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# GENESIS AND BLACK HOLE UNIVERSE: THE FOURTH DAY

**Prof. PhD. Tianxi ZHANG**,
Department of Physics, Chemistry, and Mathematics, Alabama A & M University,
Huntsville, Alabama 35762,
UNITED STATES,
Email: tianxi.zhang@aamu.edu

## ABSTRACT

*Papers I through III has fully and self-consistently addressed the first three days of Genesis according to the author's well-developed black hole universe model. In the first day, God created space and time, matter and motion, charge and fundamental forces, and energy and light for the infinite entire universe. Then, in the second day he hierarchically structured the entire universe by separating the matter and space with infinite layers bounded by event horizons and further formed our finite black hole universe. In the third day, God constructed the interiors of our black hole universe with planets, stars, galaxies, and clusters, etc. In this sequence of study as Paper-IV, we describe how God created our earth and solar system and generated lights including the Sun, the moon, and stars to give light to our universe and earth. The efforts of this systematic study on God's creative work during the first four days bridged the gap between Genesis and observations of the universe and brought us a scientific understanding of the Genesis. This innovative interpretation of Genesis also strongly supports the black hole universe model to be capable of revealing the mysteries of the universe.*

**Keywords:** Genesis; Cosmology; Black Hole; Universe;

## INTRODUCTION

Recently, the author has fully and self-consistently interpreted the first three days of Genesis [1-3], according to his well-developed black hole model of the universe [4-16]. Paper-I interpreted the first day of Genesis [1]. It was a long day that contained the entire time period for God to create the three-dimensional infinite (or formless) and dark empty space (called earth in the book of Genesis), to make the initial super fluidal matter (named as water in the book of Genesis) and fill it into the empty space, to power the matter with motion and hence start the time, to create the fundamental forces among matter and thus provide matter with inertia of motion, and to generate light or radiation so that switched the entire space or the grand universe from darkness to brightness or from night to day (i.e. evening to morning). In the first day, God created the first black hole, the infinite entire space or the grand universe, simply denoted by U.

Paper-II interpreted the second day of Genesis on the basis of the interpretation of the first day according to the black hole universe model [2]. In the second day, God structured the infinite entire space or universe that he created in the first day into layers by separating the waters (i.e. the matter or super fluidal substance that God initially made and filled into the space) with vaults, which in physics can be understood as event horizons. God did this work by only setting the light speed as the speed limit for any matter and particles in the world of matter. From the infinite entire universe, which has infinite large radius and mass and

  

infinitesimal density and temperature, to our finite black hole universe, which has finite mass, radius, density, and temperature, there are infinite layers, which are structured hierarchically and governed by the same fundamental laws of physics. In the second day, God structured the entire universe to have the infinite layers, mathematically represented by U = {…{F, F, F, ...{G, G, G, ...{A, A, A, ...{S, S, S, ...{C, C, C, ..., C} } } } }…}, in which {C, C, C, …., C} = O is our finite black hole universe [2].

Paper-III interpreted God's work in the third day in constructing the interiors of our finite black hole universe [3]. The work includes the formation of celestial objects by gathering the waters or gravitationally collapsing the initial super fluidal matter under the sky or inside the even horizon of our black hole universe. These formed celestial objects could be stars and planets called dry grounds or lands, in which matter is not in the water state any more, and galaxies and clusters called, respectively, seas of stars and seas of galaxies. Stars luminously shine on (or give off energy to) the world of matter when fusion occurs after particles of matter were assigned with the property of waves or the ability of quantum tunnelling of the Coulomb barrier. God further selected one land (i.e. our earth) for plants to grow and then for humans to live. In the third day, God constructed the interiors of our black hole universe to breed C, the child universes, which refer to star-like, massive, supermassive black holes.

In the book of Genesis, the first through fifth sections of the first chapter describe the first day's work by God on creating the entire universe with matter and light, while the sixth through eighth sections of the first chapter describe the second day's work by God on structuring the entire universe with layers. The ninth and tenth sections of the first chapter describe the third day's work by God on constructing the interiors of our finite black hole universe with stars, planets, galaxies, clusters etc. The first two days were the days of the entire universe, rather than our earth day (i.e. 24 hours), which is only the time needed for our earth to make one self-rotation about its axis. In the first two days, the Sun, planets including our earth, moon and even the interiors of our finite black hole universe were actually not formed and placed yet, and thus it is meaningless to say the earth day. The third day was the day of our finite black hole universe. During this day the interiors of our universe such as stars, planets including our earth and moon, galaxies, and clusters were created and constructed.

This paper as Paper IV further self-consistently explain God's work in the fourth day in forming our solar system including planets, comets, and asteroids. Planets may have their natural satellites such as the moon of our earth, and making lights including the Sun, the moon, and stars to give light to the universe as well as to our earth. To the universe, God made light emitters (stars including the Sun) and light reflectors (planets including their moons) to be lights that light our black hole universe and brought the universe from darkness or night without lights to brightness or day with lights. To our earth, God created two great lights: the Sun and the moon, which governed the day and the night of our earth, respectively. The Sun emits light and the moon reflects the light that the Sun emitted. Other stars serve as tiny lights to our earth for the night by placing them at large distances in the vault or within the event horizon. To the other stars and planets of the universe, God made them with similarities to the Sun, earth, and solar system. In the fourth day, God made lights to our black hole universe and created solar system including the earth and moon to prepare homeland for human to live and plants to grow.

With overall of this sequence of study, we aim at an attempt to develop author's newly well-developed black hole universe or cosmological model, for revealing the mysteries

  

of the universe and wiping out the discrepancy between science of cosmology and the book of Genesis. It provides a new interpretation of Genesis and meanwhile supports the black hole universe model in terms of Genesis. Through this effort, we will demonstrate the black hole universe model to be not only scientific because it reveals truths and self-consistently explains observations of the universes, but also philosophical because it is complete and simply answers questions and overcomes difficulties without any non-testable hypothetical entities, and further theological because it is biblical and innovatively interprets the Genesis of the bible.

## 1. GENESIS AND BLACK HOLE UNIVERSE: THE 4th DAY

In this section, we interpret the fourth day of Genesis according to the black hole universe model. We again apply the New International Version (NIV) of the bible [17].

### *1.1. Creating Lights for Our Universe*

*[14]And God said, "Let there be lights in the vault of the sky to separate the day from the night, and let them serve as signs to mark sacred times, and days and years,"*. Here, God furthered his work to make the stars and planets including their natural satellites such as the moon of our earth, which were created or constructed in the third day, to be lights that can emit (from their photospheres if stars) or reflect (by their surfaces if others) light, which here especially refers to the visible light, in our black hole universe (i.e. in the vault of the sky or within the event horizon) to separate the day from the night (i.e. from the darkness to the brightness). Figure 1 shows the lights or stars in the universe. As the black hole universe model described, the mass of the universe is about $8\times10^{52}$ kg or $4\times10^{22}$ solar masses, consistent with observations that indicate that our universe contains hundred billions of galaxies and each galaxy contains hundred billions of stars.

Fig. 1: The universe and stars (credit: www.universetoday.com). Our universe contains hundred billions of galaxies, each galaxy contains hundred billions of stars, each star can have a number of planets revolving around, and each planet may have some natural satellites orbiting around. Stars emit light and planets and their satellites reflect stars' light. They are all lights to give light to the universe and our earth.

  

Since the time (initiated by God in the first day) is a measure of change or motion, these lights created can serve as signs to indicate times, days, seasons, and years based on their relative motions. For instances, the map or relative position of constellations around the northern star or Polaris can serve us as a clock of seasons. Figure 2 shows the Dipper clock, whose pointer from the last two stars of the Big Dipper to the Polaris points or tells us the month of the year according to a formula: the time equals the Dipper clock reading subtract two times the number of month after March 6. In addition, the redshifts of light from stars, galaxies, and clusters can indicate the distances or times (including days and years) that the light has travelled. The changes of luminosities of supernovae can also show the times elapsed.

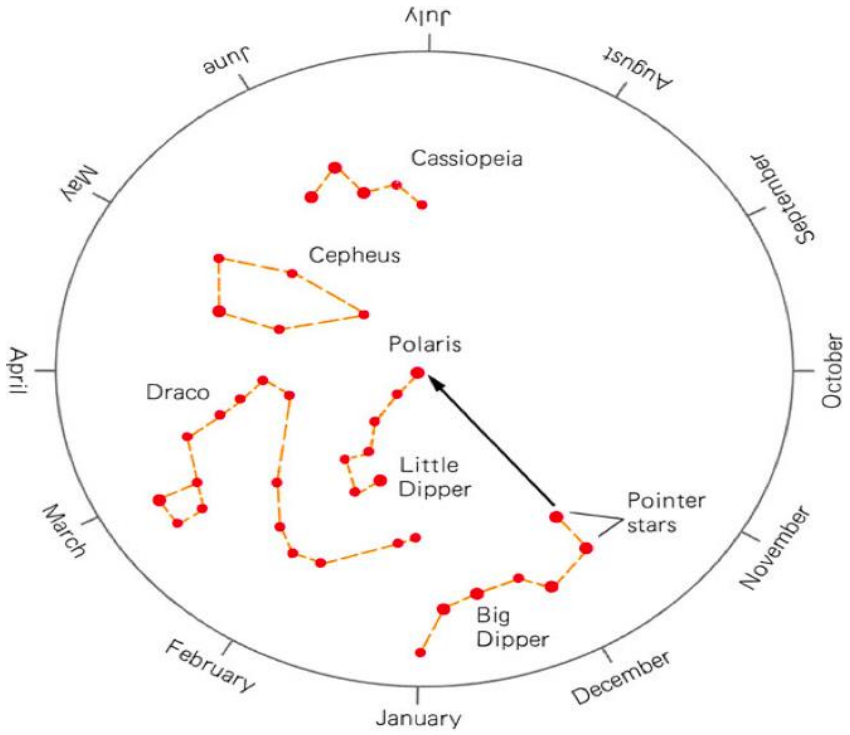


Fig. 2: The Dipper clock of seasons (credit: The McGraw-Hill Companies, In.). The pattern of constellations apparently appeared in association of the Polaris with seasons of the year. The night sky changes with the seasons. The star pointer from the head (or the last two stars) of Big Dipper to the Polaris points to the month (thus the season) of the year.

Nuclear fusions in the cores of stars do not directly emit visible light. It is known that each proton-proton fusion reaction forms a deuteron with emissions of a positron and a neutrino that all carry total energies of 17.6 MeV. Then, the proton-deuteron fusion produces a helium-3 ($^3$He) and meantime emits a gamma ray, which has frequency much higher than that of visible light. Since the positron ($\beta^+$) decay of diproton is rather rare, a star including the Sun can slowly fuse its core protons for billions of years. Recently, the author has indicated that the $\beta^+$ decay may be not rare enough and the plasma oscillations or waves generated in the hot and turbulent core can play the role in opposing the proton-proton fusion reaction [18-19]. All of the visible lights from stars are actually emitted by the photospheres, in which atoms are excited or energized from the energy of nuclear fusion in the cores of stars. Letting the energy of photons of visible light to be equal to about the thermal energy of the photosphere, one can estimate the temperature of the photosphere in an order of magnitude about $10^4$ Kelvins, thousand times lower than the temperature of the core.

According to the quantum theory or Bohr's model, the atomic spectrum of hydrogen can be represented by the Bohr's wavelength expression. Figure 3 shows the atomic spectrum of hydrogen with the spectral lines in different series, in which the visible light belongs to the Balmer series, emitted when the excited hydrogen atoms when they change their energies to the first excited states. There are 118 elements discovered in the nature and labs. Their atoms, whether ionized or not, can emit various lines of spectra with more complicate series. A star, like the Sun, usually has its atmosphere that comprises the chromosphere, transition region, corona, and heliosphere, which can be seen when the main part of the star or the photosphere is hidden.

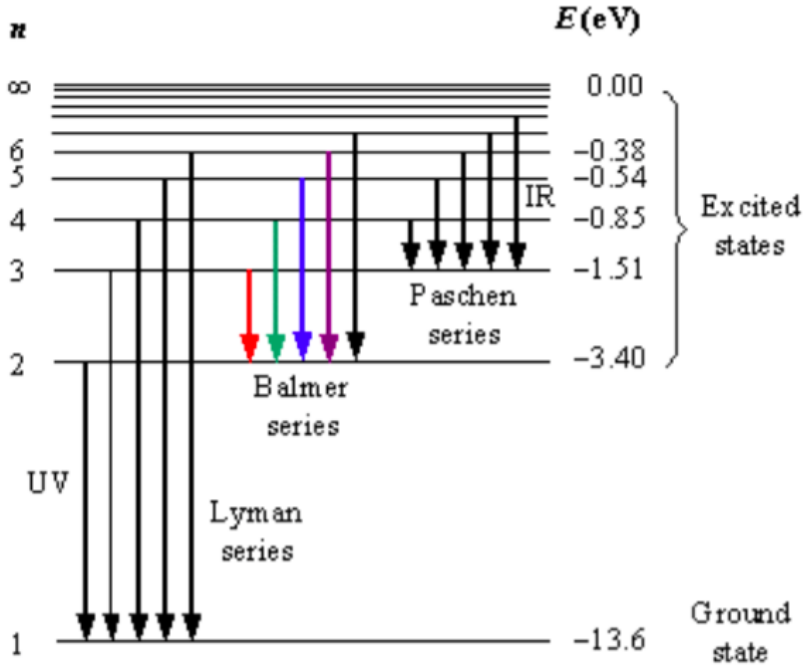


Fig. 3: Energy and spectrum of hydrogen atom [20]. When a hydrogen atom changes its state or energy from one to another, it emits a photon. The spectrum of the hydrogen atom falls into different series such as Lyman series in the UV frequency region, Balmer series in the visible light frequency region, and Paschen series in the infrared frequency region.

***1.2. Creating Solar System with the Sun, Our Earth, and Moon***

*"[15]and let them be lights in the vault of the sky to give light on the earth." And it was so. [16]God made two great lights—the greater light to govern the day and the lesser light to govern the night. He also made the stars. [17]God set them in the vault of the sky to give light on the earth, [18]to govern the day and the night, and to separate light from darkness. And God saw that it was good. [19]And there was evening, and there was morning—the fourth day.*

Then, God let the lights created in the universe to give light on the earth. God further created our solar system (Figure 4) and made two great lights for the earth. The greater light is the Sun, which emits light from its photosphere and governs the day. The lesser light is the moon, which reflects the sunlight and governs the night. To our earth, the day and night governed by the Sun and moon are the earth day and night. This was made by placing the Sun at the center of the solar system, enabling our earth to be revolving around the Sun once a year (or 365 earth days) and meantime spinning itself about its own axis once a day (or 24 hours), and making the moon to be revolving around the earth once about every 27.3 earth days. God satisfied his work in the fourth day. It was a day to prepare the earth for plants to

  

grow and for lives, especially human, to live. Before the creation of lights to give off light to our black hole universe (in the vault of the sky) and on the earth, everywhere in our black hole universe, including on the earth, was darkness i.e. there was the evening. After the creation of lights to give off light to our black hole universe and to our earth, everywhere in our black hole universe, including on the earth, becomes brightness and thus there was the morning.

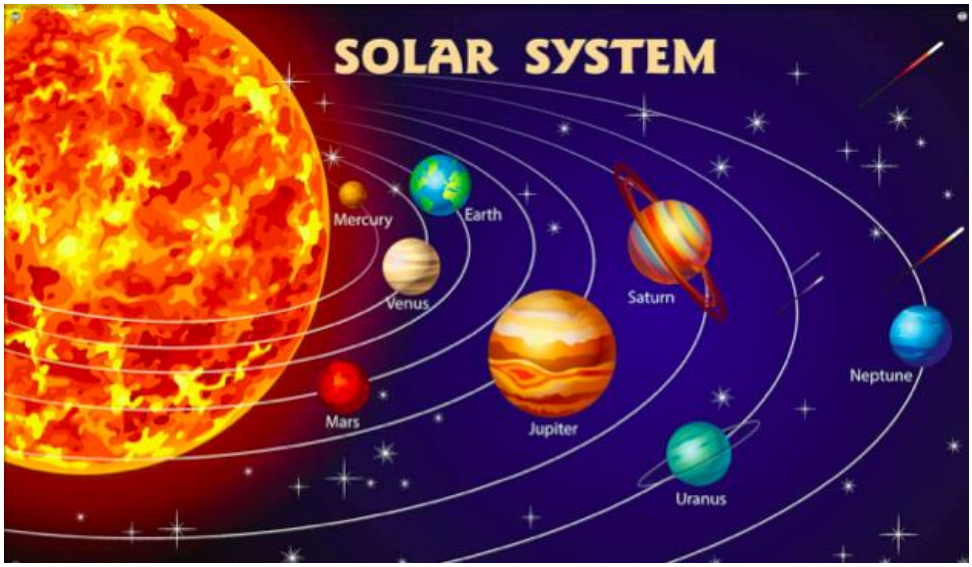


Fig. 4. The solar system (credit: amazon.com banner photos). The Sun is located at the center of the solar system with eight planets, five dwarf planets, thousands of comets, and billions of asteroids revolving around. Some planets own their natural satellites such as the moon, the only natural satellite of the earth. Jupiter has 79 confirmed natural satellites.

The Sun is our star and lies at the heart of the solar system. It holds 99.8% of the solar system's mass with luminosity of about $3.85\times10^{26}$ W, mainly electromagnetic radiation, especially visible light, from its photosphere and powered by the nuclear fusion of $3.6\times10^{38}$ protons per second to helium nuclei in its core. There are eight planets revolving around the Sun and our earth is the third planet with a distance of $1.49\times10^{11}$ m (or one AU) from the Sun. In addition, there are also five dwarf planets, thousands of comets, and billions of asteroids observed to be revolving around the Sun. The Sun is one of more than 100 billion stars in the Milky Way. It orbits some 25,000 light-years from the galactic core, completing one revolution every 250 million years. Except for emitting light, the Sun also releases a constant stream of electrically charged particles or plasma called solar wind that mostly consists of electrons, protons, and helium nuclei with speed reaching about 250-750 km/s at a distance of more than a few solar radii and trace amount heavy ions or atomic nuclei such as C, N, O, Ne, Mg, Si, Fe, and so on [21]. The solar wind that originates from coronal holes is usually flowing faster, temperature higher, and density lower than that originates from the equator region. The tails of comets are resulted from interactions by the solar wind. Considering planets to be all embraced by the solar wind, the author recently proposed the space charging model for the origin of planetary magnetic fields [22]. It provides a self-consistent and alternative explanation for the present magnetic fields of Moon, Venus, Mars, and Pluto, and the relative magnetic fields or moments of Mercury, Earth, Jupiter, Saturn, Uranus, and Neptune (Figure 5). The present dynamo model does not self-consistently explain why smaller sized Mercury and Mars can develop dynamos but the Venus cannot. The geomagnetic field plays the essential role in protecting and maintaining Earth's

  

atmosphere and environment weather.

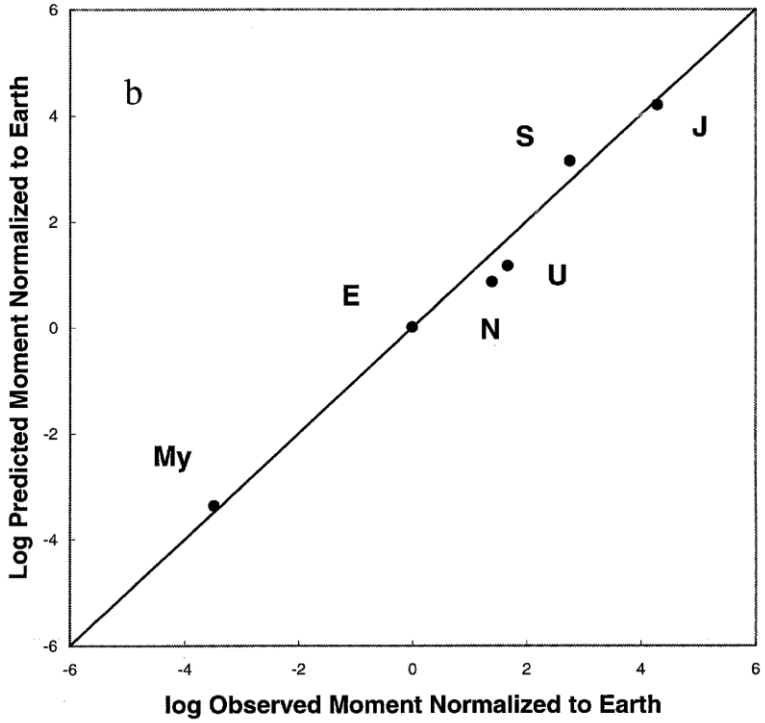


Fig. 5: The planetary magnetic moments normalized to the earth predicted by the space charging model are plotted as functions of those measured by observations [22]. Results self-consistently explained magnetic fields of Mercury, Earth, Saturn, Jupiter, Uranus, and Neptune.

The earth is our planet with mass about $6\times10^{24}$ kg and radius about $6.4\times10^{3}$ km. It is the third (or fifth largest) planet in the solar system and has distance from the Sun about $1.49\times10^{11}$ m. About 30% of its surface is land, while the remaining part covers by water. The earth atmosphere consists mostly of nitrogen and oxygen by 78% and 20%, respectively, plus 0.9% argon, 0.04% carbon dioxide, and trace amount of other gases. It has five major layers, which are, from lowest to highest, troposphere, stratosphere, mesosphere, thermosphere, and exosphere. The earth weather mostly happens in the lowest layer, troposphere, while the highest layer, exosphere, merges with the solar wind.

The earth is our human's homeland, the only place in the universe where we know for certain that life exists. By adding excess carbon dioxide, a major greenhouse gas, which traps infrared radiation from going out to space, human activity, which happens mostly in the lowest layer, troposphere, is greatly affecting the climate and weather in the earth's atmosphere and causing the blue planet global warming. Figure 6 shows the beautiful image of our earth, a blue planet, from space. God selected the earth for plants to grow and for animals, especially human beings, to live by getting energy about 1.37 kW per square meter from the Sun.

  

Fig. 6: The earth from space (image credit: NASA/JPL). Its surface is mostly covered by water, so that is called blue planet. The green part shows plants on land and white clouds are full of atmosphere.

The moon is Earth's only natural satellite, as the lesser light, which gives light for our earth and governs the night via reflecting the sunlight. It has diameter and mass to be about 1/4 and 1/80 of the earth, respectively, orbiting the earth at an average distance about 30 times the earth radius every 27.3 earth days. The moon is tidally locked to the earth since its near side always faces the earth. Its gravity is the major cause of the tides of the earth ocean waters to be rising and falling twice of each daily. The moon has phases since the illuminated portion that we see changes as it orbits the earth. As the earth also revolves the Sun, the period of the lunar phases is about 2.2 days longer than the time needed to make one revolution around the earth. Figure 7 shows the eight phases of the moon, from a new moon to the full moon and back to another new moon, taking 29.5 earth days. Chinese calendar is lunisolar, created on the basis of the astronomical observation of the Sun's longitude and phases of the moon. In this Chinese calendar, a common year has 12 months while a leap year has 13 months. A small month has 29 days, while a big month has 30 days.

The full moon is always around the 15$^{th}$ and 16$^{th}$ of the month, while the waxing crescen moon is always around the 3$^{rd}$ and 4$^{th}$ of the month. The moon as like the Sun has played an important role in the world culture and human civilization. For instance, in Chinese tradition, the full moon is a symbol of peace, prosperity, and family reunion. Mooncakes are made and eaten during the Mid-Term Festival on August 15$^{th}$ in each year. In 1969, the NASA spacecraft Apollo 11 first landed humans on the moon.

  

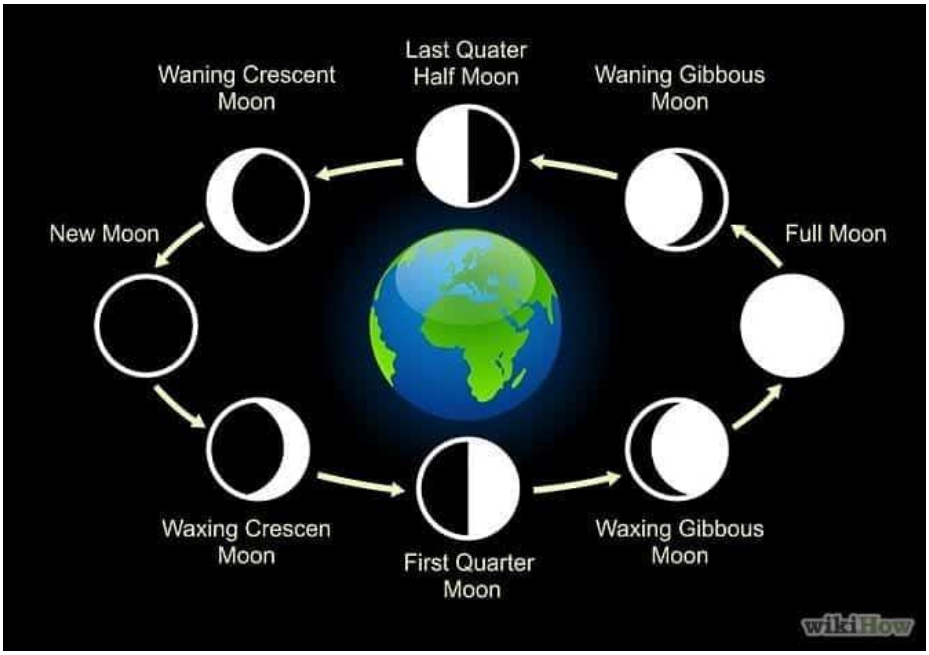


Fig. 7: Eight phases of Moon from new moon to full moon and back to new moon (credit: physicsinmyview.com). The illuminated portion that we who are standing on the earth can see varies the shape in a period of about 29.5 earth days.

Except for the sunlight and solar wind, another two fundamental solar phenomena or emissions that severely affect the space weather system of the earth environment are coronal mass ejections (CMEs) and solar energetic particles (SEPs) with energy of some MeV/nucleon, accelerated in solar flares and by CME-driven shocks. These SEP and CME events can cause solar radiation storms, geomagnetic storms, aurora, and so on (Figure 8). CMEs are ejections of materials including plasma and magnetic field from the solar corona to heliosphere in hundreds to thousands of kilometers per second [23]. According to the magnetic properties, the CMEs observed at 1AU can be classified into two categories: (1) flux-rope CMEs and (2) non-flux-rope CMEs. Statistically, about 1/3 of CMEs are associated with magnetic clouds, whose local magnetic structure is that of a flux rope, while other 2/3 of CMEs are associated with complex ejecta, which are not flux ropes and have disordered magnetic fields [24]. The SEPs are high-energy particles including electrons and ions (or elemental nuclei) and also have two distinct categories: (1) impulsive SEP events and (2) gradual SEP events [25]. The gradual SEP events are associated with flux-rope CMEs and accelerated by CME-driven shocks. The Impulsive SEP events are usually enriched in $^{3}$He and plasma waves with frequency about harmonics of the $^{3}$He-cyclotron frequency are believed to play essential roles in these solar $^{3}$He-rich events [26]. The magnetic topologies that lead to these two types of SEP events are very different. The magnetic reconnections produce the magnetic topology of impulsive SEP events if they occur partially on the coronal open field lines and the magnetic topology of gradual SEP events if they occur entirely on the coronal closed field lines. In other words, gradual SEP events originate from the closed magnetic field regions, while impulsive SEP events originate from the open field regions. Solar X-ray and plasma outflow jets are produced with similar magnetic reconnection and topology to impulsive SEP events [25,27].

  

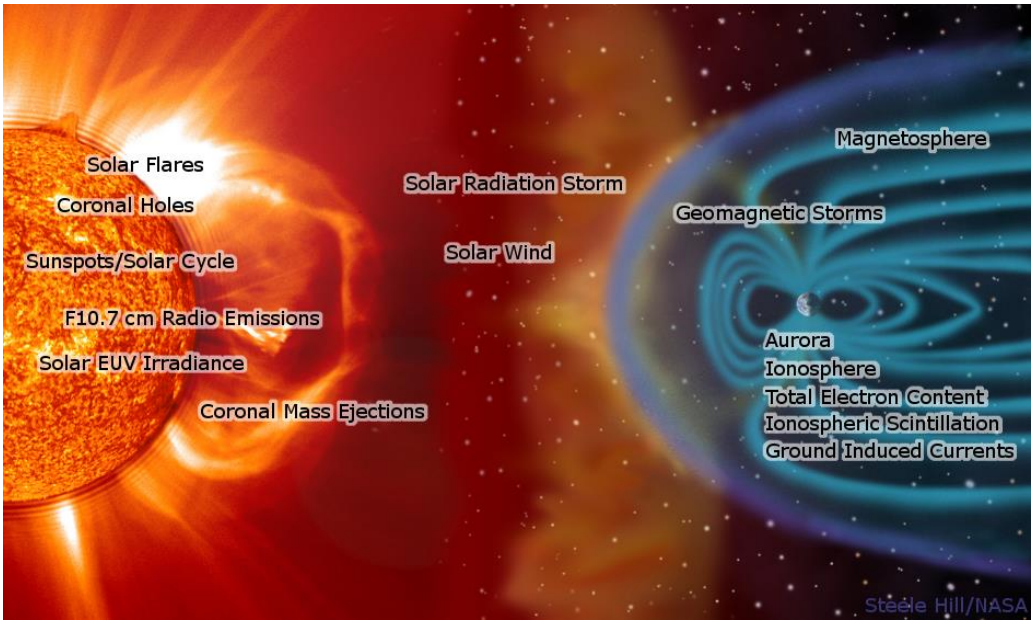


Fig. 8: Space weather phenomena (credit: www.swpc.noaa.org) between the Sun and Earth. Solar wind along with coronal mass ejections and solar energetic particles, accelerated in solar flares and by CME-driven shocks severely impact space weather environment near the earth and cause solar radiation storms, geomagnetic storms, etc.

On the CMEs, the author and his colleagues comprehensively simulated both flux-rope and non-flux-rope CMES with a well-developed 2.5-dimensional magnetohydrodynamic (MHD) model [27-30]. The MHD simulations start from the solar wind streamer solution, in which the magnetic field lines above the equator by about three solar radii are opened. The magnetic field lines at the low corona (below about three solar radii) near the equator are still closed. During a solar minimum or with an inactive solar dynamo, the solar corona appears as a large magnetic dipole-configuration streamer magnetic topology. By emerging a magnetic flux rope from the photosphere to the solar corona in the closed field region, the simulation initiates a flux-rope CME and produces the magnetic topology that leads to a gradual SEP event. By emerging a flux rope from the photosphere to the solar corona at the open field line region near the closed magnetic field lines, the simulation initiates a non-flux rope CME and produces the magnetic topology that leads to an impulsive SEP event. Physically, the magnetic field of the emerged flux rope has an opposite polarity with the background open field and the location of the magnetic flux emergence is at the edge of a coronal hole. Figure 9 plots magnetic topology and its evolution of a flux-rope CME (left panel), and plasma density image and its evolution of a non-flux-rope CME (right panel), obtained from the MHD simulations.

  

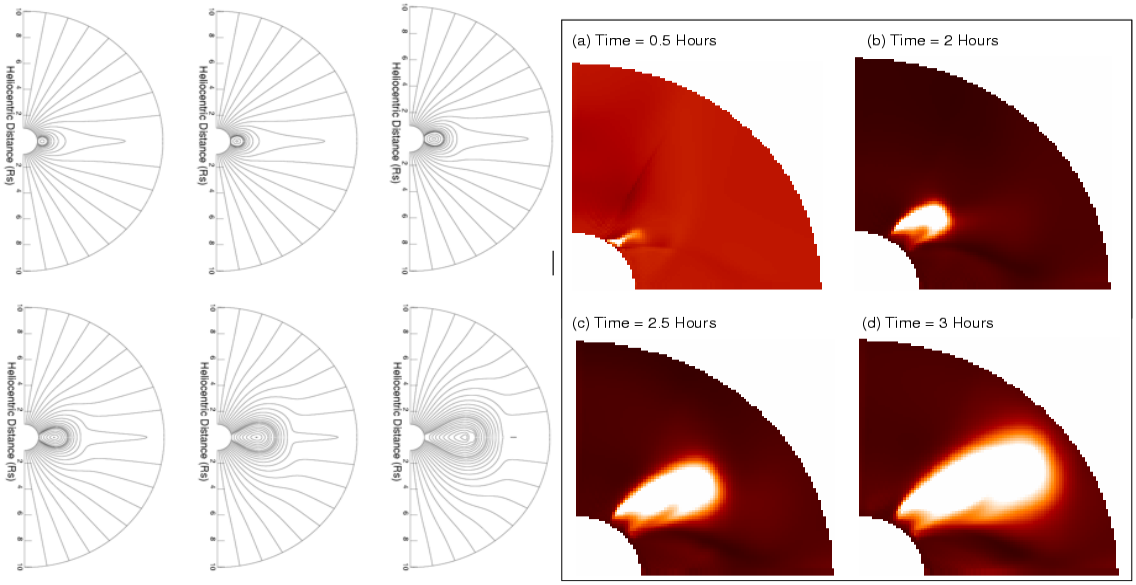


Fig. 9: Left panel plots magnetic topology and its evolution of a flux-rope CME that is produced from the MHD simulation when a magnetic flux emerges from the closed field line region in the coronal streamer [28-29]. Right panel plots images of plasma density for a non-flux rope CME to be initiated from the MHD simulation by the magnetic reconnection at the coronal base in the open field region or coronal hole near the closed magnetic field lines [27,30].

On the SEPs, the author successfully developed a complete common acceleration mechanism for $^3$He and heavy-ion enrichments in impulsive SEP events [31-32]. It consists of two processes or stages of particle acceleration (the left panel of Figure 10). In the first process or stage, $^3$He and heavy ions with appropriate charge states are preferentially heated by current-driven electrostatic ion-cyclotron waves via harmonic resonances; while in the second process or stage, those preferentially preheated $^3$He and heavy ions with velocity or energy above a threshold (the right panel of Figure 10) are further accelerated to high energies (MeV per nucleon) in a flare acceleration mechanism triggered due to magnetic reconnections. It was shown that current-driven electrostatic H-cyclotron waves could be destabilized at frequency twice the $^3$He-cyclotron frequency and thus can preferentially heat $^3$He via the second harmonic resonances and heavy ions via the third harmonic resonances. The author further self-consistently interpreted various aspects of heating and acceleration of $^3$He, $^4$He, H, electrons, heavy ions, including C, N, O, Ne, Si, Mg, and Fe elemental nuclei, and ultraheavy ions with an atomic number greater than fifty ($Z > 50$) in the most frequently occurred SEP events [33-42]. In comparison to Fisk's $^4$He-cyclotron waves, Zhang's H-cyclotron waves are: (1) more easily excited (or are excited by lower currents), (2) excited in more reasonable coronal plasma conditions, (3) more efficient at heating $^3$He and heavy ions, and (4) resonating heavy ions with higher charge states and thus, more consistent with measurements. The author first numerically solved the dispersion relation of H-cyclotron waves. Figure 11 plots the real frequencies and growth rates (i.e. positive imaginary frequencies) of H-cyclotron waves as functions of parallel and/or perpendicular wavenumbers. It shows that H-cyclotron waves are likely excited by currents at frequency about twice the $^3$He-cyclotron frequency and thus efficiently heat $^3$He ions via the second harmonic resonances and heavy ions with appropriate charge states via the third harmonic resonances. The preferential heating of $^3$He and heavy ions by H-cyclotron waves leads to

  

more $^3$He and heavy ions to be selected to further accelerate in solar flares to high energies and produces solar $^3$He-rich events. Quantitatively studying the preferential heating of $^3$He and heavy ions by H-cyclotron waves and the selective acceleration of the preheated $^3$He and heavy ions above threshold, the author has self-consistently explained various aspects and measurements of solar $^3$He-rich events [31-42]. The million tons of $^3$He in the regolith of the moon surface soils are due to direct bombardments and deposits of solar $^3$He-rich events. The measurements that $^3$He and heavy-ion spectra of solar $^3$He-rich events are very similar strongly prefer to support this two-stage common acceleration model [43].

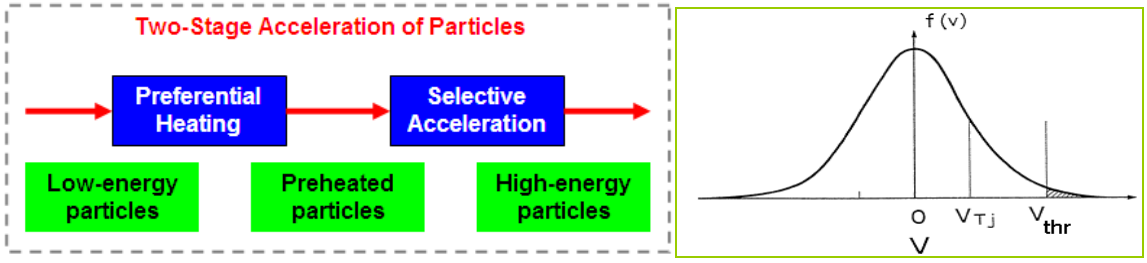


Fig. 10: Schematic diagrams for the two-stage model of preheating and selective acceleration of particles that have preheated above the threshold velocity.

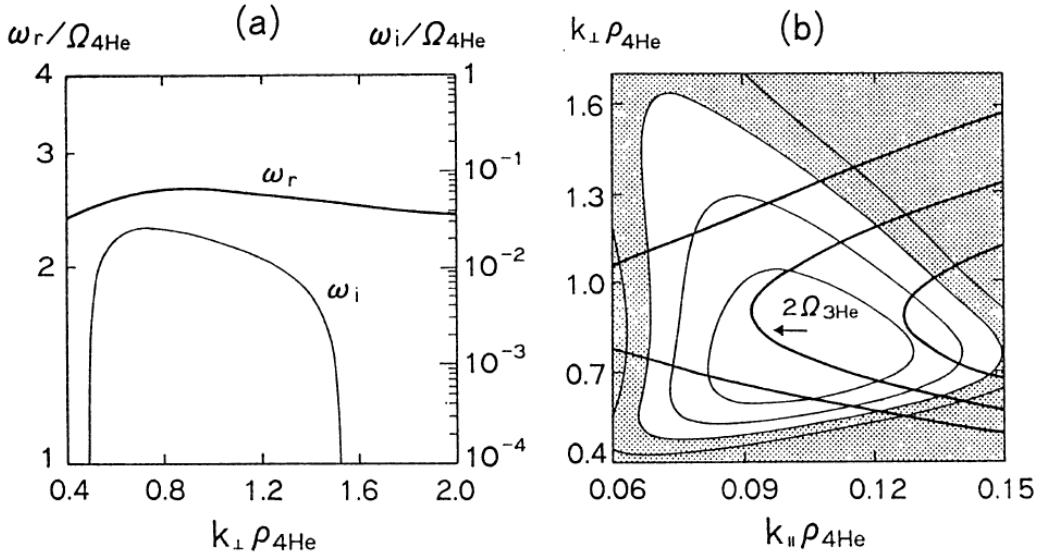


Fig. 11. Dispersion relation of current-driven electrostatic H-cyclotron waves [36]. Left panel plots the real and imaginary frequencies as a function of the perpendicular wavenumber with a fixed parallel wavenumber. Right panel plots the contours for real and imaginary frequencies in the parallel and perpendicular wavenumber plane.

## CONCLUSION

We have interpreted the fourth day of Genesis as the day of lighting stars to our black hole universe and our earth, creating solar system, and placing the Sun and the moon as the greater and lesser lights to light the earth and thus to govern the earth day and night, respectively. God created an appropriate weather environment system of the earth for plants to grow and for human beings and any animals to live. Not only does the Sun emit light to provide energy to warm the earth and blow solar wind to originate the geomagnetic field, but also it produces CMEs and SEPs that disturb the space weather. The tilt of Earth's rotation to the orbit leads to the weather on the earth to be seasonal. The rotation of the moon around the earth leads to the phases of the moon.

  

**BIBLIOGRAPHY:**

[1] Zhang, T. X., "Genesis and Black Hole Universe: The First Day", *International Journal of Theology, Philosophy, and Science*, 6 (2020), 54-67

[2] Zhang, T. X., "Genesis and Black Hole Universe: The Second Day", *International Journal of Theology, Philosophy, and Science*, 7 (2020), 5-19

[3] Zhang, T. X., "Genesis and Black Hole Universe: The Third Day", *International Journal of Theology, Philosophy, and Science*, 8 (2021), 5-18

[4] Zhang, T. X., "A New Cosmological Model: Black Hole Universe", *American Astronomical Society 211th Meeting*, Abstract #152.04 (2007)

[5] Zhang, T. X., "A New Cosmological Model: Black Hole Universe", *Progress in Physics*, 5 (2009), 3-11

[6] Zhang, T. X., "Cosmic Microwave Background Radiation of Black Hole Universe", *Astrophysics and Space Science*, 330 (2010), 157-165

[7] Zhang, T. X., "Quasar Formation and Energy Emission in Black Hole Universe", *Progress in Physics*, 3 (2012), 48-53

[8] Zhang, T. X., "Key to the Mystery of Dark Energy: Corrected Relationship Between Luminosity Distance and Redshift", *Progress in Physics*, 9 (2013), 33-38

[9] Zhang, T. X., "A New Mechanism for Gamma Ray Bursts: Emissions of Dynamic Black Holes", *Proceeding of Gamma Ray Burst 2013 Symposium*, SNSN-323-63 (2013)

[10] Zhang, T. X., and Frederick, C. "Acceleration of Black Hole Universe", *Astrophysics and Space Science*, 349 (2014), 567–573

[11] Zhang, T. X., "Gamma Ray Bursts of Black Hole Universe", *Astrophysics and Space Science*, 358 (2015), article id. #14, 8 pp

[12] Zhang, T. X., Nika P., and Guggilla P., "Energy and Spectra of Gamma Ray Bursts from Mergers of Binary Black Holes", *Gamma-Ray Burst Symposium*, article. Id. 4028.pdf (2016).

[13] Zhang, T. X., "Principle of Spacetime Black Hole Equivalence", *Progress in Physics*, 12 (2016), 353-361

[14] Zhang, T. X., Wilson, C., and Schamschula, M. P., "X-Ray Flares Sagittarius A* and Black Hole Universe", *Progress in Physics*, 12 (2016), 61-67

[15] Zhang, T. X., "Mach's Principle to Hubble's Law and Light Relativity", *Journal of Modern Physics*, 9 (2018), 433-442

[16] Zhang, T. X., "The Principles and Laws of Black Hole Universe", *Journal of Modern Physics*, 9 (2018), 1838-1865

[17] New International Version of the Bible, www.biblehub.com/niv /genesis/1.htm.

[18] Zhang, T. X., "The Role of Plasma Oscillation Played in Solar Nuclear Fusion", *Progress in Physics*, 17 (2021), 93-98

[19] Zhang, T. X., "Gamow Theory for Transmission and Decay of Unbound Diprotons", *Progress in Physics*, 17 (2021), 151-154

[20] Griffiths, D. J., *Introduction to Quantum Mechanics*, Prentice Hall Press, (1995)

[21] Parker, E. N., "Dynamics of the Interplanetary Gas and Magnetic Field", *Astrophysical Journal*, 128 (1958), 644-676

[22] Zhang, T. X., "A Space Charging Model for the Origin of Planets' Magnetic Fields", *Progress in Physics*, 15 (2019), 92-100

[23] Forbes, T. G. et al., "CME Theory and Models", *Space Science Review*, 123 (2006), 251-302.

[24] Gosling, J. T., Thomsen, M. F., Bame, S. J., and Zwickl, R. D., "The Eastward Deflection of Fast Coronal Mass Ejecta in Interplanetary Space", *Journal of Geophysical Research*, 92 (1987), 12399-12406

[25] Reames, D. V., "Particle Acceleration at the Sun and in the Heliosphere", *Space Science Review*, 90 (1999), 413-491

[26] Fisk, L. A., "$^3$He-Rich Flares - A Possible Explanation", *Astrophysical Journal*, 224 (1978), 1048-1055

  

[27] Zhang, T. X., "MHD Simulation for the Origin and Magnetic Topology of Solar $^3$He-Rich Events", *Astrophysical Journal*, 677 (2008), 692-698

[28] Wu, S. T., Zhang, T. X., et al., "Numerical Magnetohydrodynamic (MHD) Experiments for Testing the Physical Mechanisms of Coronal Mass Ejections (CMEs) Acceleration", *Solar Physics*, 225 (2004), 157-175

[29] Wu, S. T., Zhang, T. X., M. Dryer, Feng, X. S., and Tan, A., "The Role of Magnetic Reconnection in CME acceleration", *Space Science Review*, 121 (2005), 33-47

[30] Zhang, T. X., and Wu, S. T., "MHD Simulation of Non-Flux Rope Coronal Mass Ejections", *Journal of Geophysical Research*, 114 (2009), A05107.

[31] Zhang, T. X., "Solar $^3$He-Rich Events and Ion Acceleration in Two Stages", *Astrophysical Journal*, 449 (1995), 916-928

[32] Zhang, T. X., "Solar $^3$He-Rich Events and Electron Acceleration in Two Stages", *Astrophysical Journal*, 518 (1999), 954-965

[33] Zhang, T. X., "Solar $^3$He-Rich Events and Energy Spectra of Particles Accelerated in Two Stages", *Journal of Geophysical Research*, 108 (2003), 1031

[34] Zhang, T. X., "An Explanation for Huge Enhancements of Ultraheavy Ions in Solar $^3$He-Rich Events", *Astrophysical Journal Letters*, 617 (2004), L77-L80

[35] Zhang, T. X., "Preferential Heating of Particles by H-Cyclotron Waves Generated by a Global Magnetohydrodynamic Mode in Solar Coronal Holes", *Astrophysical Journal Letters*, 597 (2003), L69-L72

[36] Zhang, T. X., and Ohsawa, Y., "$^3$He-Enrichments by Magnetosonic Waves in Solar $^3$He-Rich Events", *Solar Physics*, 158 (1995), 115-137

[37] Zhang T. X., and Wang, J. X., "An Explanation for Large Enrichments of Nitrogen Relative to Carbon and Oxygen in Solar $^3$He-Rich Events", *Astrophysical Journal Letters*, 588 (2003), L57-L60

[38] Zhang, T. X., and Wang, J. X., "Double-Power-Law Energy Spectra of Electrons from Solar $^3$He-Rich Events", *Astrophysical Journal Letters*, 613 (2004), L165-L168

[39] Zhang, T. X., Toida, M. and Ohsawa,Y., "Oblique Ion Acoustic Wave Instabilities in a Multi-Ion Plasma and $^3$He-Rich Events", *Journal of the Physical Society of Japan*, 62 (1993), L2545-L2548

[40] Zhang, T. X., Wang, J. X., and Tan, A., "Solar $^3$He-Rich Events and Abnormal Enhancements of Heavy-Ion Isotopes Accelerated in Two-Stages", *Journal of Geophysical Research*, 110 (2005), A12111

[41] Zhang, T. X., Wang, J. X., and Xiao, C. J., "Resonant Heating of Ions by Parallel Propagating Alfven Waves in Solar Coronal Holes", *Chinese Journal of Astronomy and Astrophysics*, 5 (2005), 285-294

[42] Broaden, A., Zhang, T. X., Edwards, V. M., Tan, A., Winebarger, A., Zhang, J., and Wu, S. T., "The Roles of Electromagnetic Ion Cyclotron Waves in Solar $^3$He-Rich Events", *Journal of Atmospheric Solar-Terrestrial Physics*, 97 (2013), 22-28

[43] Mason, G. M., Nitta, N. V., Wiedenbeck, M. E., and Innes, D. E, "Evidence for a Common Acceleration Mechanism for Erichments of 3He and Heavy Ions in Impulsive SEP Events", *Astrophysical Journal*, 823 (2016) 138, 9

  