

Evolution of the Universe: From big bang to present day

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ACCORDING to the Big Bang theory, the universe came into being with a violent explosion from which all matter and energy originated. At the zero hour, the entire known universe was a mathematical point of infinite density, called the singularity, from which matter and energy burst out and the universe began to expand. This cataclysmic event occurred, as estimated by Hubble, approximately 14 billion years ago.

A microsecond after the explosion, temperature of the universe was 10 trillion Kelvin and it was a dense, scalding hot soup of fundamental particles - quarks, leptons and the force carriers. Most of the radiation consisted of high energy gamma-ray photons. Photons are massless particles travelling at the speed of light. They had enough energy to make matter (electron, proton, neutrino) and anti-matter through pair production. But matter and anti-matter quickly annihilated each other. Fortunately, there was an asymmetry in favor of matter. A consequence of this asymmetry was that the universe was able to mature in a way favorable for matter to persist. The universe was also expanding at an extremely fast rate. This period is known as the Inflationary Epoch.

After one second, the universe grew older, temperature decreased to about

10 billion Kelvin, and the gamma-rays lacked sufficient energy for pair production. Hence, no matter or anti-matter was produced and their amount decreased because of the annihilation process. The quarks and gluons (carriers of the strong force) combined into composite particles like protons and neutrons. At this time, the neutrinos stopped interacting with matter and have moved freely through the universe ever since.

The universe was a sea of high-energy radiation of gamma- and X-rays. Together with some neutrons, protons and electrons, it was an ionized plasma where matter and radiation were inseparable. Neutrons spontaneously decayed into protons and electrons. Also deuterium, an isotope of hydrogen, was formed through fusion of neutrons and protons. Initially, the deuterons did not survive because the gamma- and X-rays had sufficient energy to break them up into neutrons and protons.

One hundred seconds later, the universe cooled down to 1 billion Kelvin and the photons did not have enough energy to disrupt a deuteron. Abundance of deuterium climbed swiftly; protons and neutrons became the common state of matter. After 200 seconds, protons and neutrons slowed down enough for a series of nuclear reactions (nucleosynthesis) to take place, and the chemical makeup of the



The very early Universe was a dense, scalding hot soup of fundamental particles...within about a billion years clouds of matter formed into galaxies.

universe changed from hydrogen and deuterium only to helium, lithium and beryllium. They were, however, quickly torn apart by the energetic photons.

Radiation dominated the universe during the initial few minutes. This stage in the development of the universe is known as the Radiation Era. The universe was still too hot (temperature was around 1 million Kelvin after the first few years) for atoms to be stable. Gas in the universe, mostly free electrons, was very opaque. Light and radiation never got far away from the place where they were emitted before being destroyed or rescattered again.

For the next 300,000 years, the universe was a "primordial fireball," completely filled with a shimmering expanse of high-energy photons colliding vigorously with protons and electrons. Things gradually started to change in a fundamental way; both temperature and density started to drop and collision between particles became less violent.

The radiation that flooded the universe gradually shifted from gamma- and X-rays to relatively less energetic ultra-violet and infra-red rays. The temperature dropped to a few thousand Kelvin and the photons no longer

had enough energy to keep the protons and electrons apart. They began combining to form hydrogen atoms. The universe changed from opaque to a transparent state and the atoms absorbed and scattered radiation far less efficiently. This meant that light and other forms of radiation could now stream unimpeded across space. The moment light broke free from matter is called the Decoupling Epoch or Era of Recombination.

The universe was filled with hydrogen and helium gas in the first million years after its birth. The high density regions expanded along with the rest of

the universe. However, the slightly greater pull of gravity in these regions gradually slowed their expansion. Within about a billion years, the expansion of these denser regions halted and reversed, and the material within them began to contract into clouds of matter that eventually formed the galaxies.

The blinding radiation and careening particles eventually filled up the large and empty universe of today. By looking far enough into space, we can still detect the radiation that originated at the early stage in the development of the universe. They are known as Cosmic Background Radiation (CBR). Over the long period of 14 billion years, they "cooled to a faint whisper" in the microwave region. Consequently, their wavelength got red-shifted by almost 1000 times because of Doppler Effect shift in the wavelength toward larger values if the source is moving away from the observer. That is why CBR appears today as radio waves characteristic with a temperature of 2.7 Kelvin. The accidental discovery of CBR in 1977 by Penzias and Wilson of Bell Lab and the cosmological red-shift of galaxies are considered the most conclusive evidences of the Big Bang model of the universe.

We are bits of stellar matter that got cold by accident, bits of a star gone wrong. -- Arthur Eddington.

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FOOTPRINTS OF DAVID



LIGHT OF BAGHDAD



TAGGING RAY

Earliest proof of biblical cult



The excavation of a shrine in the 3,000-year-old city of Khirbet Qeiyafa near Jerusalem.

For the first time, archaeologists have uncovered shrines from the time of the early Biblical kings in the Holy Land, providing the earliest evidence of a cult, they say.

Excavation within the remains of the roughly 3,000-year-old fortified city of Khirbet Qeiyafa, located about 19 miles (30 kilometers) southwest of Jerusalem, have revealed three large rooms used as shrines, along with artifacts, including tools, pottery and objects, such as alters associated with worship.

The three shrines were part of larger building complexes, and the artifacts included five standing stones, two basalt altars, two pottery libation vessels and two portable shrines, one made of pottery, the other of stone. The portable shrines are boxes shaped like temples.

The shrines themselves reflect an architectural style dating back as early as the time of King David (of the biblical David and Goliath story), providing the first physical evidence of a cult in the time of King David, according to an announcement by Yosef Garfinkel, an archaeologist at Hebrew University of Jerusalem. (Religious Worship: Top 10 Cults)

The research is presented in the book, "Footsteps of King David in the Valley of Elah" (Yedioth Ahronoth, 2012).

Radiocarbon dating on burnt olive pits found in the ancient city of Khirbet Qeiyafa indicate it existed between 1020 B.C. and 980 B.C., before being violently destroyed.

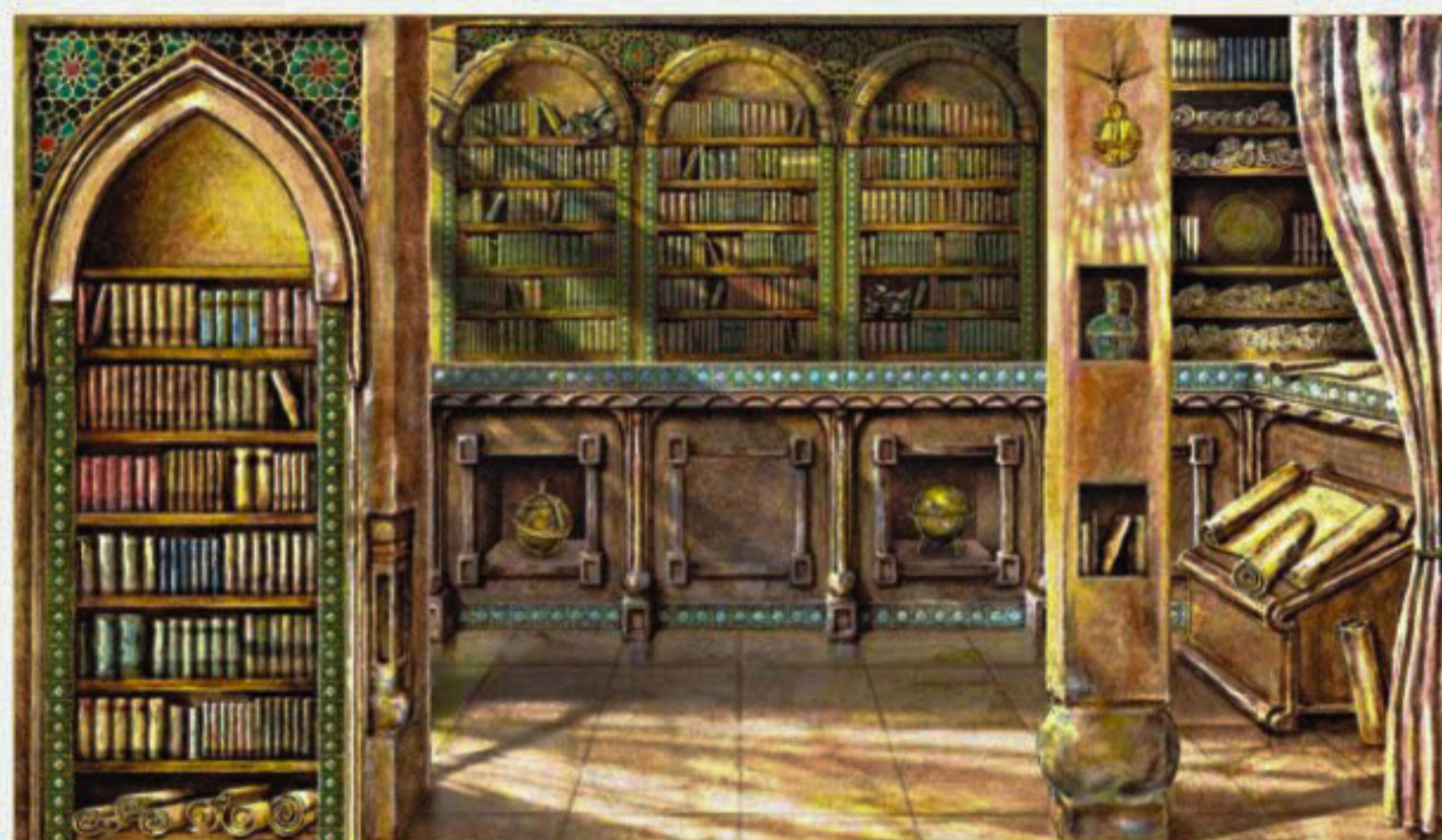
According to Biblical tradition, the ancient Israelites' belief in one God and their ban on human and animal figures set them apart from their neighbors. However, it hasn't been clear when these distinct practices arose.

The discoveries offer a clue to the timing, since they contain none of the human or animal figurines common at other sites. No bones from pigs showed up here or elsewhere in the city.

Source: Live Science

A brief history of the house of wisdom

THE legendary Bayt al-Hikma meaning "House of Wisdom" was a library and a translation institute established somewhere later in the 8th century by Caliph Harun al-Rashid which later flourished under the rule of his son Caliph Al-Mamun and his immediate successors. This ancient grand institution was modeled after the Sassanid Imperial Library (the pre-Islamic Persian Empire, 224-651 AD), given the strong bond that Abbasid Caliphate had with the Persians, a great association which many experts believe spawned the very birth of Islamic Golden Period in the first place. It is in this House of Wisdom, for the next 4 to 5 hundred years alchemists, scientists, scholars, writers, men of letters, copyists painstakingly learned, read, wrote and translated manuscripts that were originally Farsi, Aramaic, Syriac, Hebrew, Greek, Latin, Sanskrit, Devanagari and other languages and linguistically converted them into Arabic and circulated the Arabic translated texts throughout the then Arabic speaking world. In this process many works by ancient Persian, Greek and Indian scholars like Aryabhata and Brahmagupta were translated and further researched which was also one of the tasks of the historic library. There were a couple of technical reasons why House of Wisdom was in Baghdad. For starter, it was the then capital of Islamic empire and secondly it was in Baghdad where, during this era, world's very first recorded paper mill was established which made it possible for widespread literacy in that region and by 10th century paper replaced the usage of parchment and papyrus in the Arab world. And that



In the medieval Arabic world "House of Wisdom" of Baghdad was the epicenter of learning.

era was glory times for Baghdad, which was known as the world's richest city housing over a million people, not by the might of oil by the way, and a true centre for the intellectual development of that time, a great accomplishment that many modern day Arab states failed to achieve even at this day and age regardless of their immense monetary wealth and easy access to global scholarship.

It was in this House of Wisdom, that the Islamic empire witnessed some of its most brilliant minds whose work later gave birth to the European renaissance. Some of the Islamic scholars associated with House of Wisdom were Persian mathematician Al-Khwarizmi, the Banu Musa brothers of Persia who were known for their works on automatic machines and machinery devices, the Sindh scientist Sind ibn Ali who was born in modern day Pakistan, the great Iraqi scientist Al-Kindi, who

is unanimously considered as the "Father of Islamic or Arabic philosophy", the Iraqi-Christian physician, scholar Hunayn ibn Ishaq, known for his translation of Syriac texts into Arabic and the mathematician Thabit ibn Qurra, who was born in modern day Turkey and belonged to the Sabian religion of the Mesopotamia and many other scholars and gifted minds.

Sadly in 1258, the prestigious House of Wisdom was utterly destroyed during the Mongol invasion of Baghdad. Historically there is a saying that during and aftermath of the invasion the waters of Tigris river ran black with the ink from the enormous quantities of books that were thrown into the ancient river and red from the blood of all the scientists, scholars and philosophers who were killed by the armies of Hulagu Khan, the Mongol ruler who committed histories one of the most atrocious massacres.

Satellite tracks manta rays

USING the latest satellite tracking technology, conservationists from the Wildlife Conservation Society, the University of Exeter (UK), and the Government of Mexico have completed a ground-breaking study on a mysterious ocean giant: the manta ray.

The research team has produced the first published study on the use of satellite telemetry to track the open-ocean journeys of the world's largest ray, which can grow up to 25 feet in width. Researchers say the manta ray -- listed as "Vulnerable" by the International Union for Conservation of Nature (IUCN) -- has become increasingly threatened by fishing and accidental capture and now needs more protection.

The study was published May 11 in the online journal PLoS ONE. The authors include: Rachel T. Graham of the Wildlife Conservation Society and the University of Exeter; Matthew J. Witt of the University of Exeter; Dan W. Castellanos of the Wildlife Conservation Society; Francisco Remolina of the National Commission of Protected Areas, Cancun, Mexico; Sara Maxwell of the Marine Conservation Institute and the University of California-Santa Cruz; Brenden J. Godley of the University of Exeter; and Lucy A. Hawkes of Bangor University, Bangor, United Kingdom.

"Almost nothing is known about the movements and ecological needs of the manta ray, one of the ocean's largest and least-known species," said Dr. Rachel Graham, lead author on the study and director of WCS's Gulf and Caribbean Sharks and Rays Program. "Our real-time data illuminate the previously unseen world of this mythic fish and will help to shape management and conservation strategies for this species."

The research team attached satellite transmitters to manta rays off the coast of Mexico's Yucatan Peninsula over a 13-day period. The tracking devices were attached to the backs of six individuals -- four females, one male, and one juvenile.

"The satellite tag data revealed that some of the rays traveled more than 1,100 kilometers during the study period," said Dr. Matthew Witt of the University of Exeter's Environment and Sustainability Institute. "The rays spent most of their time traversing coastal areas plentiful in zooplankton and fish eggs from spawning events."

Like baleen whales and whale sharks, manta rays are filter feeders that swim through clouds of plankton with mouths agape.

The research team also found that the manta rays spent nearly all their time within Mexico's territorial waters (within 200 miles of the coastline), but only 11.5 percent of the locations gathered from the tagged rays occurred within marine protected areas. And the majority of ray locations were recorded in major shipping routes in the region; manta rays could be vulnerable to ship strikes.

Source: Science Daily

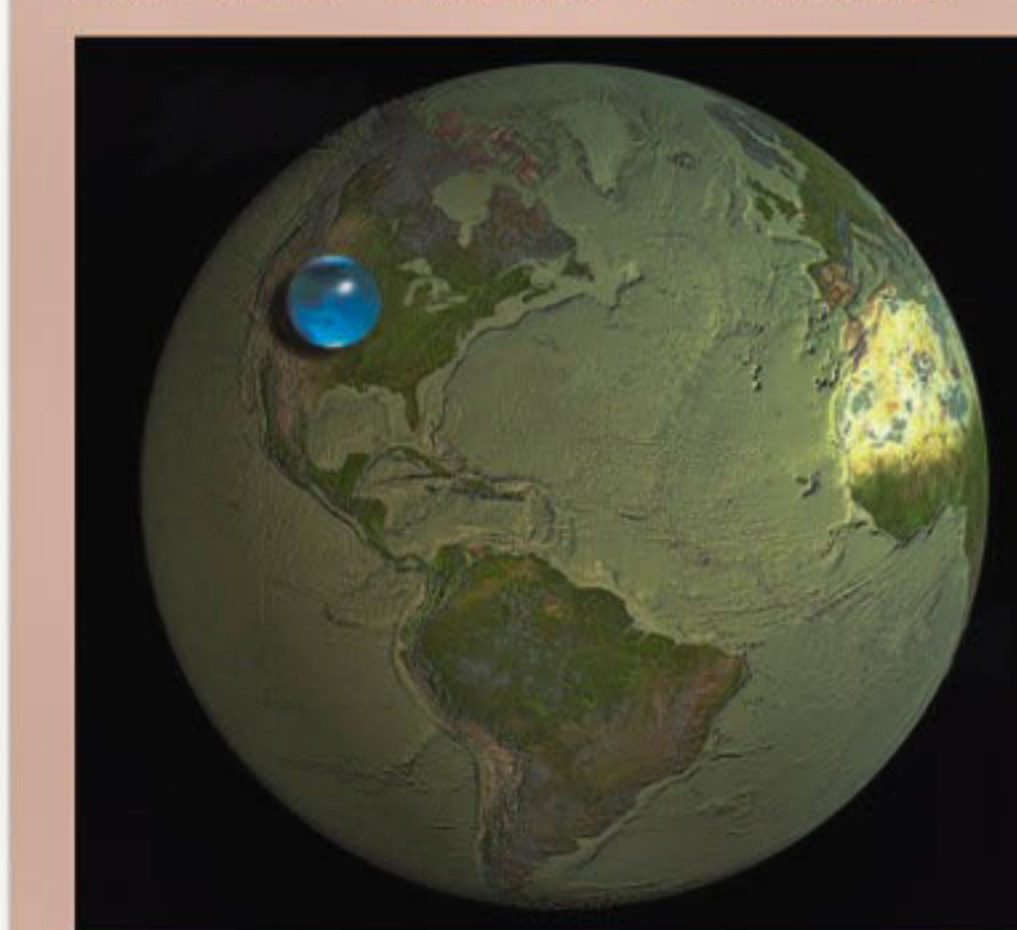


DROP OF LIFE



DO YOU KNOW?

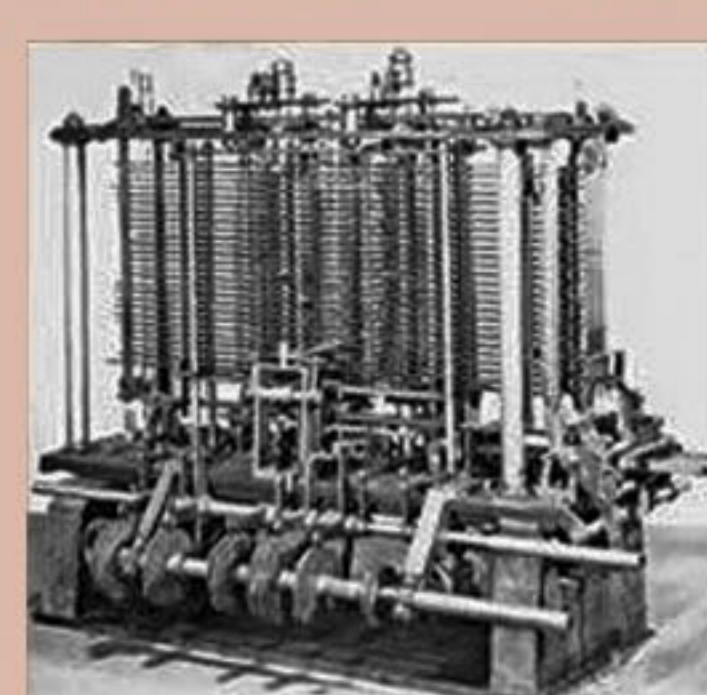
All the world's water



If all the world's water were to form a single drop, this is how big it would be: A sphere stretching from Salt Lake City, Utah to Topeka, Kansas. Though this mega-droplet looks small compared to Earth's bulk, the two dimensionality of this image is somewhat deceiving. In fact, the water sphere would have a diameter of about 860 miles (1,385 kilometers) and a volume of about 332,500,000 cubic miles (1,386,000,000 cubic km). That's a lot of water, but you wouldn't want to drink this droplet. More than 96 percent of Earth's water is saline. About 68 percent of the world's fresh water is frozen in ice sheets and glaciers, with another 30 percent stored underground. Rivers make up just 1/10,000th of a percent of the globe's total water.

Source: Live Science

Who invented first computing machine?



Difference Engine No 2 for the bicentennial year of Babbage's birth and later completed the printing mechanism in 2000.

In 1822, Charles Babbage purposed and began developing the Difference Engine, considered to be the first automatic computing engine that was capable of computing several sets of numbers and making a hard copies of the results. Unfortunately, because of funding he was never able to complete a full-scale functional version of this machine. In June of 1991, the London Science Museum completed the Difference Engine No 2 for the bicentennial year of Babbage's birth and later completed the printing mechanism in 2000.



The Wildlife Conservation Society, the University of Exeter, and the Government of Mexico have published the first-ever satellite telemetry study on the manta ray.