# Holy Kaaba Circumambulation in the Predominant Motion Direction

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**Abstract.** Muslims from all over the world go on pilgrimage to Mecca to circumambulate the Holy Kaaba. This closed path movement can be done in the clockwise or counterclockwise direction. The choice of the direction of Muslims is counterclockwise which is the direction followed by the heavenly bodies. Closed path motion- spinning upon the self or revolving around a central object has been surveyed for satellites, planets, comets, stars, and galaxies from online sources. Relevant Quranic verses and Hadith pieces have been mentioned in support of the movement direction of the giant objects. Muslims should learn science in the light of the Quranul Hakim and Hadith.

**Introduction.** Millions of Muslims from all over the world go to Hajj every year. Besides, thousands of Muslims perform the tawaf all the time of the year. Going around the Holy Kaaba is the central ritual in the performance of Hajj or Umrah. The direction of circumambulation is anti-clockwise. The reference point is in the anticlockwise direction after Hajre Aswad corner which comes after the Rukne Yamanee (Fig. 1) corner moving in the anticlockwise direction.

Simply going around the Kaaba in the clockwise direction would just possibly be for the sake of going around it. It would not comply with the most common direction of rotation and revolution of other creations in the universe that express loyalty to Allah by maintaining harmonious relations. This anti-clockwise direction of motion is like the universal direction of motion from the macroscopic to the microscopic world. This counterclockwise direction is, so to say, universal in the Grand design of Allah.

Any motion is described relative to an observer. Motions can be in open or closed tracks, the latter being the most common. Passengers from a swiftly and uniformly (no changes of direction along with no increase or decrease of speed) moving train find the outside scenery moving backward and they are stationary. Spectators outside the train find the opposite picture. Mathematically, both are right. While standing on the left of a wheeled vehicle, anti-clockwise wheel rotation takes in the forward direction and the clockwise rotation in the opposite direction, a right-side observer sees just the opposite. The right-side observer's observation is in consistent with the left side observer's observation. Other similar examples may be cited here.

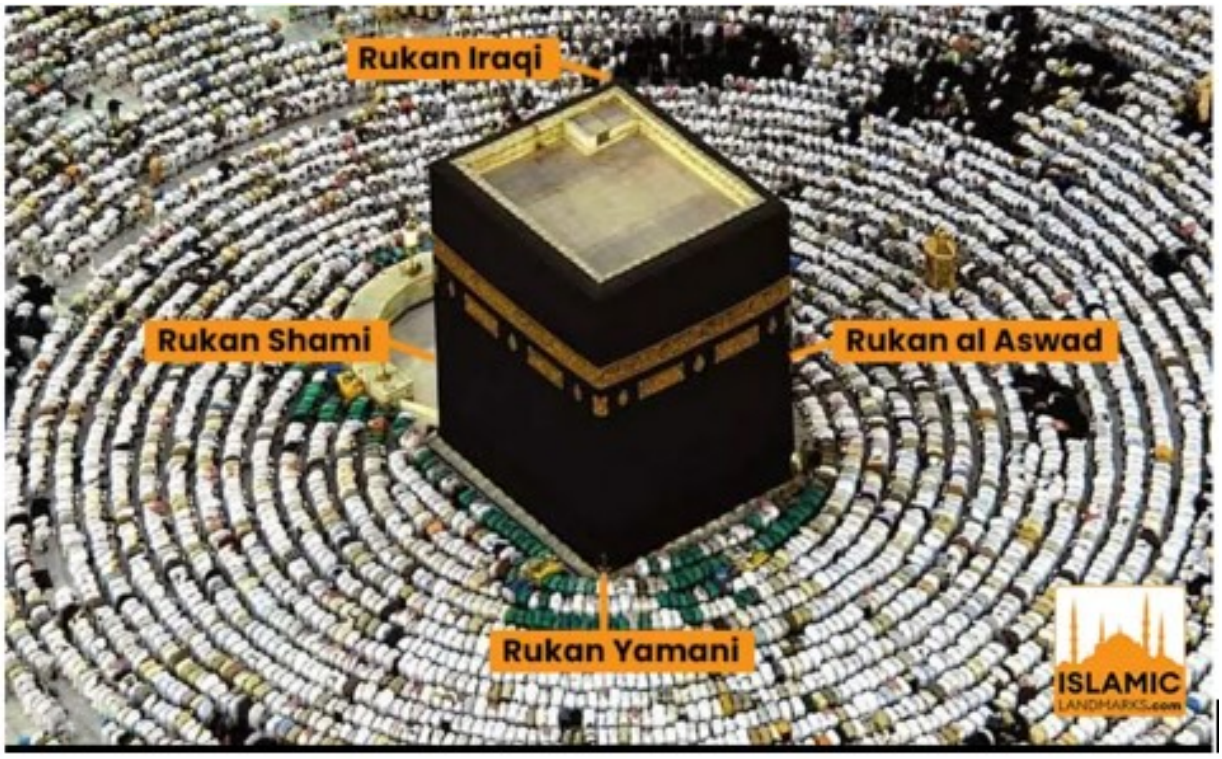


Fig. 1. The names of the corners of the Kaaba (https://www.islamiclandmarks.com/rukan-yamani/)

Electrons are the mobile carriers of electric charge in electric circuits (Fig. 2). In an electric circuit, electrons move from the negative terminal of the battery through the connecting wires, load resistances, etc. to the positive terminal of the battery to complete the circuit. By convention of current flow, it is taken that positive charges flow from the positive terminal of the battery through the connecting wires, load resistances, etc. to the negative terminal of the battery. And this convention is in complete consistent with the actual electron flow situation. If the actual thing is replaced by its opposite one, to maintain the consistency, this kind of direction change appears. In the world of paired creation, the opposite of the opposite puts back to the original one or its equivalent.

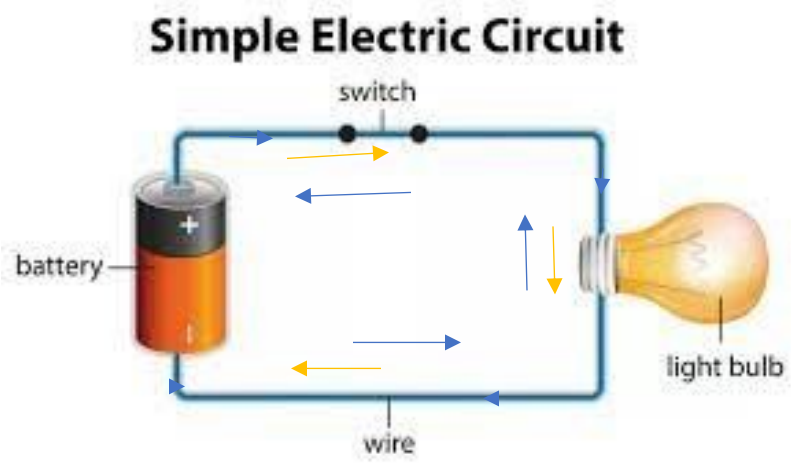


Fig. 2. Positive charge carriers (indicated by yellow arrows) moving from the positive terminal of the battery in the anti-clockwise direction is equivalent to negative charge carriers (indicated by green arrows) moving from the negative terminal in the clockwise direction (https://www.wondriumdaily.com/electric-circuits-components-types-and-related-concepts/)

For projectiles, spinning brings stability in the sense of being less affected by the surrounding conditions. For this case, too, the observation from the direction opposite to which anticlockwise spin appears for forward motion, clockwise spin appears for forward motion. Every change has an effect.

For the solar system, without going into a finer analysis, it can be said that in general, the planets move from west to east with respect to the stars which is the motion in the anticlockwise direction.

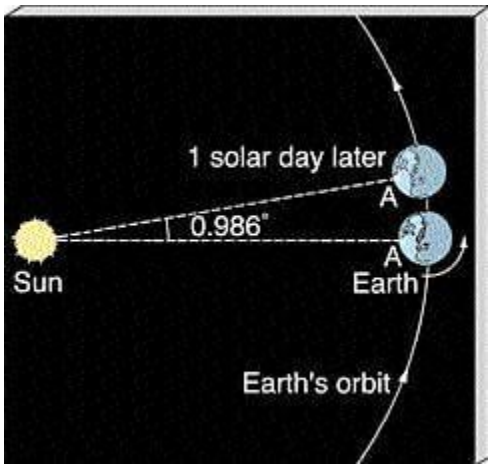


Fig. 3. Planet Earth's motion around the Sun in the anticlockwise direction. Its spin direction is also shown in the anticlockwise direction (http://www.astro.psu.edu/users/caryl/a10/lec2_2d.html).

**Astronomical Observations.** To study the directions of spin and revolution of heavenly bodies, let us take our planet first. Scientists find the Earth spins like a top in the anti-clockwise direction in 23.9345 hours. It completes around the Sun a merry-go-round trip in 365.256 days moving at 29.8 kilometer in one second (Fig. 3). It has a third motion which is precession. It precesses like a falling top. In the beginning, a moving top is upright. As its energy decreases, gravity applies a toque that causes its head to wobble (Fig. 4). Likewise, the Earth's axis wobbles (Fig. 4) (not because of energy decrease). The motion is repeated in every 26,000 years. This motion makes the North Pole star to be different. The Polaris is the North Pole star and is located within 1/2 degree of the pole. In 3,000 B. C., the north pole of the Earth was pointing near Thuban, a star in the constellation called Draco (the Dragoon). In 14,000 A. D., the North Pole will be pointing near the star Vega in the constellation Lyra (Fig. 5). Star configuration in the sky is taken as the reference point in the counting of one complete spin upon itself or revolution around another object. After one complete spin or revolution, the same star configuration in the sky comes back. Fig. 6 illustrates all the three motion of our planet. Any difference of direction from the opposite hemisphere will be consistent with the observed anticlockwise motion of the Earth viewed from the Northern Hemisphere.

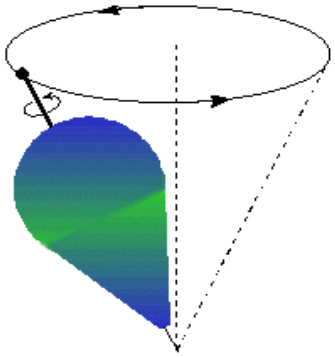

Fig. 4. Precession of spinning top that traces the surface of a cone. It spins and wobbles in the anticlockwise direction (http://www-istp.gsfc.nasa.gov/stargaze/Sprecess.htm)

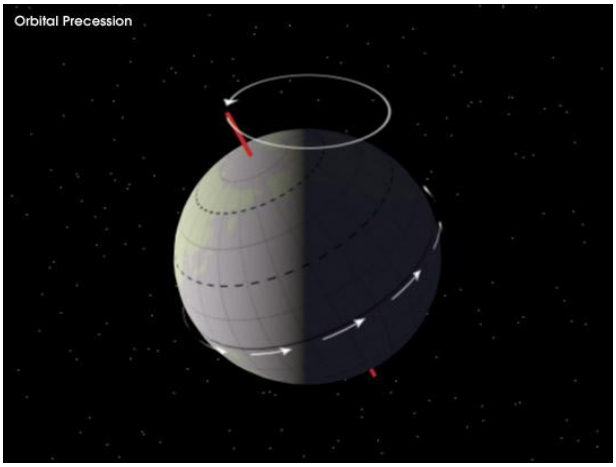

Fig. 5 Wobbling of the Earth's axis in the anti-clockwise direction. Its spin direction is also shown to be anticlockwise (http://earthobservatory.nasa.gov/IOTD/view.php?id=541).

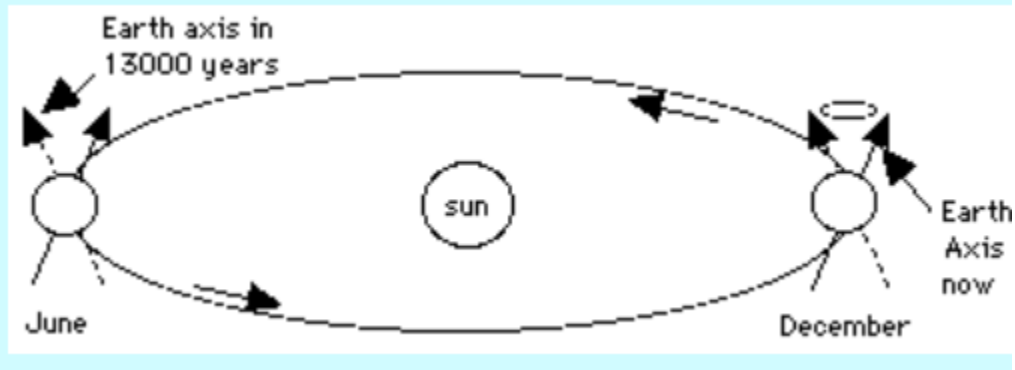


Fig. 6. Rotation, revolution, and wobbling of the Earth in the anticlockwise direction (http://www-istp.gsfc.nasa.gov/stargaze/Sprecess.htm).

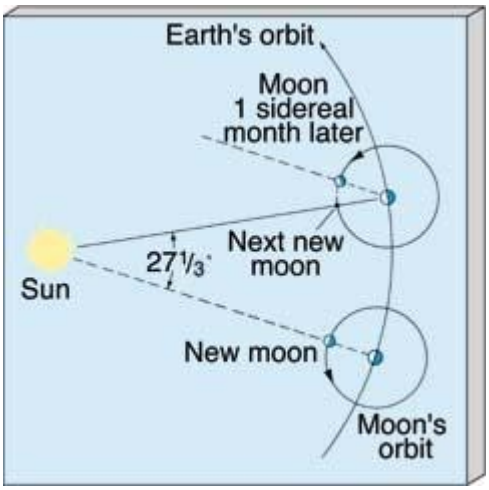


Fig. 7. Motion of the Earth and the moon around the Sun in the anti-clockwise direction is shown. The moon completes one spin by the time it completes one revolution around our planet (http://www.astro.psu.edu/users/caryl/a10/lec2_2d.html).

The Moon spins upon itself in the anticlockwise direction. The Moon goes on a merry-go-round trip around the Earth in the counterclockwise direction (Fig. 8). Its speed in the merry-go-round trip is 3,680 km in one hour. Its spinning and revolution times around us are the same – 29.5 days. This effect is called 1-to-1 spin-orbit coupling that is completing one spin by the time of completion of one revolution. It may be mentioned that Mercury has 3-to-2 spin-orbit coupling meaning completion of three spins in two revolution periods.

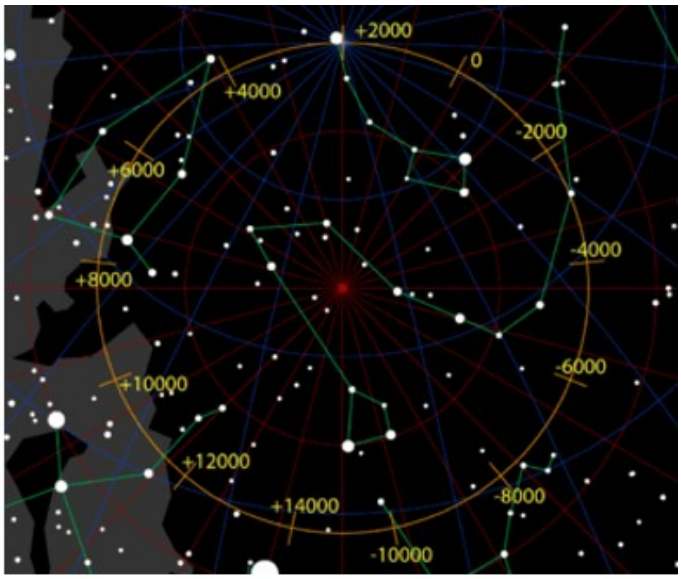


Fig. 8. Earth's North Pole pointing to different stars in course of 26,000 years. The years 3000 BC is in between -4000 and -2000 marks on the circle swept by the North Pole in the sky (celestial sphere). The Pole star is marked near +2000 AD. The year marks 3000 BC which is -3000, 2000 AD which is +2000, and 14000 AD which is +14000 are in the anticlockwise sense in the figure (http://en.wikipedia.org/wiki/Axial_precession_(astronomy).

About other planets in the solar system, Figs. 9 & 10 illustrate the terrestrial and Jovian planets.

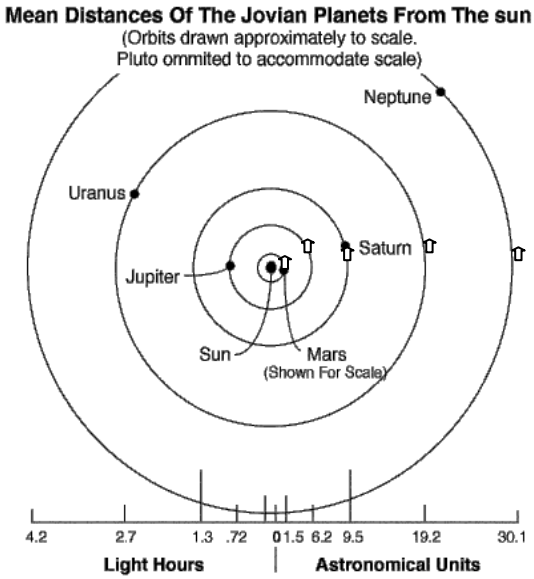


Fig. 9. Planets and their moons revolve around the sun and spin upon their axes in the anticlockwise direction. If light minutes are multiplied by the speed of light of $3 \times 10^8$ m/s, the product will be in the usual distance unit. Similarly, if the astronomical units are multiplied by

the miles equivalent to an astronomical unit, the product will be in miles (www.solarviews.com).

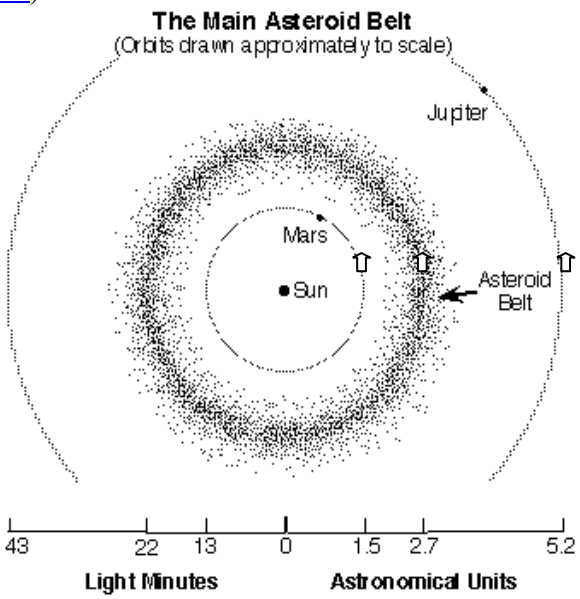


Fig. 10. Anticlockwise motion of planets Mars and beyond. If light minutes are multiplied by the speed of light, the product will be in the usual distance unit. Similarly, if the astronomical units are multiplied by the miles equivalent to an astronomical unit, the product will be in miles (www.solarviews.com).

All other planets and their satellites except Uranus spin and move in the counterclockwise direction. It is only Uranus that spins in the clockwise direction. Uranus is said to have retrograde motion – it spins in the direction opposite to its revolution direction.

Asteroids are called minor planets. Their orbits are located between the orbits of Mars and Jupiter (Fig. 11). Ceres is the largest asteroid. Only Ceres, Pallas, and Vesta have diameters greater than 300 km. As of May, 2002, 39,462 asteroids have been confirmed and 125,000 more pending.

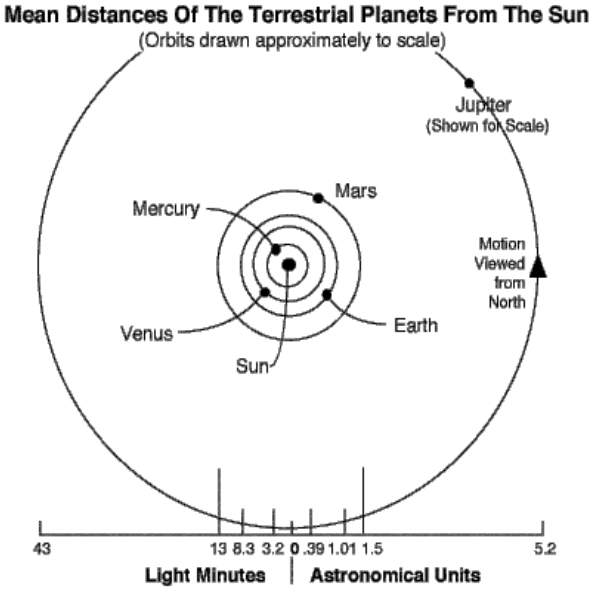

Fig. 11. Asteroids go round the sun in the anticlockwise direction. (www.solarviews.com)

Comets are another type of objects that go round the Sun in the anti-clockwise direction (Fig. 12). Comets are Kuiper belt (the space from Pluto out 500 Sun-Earth distance from the Sun) bodies. An estimated 200 million Kuiper belt comets are believed to exist. Out of this huge number, 530 have been located.

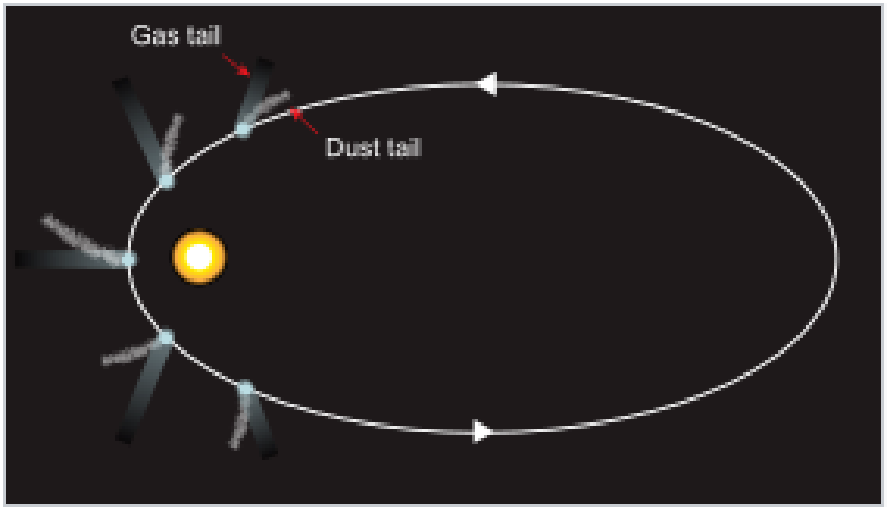


Fig. 12. A cometary orbit (https://en.wikipedia.org/wiki/Comet)

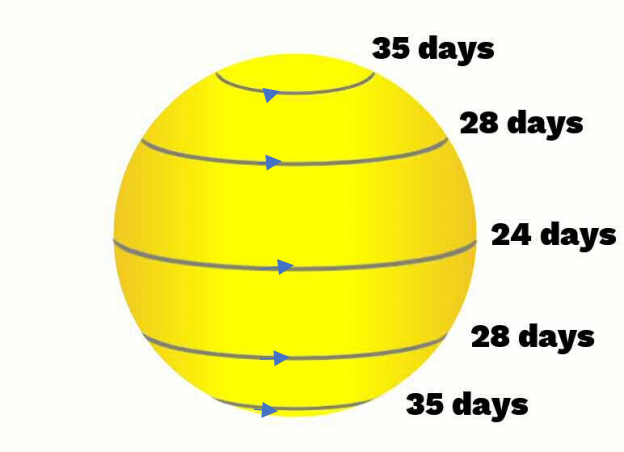


Fig.13. Spinning of the Sun (https://astronomyrookie.com/is-the-sun-spinning/)

The Sun spins too. The Sun is not a solid body. It does not have any bounding surface. Its fluid medium undergoes differential rotation. That is different parts undergo rotation cycles in different times. The equatorial part of the Sum makes one spin in 24 days. It takes 35 days for parts near the pole to make one spin. The Sun is not known to have retrograde motion.

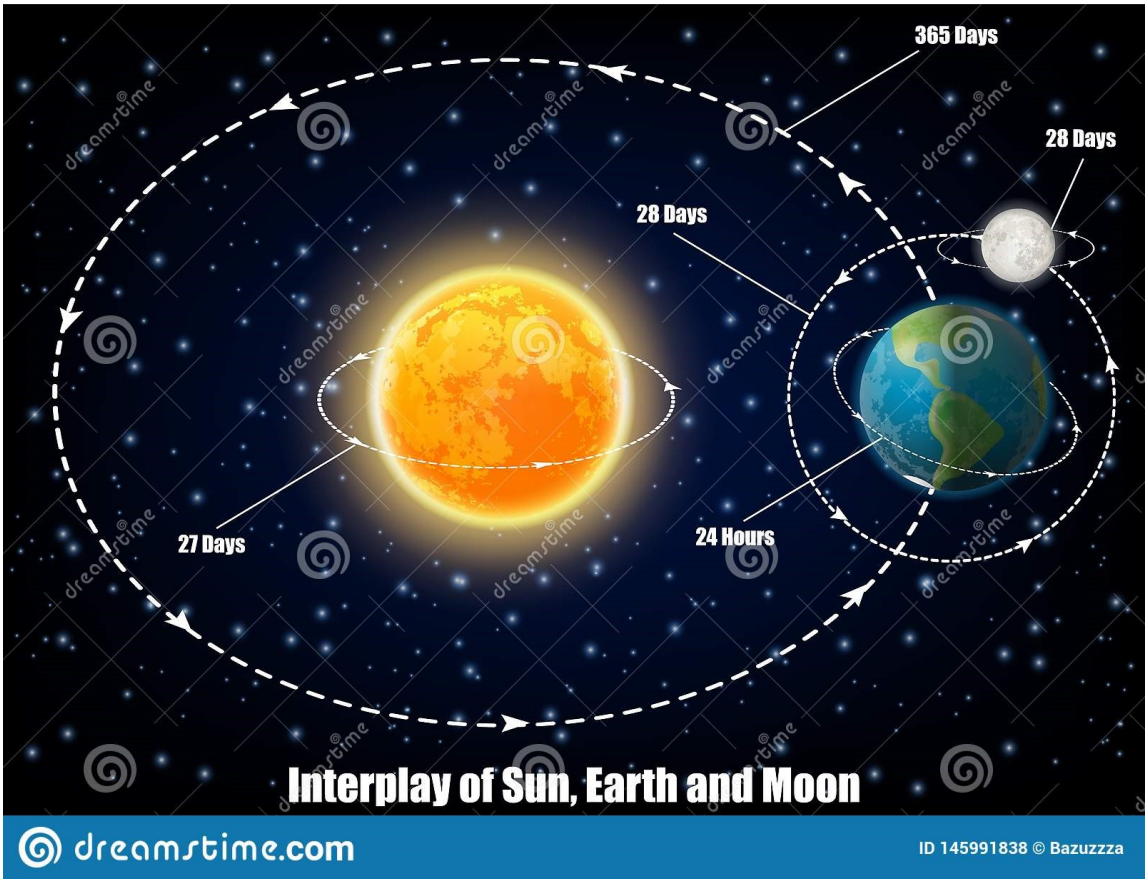


Fig. 14. Rotation and revolution of the Sun, the Earth, and the Moon (https://www.dreamstime.com/interplay-sun-earth-moon-vector-educational-poster-diagram-scientific-infographic-presentation-turnover-period-movements-image145991838)

Planets beyond our solar system are exoplanets. These are planets that revolve around other stars. These exoplanets outnumber rogue planets that orbit around the galactic center. Rogue planets are free-floating in that they are not tied to any stars. Exoplanets sizes vary- larger than Jupiter gas giants to small Earth size or Mars size rocky. They can be as hot as boiling metal or as cold as ice. Their revolution time around the parent star can be as short as a few days. Exoplanets, too, move in the counterclockwise direction around the parent star (Fig. 15). There are more than 5,300 exoplanets discovered.

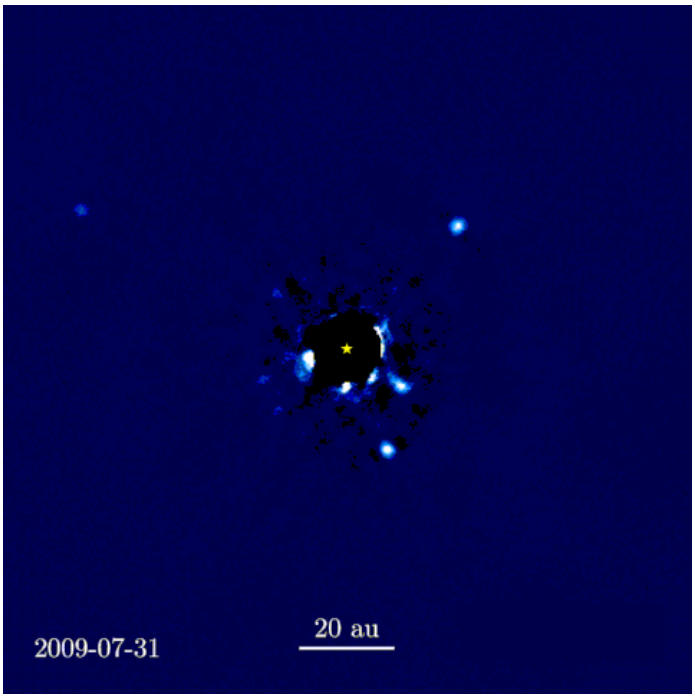


Fig. 15. Counterclockwise motion of exoplanets around the parent star. This is not a real time picture or video.( https://en.wikipedia.org/wiki/Exoplanet) (Click on the picture if it is stationary)

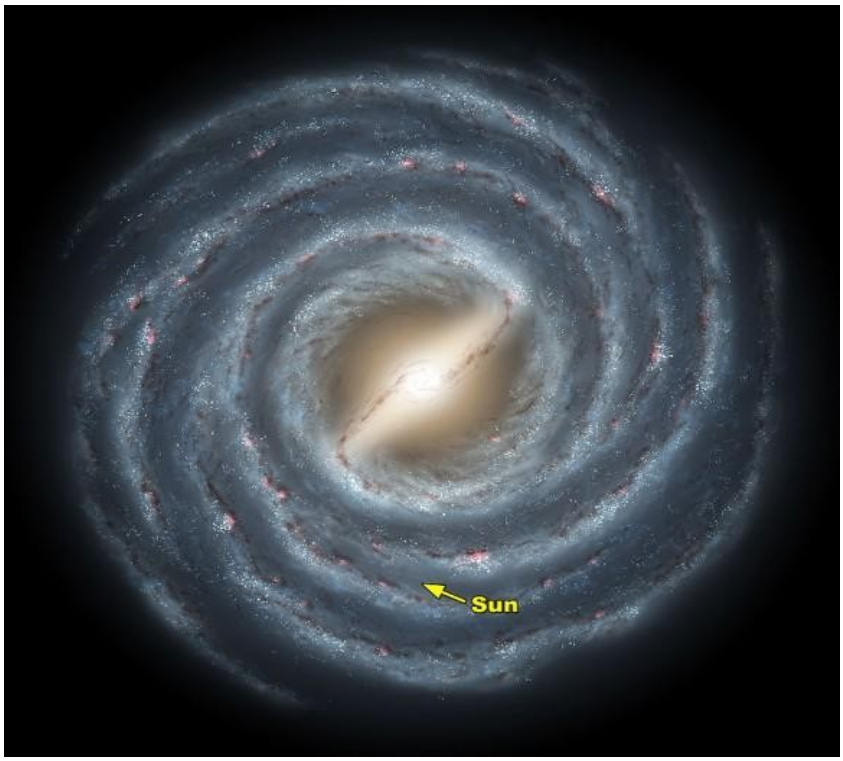


Fig. 16. Milky Way Galaxy. Position of the Sun is shown (www.universettoday.com)

The Sun is located about 25,000 light years from the center of our Milky Way galaxy (Fig. 16). One light year is approximately 6 trillion miles. The Sun goes on a merry-go-round trip around the center of the Milky Way galaxy. The Sun moves about ½ million miles in one hour in the merry-go-round trip. It takes about 200 million years to complete one round. The Sun is one of about 200 billion stars in our Milky Way galaxy. An unaided eye can detect about 6000 stars in the sky, and in the dark sky that lies above the horizon, about 3000 stars can be detected at any time. Allah states in the Quran, "So, I swear by the setting of the stars (75), And verily, that is indeed a great oath, if you but know" (76) (Surah Al-Waqia, 56:75-76). The apparent illusory motion of the rising and setting of the Sun and other stars is due to the Earth's anticlockwise spin motion.

The galactic spin direction depends on our perspective. If the face-on view from the top appears anticlockwise, the face-on view from the bottom will appear clockwise. To convince oneself, one can draw an anti-clockwise rotation direction on a piece of paper and can look at it from the underside of the paper. From the isotropic nature of the universe, astronomers believe 50% of the galaxies spin clockwise and another 50%spins counterclockwise.

The harmony of the motion direction in the macroscopic world comes in the understanding of the verse "Neither it is possible for the sun to overtake the moon, nor for the night to outstrip the day: each swim along in its own orbit" (Sura Yasin, 36:40). The grand harmony will be at stake if either one of the two uniquely visible bodies – the Sun and the Moon - race for overtalking each other. They are loyal to Allah through the law of gravitation. Similarly, the day and night that have characteristic durations, cannot go or be beyond fixed limit. If the Earth would reverse the spin direction, the night could outstrip the day.

From the Earth, the Moon is located 233,810 miles away, and the Sun is located 93 million miles away. Observed from the Earth, the Moon's path through the constellations (Fig. 17) is close, in angular measure, to the Sun's path. The Moon's path is within 8 degrees (above and below) of the Sun's path in the sky. The underlying cause of the day and the night is the spin motion of the Earth. If there is no spin motion, there are no days and nights. If the spinning rate increases that is shorter time is taken for a spin, quicker succession of days and nights will appear. Outstripping of days by nights or by nights by days can occur if the spin direction flips – anticlockwise to clockwise and back to anticlockwise and so on. It may also happen through variations of spin periods. Such things are not permitted for those heavenly bodies. A grand discipline is universally prevalent.

Like the example of swiftly moving train passengers and the spectators on the ground given, we on the Earth think that we are stationary, and the Sun is moving around us. As the Earth revolves around the Sun in the anti-clockwise direction, we find different stars far, far away at the background of the Sun. The nearest star Proxima Centauri- is about 25 trillion miles away from us. The stars in the constellation are even farther away. It is the motion of the planet Earth that makes different stars appear as the background of Sun which gives the illusion of the apparent path of the Sun in the sky. This path is called the ecliptic. The Earth's orbital plane is also in the ecliptic (Figs. 17 and 18).

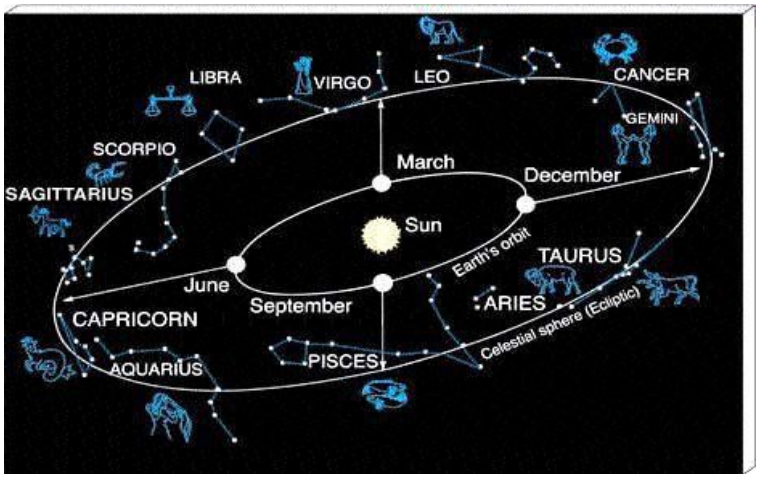


Fig. 17. Path through the constellations (http://www.astro.psu.edu/users/caryl/a10/lec2_2d.html)

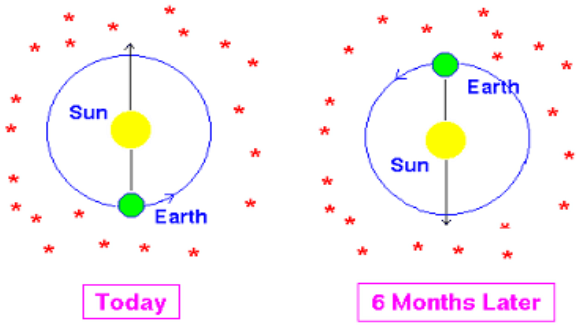


Fig. 18. Understanding the apparent Sun's path in the sky. Today we see one star behind the Sun. Six months later, due to the motion of the Earth, we find a different star at the Sun's background ( http://csep10.phys.utk.edu/astr161/lect/celestial/celestial.html). This is like a journey by train where the outside scenery appears to move backward. Earth observers are on the train and the outside stars takes place of the outside scenery.

The mass of the Sun is $1.99 \times 10^{30}$ kg. The mass of a galaxy can be up to ten trillion times the mass of the Sun. Stellar matter is mostly in plasma form where atoms do not stay electrically neutral. An atom may lose more than one electron in the tremendously hot stellar environment. However, spin motion is still present in protons and electrons of this vast quantity of matter. Astronomers think that major quantity of matter in galaxies is dark – invisible. At this point, we do not know anything about their structure.

Most of the stars are binary (paired) in nature (Fig. 19). Both stars move around their center-of-mass as shown in Fig. 20. The center-of-mass is located away from the lighter star and near the heavier star as in the case of a see-saw machine the lighter kid sits farther away from the fulcrum than the heavier kid for balancing.

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Fig. 19. Binary stars.
(http://www.google.com/imgres?imgurl=http://www.nasa.gov/centers/goddard/images/content/177768main_O_Star_Binary_med.jpg&imgrefurl=http://www.nasa.gov/centers/goddard/news/topstory/2007/fuse_titans.html&h=521&w=650&sz=46&tbnid=CkRMK57si1xS3M:&tbnh=110&tbnw=137&prev=/images%3Fq%3DBinary%2BStars&zoom=1&q=Binary+Stars&usg=__i7Y0zZ0ZEwrMGLWBvs8vw1B0Scs=&sa=X&ei=iwASTdbEAYH98AbDqNT1DQ&ved=0CEMQ9QEwAw)

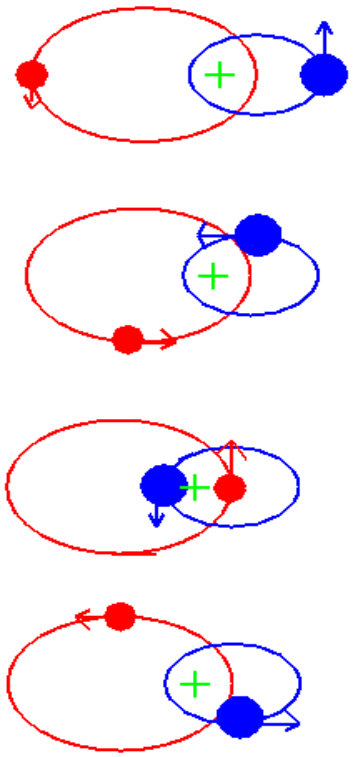

Fig.. 20. In a binary star system, both stars move around their center-of-mass indicated by a + sign. . (http://www.astro.cornell.edu/academics/courses/astro201/bin_orbits.htm)

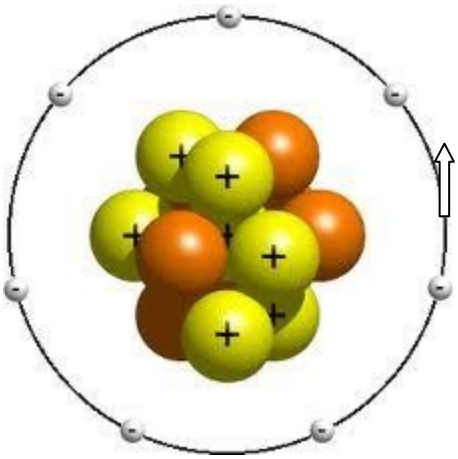

Fig. 21. Atomic model in false colors. Electrons move in the anticlockwise direction. Spin motion of electrons, protons (yellowish), and neutron can be anti-clockwise as well as clockwise (http://www.google.com/search?sourceid=chrome&ie=UTF-8&q=Atomic+model)

In the atomic world, an electron in an atom is thought to have both spin motion upon itself and orbital motion around the nucleus. The direction of this motion is anti-clockwise (Fig. 21). Our body is made of chemical compounds. Molecules are the tiniest parts of the compounds. Atoms form molecules. An atom has two parts – the central nucleus and the outer electrons. As planets go round the Sun, electrons move around the nucleus of atoms. The nucleus is composed of protons and neutrons which carry the common name nucleon. Both protons and neutrons spin in the anticlockwise direction. In an atom, the number of electrons is the same as the number of protons. In heavier elements, the number of neutrons outnumbers the number of protons. These subatomic particles have their antiparticles which also have spin motion. Generation of particle-antiparticle pairs takes place simultaneously. About pair creation, Allah says in the Quran, "Glory be to Him, Who has created all the pairs of that which the earth produces, as well as of their own (human) kind, and of that which they know not" (Sura Ya-Sin, 36:36). Nobody knows how many more particle-antiparticle pairs are yet to be discovered. Already a few hundred have been discovered. Figs. 22 and 23 illustrate the electron-positron pair production. A proton is always created along with an antiproton in elementary particle interactions. Matter has antimatter, too. We do not know if we are created of matter or antimatter. When matter and antimatter interact, all of them are converted to energy. When an electron and its antiparticle position interact, all their mass is converted into energy. This is perfect annihilation of matter.

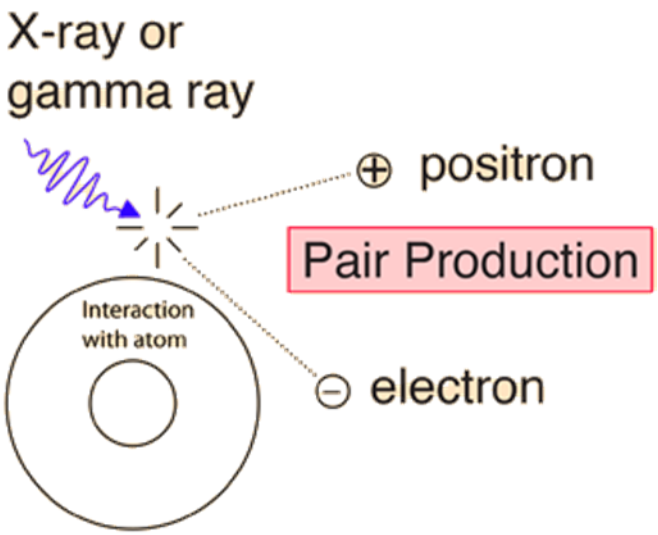


Fig. 22. Photons of appropriate energy interacts with matter to create electron-positron pair (http://hyperphysics.phy-astr.gsu.edu/hbase/Particles/lepton.html).

An estimate of the number of atoms in an adult human body is $10^{69}$ ( = $10^{12}$ + $10^{12}$ + $10^{12}$ + $10^{12}$ + $10^{12}$ + $10^{9}$) , where each $10^{12}$ measures a trillion and $10^{9}$, a billion). Each of the atom's spin is made up of the spins of the nucleus and that of electrons. In turn, nuclear spin is made up of the spins of protons and neutrons. Additionally, electrons revolve in the anticlockwise direction around the protons.

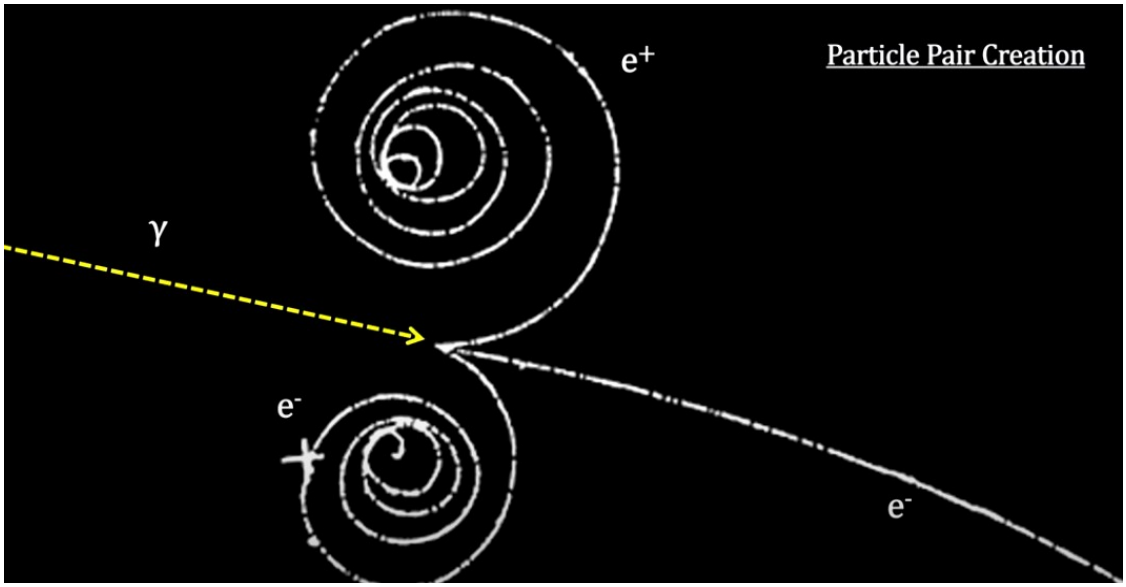


Fig. 23. A high energy gamma ray photon interacts with an atom, knocks out an electron (forward) and itself is converted to an electron (curling to the right) and a positron (curling to the left). It was observed in a cloud chamber experiment (https://www.youtube.com/watch?v=grOAlACupd0).

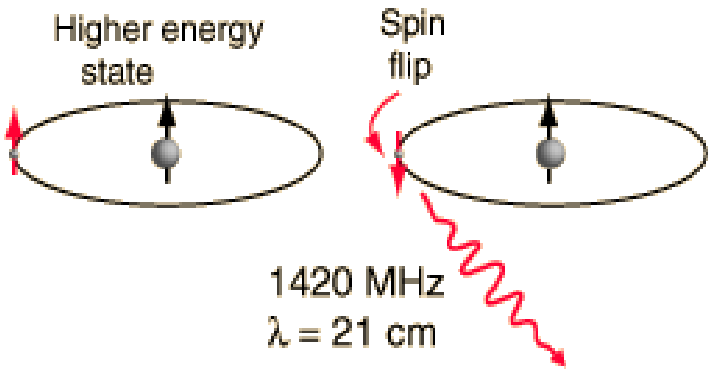


Fig. 24. Electron spin flip (http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/h21.html)

By deep inelastic scattering experiments, it is found that there are three tiniest particles inside a nucleon which can be a proton or a neutron. These tiniest particles, too, have spin motions. These are called quarks. Quarks have antiquarks, too, as an evidence of pair existence.

We observe a kind of effect of spin flipping in the microscopic world. The origin of magnetism is the motion of electric charge. Spinning constitutes motion of both proton and the electron present in the hydrogen atom. When both electron and the proton spin in the same anticlockwise direction, they have higher energy than when proton spins anticlockwise and electron spins clockwise (Fig. 24). When the electron flips the spin direction, the atom becomes in a lower energy state. The difference of the energy between these two states is released as a radio wave of wavelength 21 cm. Radio telescopes can detect this radiation from numerous hydrogen atoms present in the Milky Way galaxy. Detection of this radiation in the galaxy is the confirmation of hydrogen gas in the galaxy.

Those who obey Allah's command are Muslims as Allah Commands the Prophet (SM) to say "And I am commanded to be the first of those who submit themselves to Allah (in Islam) as Muslims" (Sura Az-Zumar, 39:12). In that sense, the entire disciplined universe maintains the qualities of a Muslim.

The majority of the people are right-handed. Starting any task from the right side is among the Sunnah of the Prophet (SAWS). People may call the motion of celestial bodies with the sense of right hand because of being right-handed, but the Earth's motion from the west to east carries the sense of right-handedness. Prograde (spin and revolution in the same direction) motion of the Earth carries the sense of the anti-clockwise direction of revolution of the Earth. All planets except Uranus have prograde spin and revolution. Among the moons of the planets, we observe prograde motions. The Sun is not reported to have retrograde motion. This may be the general characteristics with all other stellar systems.

**Conclusion.** In conclusion, the universal direction of motion involving spin and revolution is anticlockwise. Satellites, planets, comets, stars, galaxies, etc., etc., glorifies Allah, the Almighty, by being loyal to Him as is said in the Quran "**Everything in the heavens and on Earth glorifies Allah"**. ~ (Quran 62:1). Animate and inanimate – all have surrendered to Allah, and hence all are Muslims as if all are sailed in the same boat. The pilgrims circumambulate the Holy Ka'ba in grand harmony with this very common direction of motion in the observable universe. The tawaf, as if, elevates spiritually the status of the pilgrims as the rotation of a screw in the counterclockwise direction raises it up.

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