organisms must have been simpler than the organisms living today. Furthermore, before the primary organisms there must have been structures that one would not call "alive" but that are now components of Bios . Today, all living organisms store and transmit hereditary information using two kinds of molecules: DNA and RNA. Each of these molecules is in turn composed of four kinds of subunits known as nucleotides. The sequences of nucleotides in particular lengths of DNA or RNA, known as genes, direct the construction of molecules known as proteins, which in turn catalyze biochemical reactions, provide structural components for organisms, and perform many of the other functions on which life depends. Proteins consist of chains of subunits known as amino acids. The sequence of nucleotides in DNA and RNA therefore determines the sequence of amino acids in proteins; this is a central mechanism in all of biology.

Experiments conducted under conditions intended to resemble those present on primitive Earth have resulted in the production of some of the chemical components of proteins, DNA, and RNA. Some of these molecules also have been detected in meteorites from outer space and in interstellar space by astronomers using radio-telescopes. Scientists have concluded that the "building blocks of life" could have been available early in Earth's history.

An important new data manipulation avenue has originated with the discovery that certain molecules made of RNA , called ribozymes, can act as catalysts in modem cells. It previously had been thought that only proteins could serve as the catalysts required to carry out specific biochemical functions. Thus, in the early prebiotic world, RNA molecules could have been "autocatalytic"—that is, they could have replicated themselves well before there were any protein catalysts (called enzymes).

Laboratory experiments demonstrate that replicating autocatalytic RNA molecules undergo spontaneous changes and that the variants of RNA

molecules with the greatest autocatalytic activity come to prevail in their environments. Some scientists favor the hypothesis that there was an early "RNA world," and they are testing models that lead from RNA to the synthesis of simple DNA and protein molecules. These assemblages of molecules eventually could have become packaged within membranes, thus making up "protocells"—early versions of very simple cells. For those who are studying the origin of life, the question is no longer whether life could have originated by chemical processes involving non biological components. The question instead has become which of many pathways might have been followed to produce the first cells.

Will we ever be able to identify the path of chemical evolution that succeeded in initiating life on Earth? Scientists are designing experiments and speculating about how early Earth could have provided a hospitable site for the segregation of

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molecules in units that might have been the first living systems. The recent data manipulation includes the possibility that the first living cells might have arisen on Mars, seeding Earth via the many meteorites that are known to travel from Mars to our planet.

Certainly , even if a living cell were to be formed in the laboratory, it would not prove that nature oriented with the same pathway billions of years ago. But it is the job of science to provide probable natural explanations for natural phenomena. The study of the origin of life is a very active research area in which important progress is being made, although the consensus among scientists is that none of the current hypotheses has thus far been confirmed. The history of science shows that seemingly intractable problems like this one may become amenable to solution later, as a result of advances in theory, instrumentation, or the discovery of new facts.