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Quantum Computing: Pinning Down the Age of Universe

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ABSTRACT

Hubble, The advance technology leads to many discoveries in Astronomy world. One of them is estimating the age of universe. This paper provides an Overview on how Hubble, its Scientific instruments, Communication Technology, Computer Systems, Data processing and Analysis makes the scientists to estimate the correct enough age of the Universe. This paper also focuses on many aspects that leads to success of this theory. This paper also talks about calculating the age of stars by their variant factors, their clusters, formations and how Hubble also opens up the mystery about the Expansion of Universe, which is also known as "The Hubble Constant". This paper give light to the future by using advance technologies, high-tech scientific instruments, high end communication systems and very powerful super computers under Quantum Computing.

KEYWORDS: *Hubble, Telescope, Light, Object*

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I. INTRODUCTION TO HUBBLE

Galileo improved the design of telescope and bring a new technology to life. In 1610, Galileo gives a way to the world, a spyglass pointing towards the Heaven.

In 1923, a German scientist Hermann Oberth believed that a telescope could be launched into the Earth's orbit so as to overcome the distortion caused by the atmosphere.

In 1975, the European Space Agency in collaboration with NASA worked on the plan that would eventually become Hubble.

World's largest telescope was named in honor of Edwin Hubble, this American astronomer concluded that the universe is extended beyond the boundaries Milky Way Galaxy.

The world's first space telescope was launched on April 24, 1990 at a cost of 1.5 billion.

Hubble is the largest telescope launched by the Discovery space shuttle in Lower Earth's Orbit (LEO). Hubble is solar powered & take pictures from above the haze of atmosphere. These images are of stars, planets and galaxies including detailed pictures of the birth and death of stars, galaxies billions of light years away, comet fragments crashing into the atmosphere of Jupiter.

II. DETAILS

Fine Guidance Sensors as a part of the Pointing Control System keeps Hubble in the right direction.

(Hubble Space Telescope completes anorbit around in every 95 minutes)

After acquiring the target, primary mirror of Hubble collects light, the light then bounces off from the primary mirror to the secondary mirror.

The secondary mirror focuses the light back through the hole in the primary mirror. The light then shines on Hubble's scientific instruments and each device has its own unique way of understanding and explaining shine

Hubble's scientific instruments include spectrographs and cameras. Spectrograph is an advance instrument that splits the lights in its individual wavelengths.

The Hubble studies everything from the in the solar systems to the distant galaxies. To do this Hubble uses the Wide Field

Camera 3. Wide Field Camera 3 is Hubble's main camera, this technologically advance camera can interpret three types of light: visible, near infrared and near ultraviolet.

Advanced Camera of Survey capture images of large areas. These images have helped national organizations to study and analyzeearliest happenings of the universe.

The Cosmic Origins Spectrograph interprets ultraviolet light. This technology works on the department of how the galaxies, planets and stars were formed and changed.

The Space Telescope Imaging Spectrograph helps in determining the temperature, density, motion and composition of any object. It also has been used to detect black holes in space.

The Near Infrared Camera & Multi Object Spectrograph (NICMOS), sees any object deep in space by sensing the emitted heat by that object.

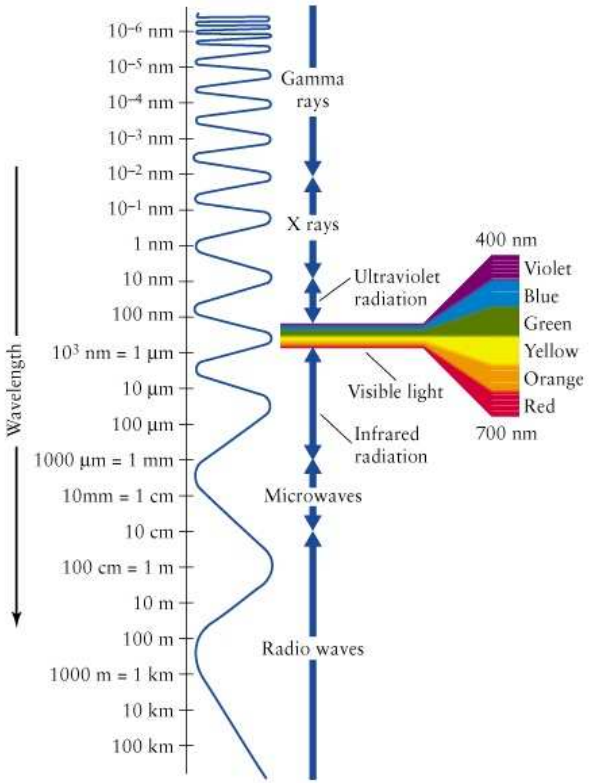
It is a Spectrometer and it also capture images.

III. COMMUNICATION WITH HUBBLE

Approximately 140 GB of scientific data is been transmitted by the Hubble back to Earth. The signals are transferred to the satellite and then relayed back to the ground stations, then to NASA's Goddard Space Flight Center and finally to the Space Telescope Science Institute.

Images are translated to meaningful data that we can understand.

Received images are in black & white shades. The Space Telescope Science Institute add colors to the image for various reasons. Sometimes colors are chosen to show how an object might looks according to a human eye. Other times, colors are chosen according to highlight any important detail or can be used to show the details that might otherwise be invisible to a human eye.

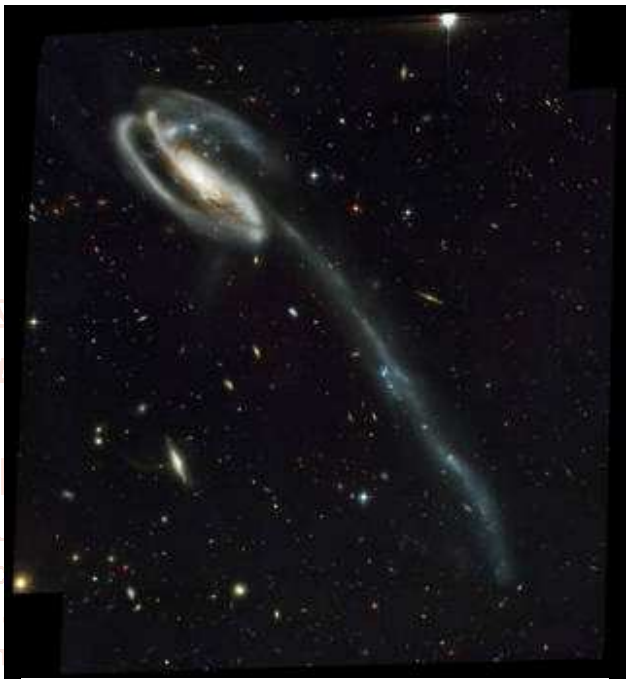


Electromagnetic spectrum shows that visible light is between infrared and ultraviolet radiation.

IV. COMPUTER SYSTEM AND DATA PROCESSING

Hubble's two primary computers are the 1.25 MHz DF-224 system (built by Rockwell Autonetics). Two repetitive NASA standard spacecraft computer and Model 1 systems were developed using diode transistor logic. Added co-processor for DF-224 which contains two redundant string of Intel based 80386 processor with 80387 math co-processor.

In addition, some scientific instruments have their own embedded microprocessors & control systems. Multiple Access Transponder Components (MAT-1 and MAT-2), uses the Hughes Aircraft CDP1802CD. WFPC (Wide Field and Planetary Camera) uses an RCA 1802 microprocessor.



The Hubble Space Telescope took this picture of the Tadpole Galaxy and its tail with the large bright blue star clusters.

V. OLDEST "CLOCK" TO MEASURE THE AGE OF UNIVERSE

With its powerful vision, NASA's Hubble has discovered the oldest burning star (HE 1523-0901) in the Milky Way galaxy. This old star has provided an independent reading of the age of universe without relying on the measurement of the universe's expansion.

The ancient white dwarf seen by Hubble dates back to 12-13 billion years.

Prior to this Hubble discovery, the first star was discovered less than a billion years after the Big Bang. Astronomers are well-placed to calculate the absolute age of the universe by estimating the age of this ancient star.

VI. SEARCH FOR CEPHEIDS

The justification for Hubble's development is to determine the age and size of the universe by observing the Cepheid variable in distant galaxies. Cepheid is a special type of variable star with constant and predicted brightness variations. The duration of these variations depends on the physical property of the Cepheid such as mass and brightness

Spiral Galaxy NGC 4603, which contains a Cepheid for distance measurements.

This means that by looking at the variation of light, astronomers can determine the physical nature of the Cepheid, which can then be effectively used to estimate the distance from Cepheid. For this very reason, cosmologists call Cepheid "standard candles."

Hubble on its side has given astronomers some extraordinary results. The Cepheid was then used to measure the distance for a Supernova, which gave a measure to scale the universe.

We know the age of the universe today with much greater certainty than before Hubble. It is about 13.7 billion years old.

VII. EXPANSION OF UNIVERSE

One of the main and core purpose of Hubble is to estimate the rate of expansion of universe, known to astronomers as the "Hubble Constant".

After 8 years of Cepheid observation, the conclusion was found that for every 3.26 million light years you see further in space, it increases exponentially at a speed of 70 km per second. Hubble's focus can be seen exploding stars billions of light years away, and it is impossible to study from other ground telescopes. The image taken from the ground telescope of the Supernova is usually mixed with the image of its host galaxy. The Hubble can distinguish lights from two sources and thus directly measure the supernova.

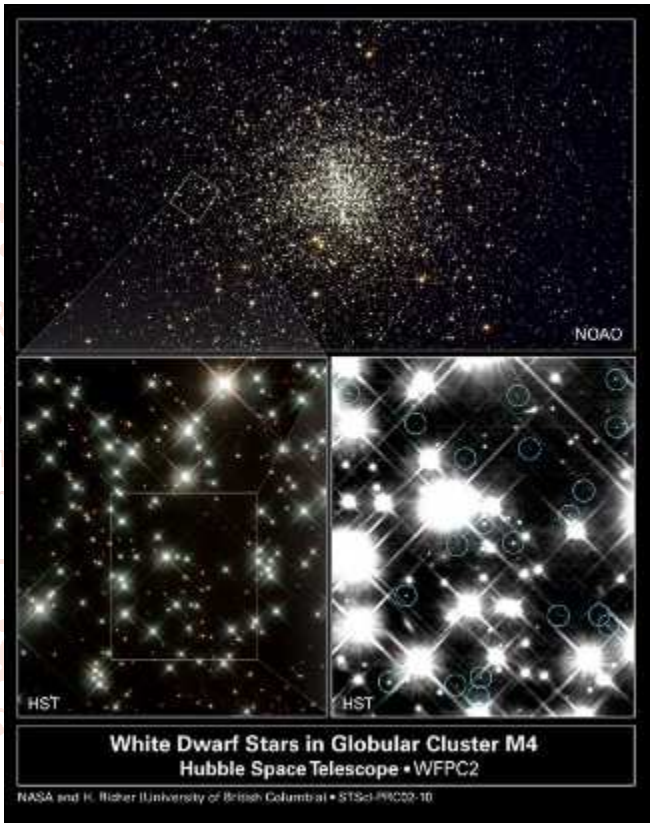
For many years, astronomers have discussed that whether the expansion of the universe will stop or continue ever slowly?

And from the results of the supernova, it is clear that there is nowhere to slow the expansion of the universe. Due to some property of the space called Dark Energy, expansion is accelerating and is ever increasing.

This conclusion came from combining measurements of Supernova with world's most top class telescope including Hubble. Furthermore, it was observed that COSMOS did not always accelerate, it began when the universe is less than half of its current age.

Supernova 1994D

Richter and his colleagues used a new age-dating observation using the Hubble to hunt the elusive ancient stars hidden inside the globular star cluster at 5600 light-years away. The new age-dating observation is very general, it is as simple as eltimating the campfire by measuring the heat & temperature of the coals. In the observation the "Coals" are white dwarf stars. White dwarf star cool down at a predictable rate, older the dwarf, the cooler it is and hence making it a perfect clock that has been ticking since the universe has existed. This approach is easier and relible than date-aging the oldest star still buring, this technique relies on complex calculations and models about how a star burns its nuclear fuel and ages. As a dwraf cool they go fainter, this required Hubble to capture many images of the ancient globular star cluster M4.The globular cluster M4 was selected for observation as this cluster is closer to Earth, so the white Dwarf is still bright enough to be picked up by Hubble.

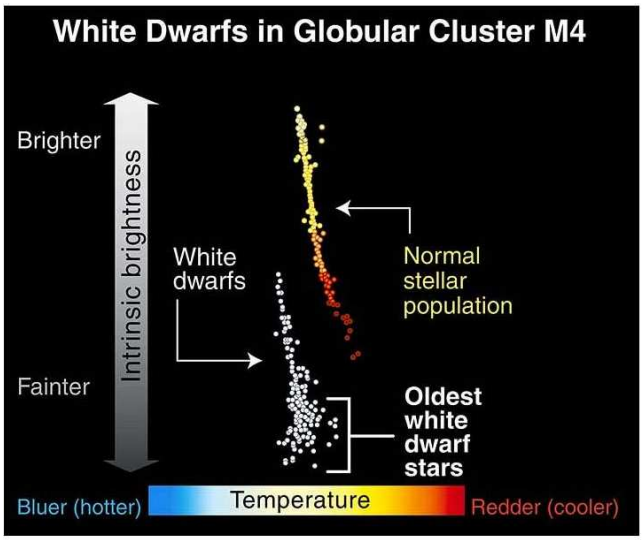


(Image of White dwarf stars in Global cluster M4)

According to Edwin Hubble's measurments, universe is uniformly expanding, that means the universe has a finite age which can be estimated mathematically by running the expansion backwards.

The age of universe is now calculated by the astronomers from a very precise measurement of the expansion rate. Using Hubble and other ground based observatories, astronomers discovered that the universe is not expanding at a constant rate rather accelerating due to an unknown repulsive force termed "Dark Energy". When the dark energy is taken as an important factor for measuring the universe expansion history, then the result arrives at 13-14 billion years and this age is now independetlyvarified with various observations. Thanks to Hubble.

"Stars could not be older than thr universe itself"



Pediction of age using Temperature of the stars

VIII. CONCLUSION

- Hubble is the largest telescope launched by the Discovery space shuttle in Lower Earth's Orbit (LEO). Hubble is solar powered & take pictures from above the haze of atmosphere. These images are of stars, planets and galaxies including detailed pictures of the birth and death of stars, galaxies billions of light years away
- Received images are in black & white shades. The Space Telescope Science Institute add colors to the image for various reasons. Sometimes colors are chosen to show how an object might looks according to a human eye. Other times, colors are chosen according to highlight any important detail or can be used to show the details that might otherwise be invisible to a human eye.
- With its powerful vision, NASA's Hubble has discovered the oldest burning star (HE 1523-0901) in the Milky Way galaxy. The ancient white dwarf seen by Hubble dates back to 12-13 billion years.
- For every 3.26 million light years you see further in space, it increases exponentially at a speed of 70 km per second. Due to some property of the space called Dark Energy, expansion is accelerating and is ever increasing.
- The globular cluster M4 was selected for observation as this cluster is closer to Earth. We know the age of the universe today with much greater certainty than before Hubble. It is about 13.7 billion years old.

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