



Common Misconceptions in Astronomy & Science History

Newton was Born the Year that Galileo Died

This is, unfortunately, one of the most promulgated snafu's in science history articles, and it continues to be profusely propagated from textbook to textbook, as well as on the Internet.

When comparing historical dates, it's important to note that our modern calendar that is in use today was adopted at varying times by different countries. The Gregorian calendar was proclaimed by Pope Gregory XIII and took effect in 1582. However, it was only adopted in most Catholic countries. The calendar change resulted in Thursday, October 4, 1582, of the Julian calendar (its predecessor,) being followed by Friday, October 15 in the new calendar. This change corrected for a 10 day shift from the equinox the Julian calendar had accumulated since its institution in 325 at the Council of Nicaea. Britain and its colonies, including what is now the United States, did not convert to the Gregorian calendar until 1752, when Wednesday, September 2 in the Julian calendar preceded Thursday, September 14 in the Gregorian (by then a 12 day shift.)

Where the error lies: Newton was born on December 25, 1642, and Galileo died January 8, 1642. However, Newton was still on the Julian Calendar (British being Protestant) and the Galileo was on the Gregorian Calendar (Italy was Catholic.) Below is a comparison of the differing calendar dates.

| Scientist | Julian Calendar | Gregorian Calendar |
|------------------------|----------------------|---------------------|
| Galileo Galilei (died) | Dec. 29, 1641 | Jan. 8, 1642 |
| Isaac Newton (born) | Dec. 25, 1642 | Jan. 4, 1643 |

Note that Newton was actually born almost a year after Galileo died, not a few days before. If we use the Julian calendar, then the Galileo and Newton dates are 1641 and 1642, respectively. For the Gregorian case, the years are 1642 and 1643. One must always use the same ruler when measuring. After all, are 12 meters, and 12 feet, the same?

2000 was the 1st year of the 21st Century

This misunderstanding happens every 100 years when everyone celebrates a new century (I have found it recorded in 1900, as well as in 1800, newspaper sources.) The year 2000 was no exception. In fact, due to our mass media it was promoted even more greatly

as "Welcome to the new millennia!!!" ... with a small, under one's breath, "oops, we goofed" by just a few TV stations the following December 31st.

The counting of years in our calendar is derived from the Roman, or Julian, calendar system (albeit slightly modified by Pope Gregory XIII in 1582.) The first year is 1, the second is 2, the third is 3, etc. For one century to be counted it must complete 100 years. Hence, the first year of the second century is 101. And that of the third century is 201, and so on. Likewise, the first year of the 21st century is 2001, not 2000.

Years are a different kind of number line than we are used to. The year of this writing is referred to as 2014 CE (Current Era.) Prior to the current calendar year numbering that begins with 1 is 1 BCE (Before Current Era) and counts in the opposite direction. For instance, Julius Caesar was assassinated on March 15, 44 BCE. Before the year 1 is the year -1 (i.e. 1 BCE.) There is no year zero(0). Neither the Romans, nor anyone else at that time, had developed the concept of zero (not until several hundred years later by the Hindu/Arabs, and the Mayans, independently.)

The Moon is Larger on the Horizon than when it is High in the Sky

This is called the Moon Illusion, and it is just your brain playing a psychological trick on your perceptions. When rising, the eye sees the moon against distant landscapes which may contain houses, trees, or mountains among many other things. Your brain knows that these distant objects would indeed look large if they were close to you. This psychological effect is transferred to the moon which is now made to appear bigger than reality by the brain.

Astronomy and Astrology are Interchangeable

ASTRONOMY is the science which investigates all matter-energy in the universe. It is based upon the scientific method, which states that theories must be grounded upon observational facts and endure repeated testing as new observational data is acquired.

ASTROLOGY is the pseudoscience which entertains how the relationships of the sun, moon, planets, and stars influence the attitudes and lives of humans. The predictions purported by astrologers have been shown to have no scientific basis in themselves and were the synthesis of Claudius Ptolemy, a Greek astronomer. About 140 AD Ptolemy wrote a series of four books called the "*Tetrabiblos*" which summarized all of the principles of astrology which are still practiced today.

Astrology began about 3000 years ago in Babylon with what we today call mundane astrology. Predictions were applied to world or national events. To meet these

needs, Babylonian astronomers were required to keep a continuous record of accurate planetary movements which in themselves were good astronomy. They did not seek answers to questions about the physical universe, but attempted to understand the motions of celestial objects in more of a mechanistic manner.

By the sixth century BC astrology had spread as far east as India where it still flourishes today. Meanwhile, the Egyptians modified Babylonian concepts by developing a more personal version of astrology which was later synthesized into natal astrology by the Greeks after the conquests of Alexander the Great. The Greeks believed that our lives were preordained by the precise configuration of the sun, moon, and planets in the sky at the moment of our birth.

Copernicus was the First Person to Postulate a Sun-Centered Universe

Actually, it was the Greek, Heracleides (388 BC - 315 BC) and later, Aristarchus of Samos (310 BC - 230 BC) who first entertained the heliocentric notion that a rotating Earth could be in revolution around the sun. The concept lost favor to the geocentric model of the universe which was the synthesis of hundreds of years of inductive reasoning practiced by Plato, Eudoxus, Aristotle, Hipparchus, Ptolemy and others. The Greeks never intended their ideas to represent reality, but by the time of the Renaissance, Ptolemy's geocentric model was accepted as a accurate portrayal of the cosmos.

Copernicus realized the inexactness of the cumbersome geocentric models to predict accurately planetary positions and borrowed ideas from earlier Greeks to simplify the system into a heliocentric version. However, Copernicus did not merely suggest this change he worked out the mathematical details of this system to show how the revolutions of the planets around the sun could account for the observations of planetary motion. Ironically, after Copernicus completed publication of his theory in 1543, under the title of "*De Revolutionibus Orbium Coelestium*", astronomers could not decide by observations which theory produced the better fit. It appeared that the simplicity of the Copernicus's theory easily began to win converts, particularly in the Protestant territories of Europe.

The dilemma of which theory was superior was finally solved by Johannes Kepler in 1609 when he used the Copernican model to solve correctly for the changes which Tycho Brahe had observed in the positional shifts of the planet Mars. Kepler used ellipses to explain the planetary motions, rather than circles, which Copernicus had retained in his theory, Tycho's data fit precisely with the orbital parameters of Mars. In short order, the reinvented heliocentric theory as proposed by

Copernicus became one of the cornerstones of Renaissance thought.

A Leap Year Occurs Every Four Years

This is almost true. The exception occurs with century years which are not divisible by 400. The year 2000 was a leap year, but the century years of 1700, 1800, and 1900 were not leap years, because they did not produce a whole number when divided by 400. This is the main difference between the older Julian calendar (45 BC) and our modern Gregorian calendar used for civil purposes. The reason for the change arose because the Julian calendar overcorrected for the leap year by approximately 11 minutes, 14 seconds per year. From the adoption of the Julian calendar on January 1, 45 BC to the onset of the Gregorian system in 1582, the first day of spring had slipped backwards by 14 days, from March 25 to March 11, causing the observance of Easter to fall on earlier and earlier dates. If this were not corrected, eventually Easter and Christmas would be celebrated at the same time of the year. The Gregorian calendar was adopted by the Catholic nations of Europe in 1582 during the papacy of Gregory. During that year 11 days were dropped from the calendar so that the vernal equinox would occur on March 21. The day following October 4, 1582 became October 15. The calendar is now corrected to about 1 day in 3300 years.

A Compass Needle Always Points North

Unfortunately, the north magnetic pole is not at, but only somewhat close to Earth's true geographic north pole (at about 82°N Lat., 113° W Long., the north magnetic pole is located roughly 700 miles south of the geographic pole, in the Laptev Sea, north of Russia.) A compass needle will only tend to point in the general direction of true north. Except at positions where true geographic north lies directly north of the north magnetic pole, a compass needle will point directly north. Otherwise there will always be some deflection of the needle either to the east or west of the true north position.

Meteors and Meteorites are the Same Thing

There is a type of celestial fireworks that has been witnessed by humans since the dawn of their existence. They are called Meteors, or more commonly, shooting stars. A Meteor is the flash of light left by falling space debris. Whenever you observe a shooting star piercing rapidly through the black night sky, you are most likely witnessing the final act in the existence of an extremely small particle (probably the size of a grain of sand, or less) spewed from the nucleus of a comet. The flash of light is created by air molecules which are set aglow as the debris slams into our protective atmosphere. Speeds can range between 7 and 45 miles per second. If the air

is unable to stop, or consume, the material completely, due to its size, a piece of it will reach the Earth's surface, where it is known as a Meteorite.

Meteorites most likely originate from the asteroid belt as rock or ice-rock fragments formed through the collisions of asteroids and comets. Meteoroids are these same objects, plus comet dust, which can be found in space orbiting the sun. Meteor, meteoroid, and meteorite are three of the most butchered words in astronomy.

Many educators seem to use the words "Meteor" and "Meteorite" interchangeably. The other problem with these terms may stem from Meteor Crater, a nearly one mile in diameter extraterrestrial hole in the Earth just off I-40 west of Winslow, Arizona. It was formed by a 100 yard nickel-iron METEORITE which struck our planet about 50,000 years ago. Had this occurred in modern times, the "dead zone" for humans would have reached to a radius of 40 miles from the center of impact. Make no mistake; Meteor Crater is very spectacular, and well worth the visit, but it was made by a Meteorite impact.

In summary: A Meteoroid is a small body in space before it enters the Earth's atmosphere. A Meteor is the visual light flash and streak viewed in the sky when a Meteoroid enters the atmosphere and burns. A Meteorite is the physical extraterrestrial stony or metallic object once landed.

The Earth was Considered Flat When Columbus Discovered the New World

This misconception is generally true for the uneducated masses, but not so for anyone who had received a formal education and who could read. Columbus could read, and he was familiar with Greek texts which spoke of a spherical Earth as well as the circumference of the Earth. It was the Earth's circumference that was in disagreement among European scholars of Columbus's time. Columbus thought that the Earth was about 18,000 miles in circumference, and that the East Indies were only about 3000 miles away. Despite this misconception, Columbus was a keen observer who had sailed widely and who had witnessed the changes in the sky which were consistent with a spherical Earth. Convincing a superstitious crew that the Earth was round and not inhabited by monsters was more difficult.

The Telescope was Invented by Galileo

Credit for the invention of the telescope is usually given to the German/Dutch lens maker Johann Lippershey (ca. 1570-1619) in the year 1608, though the records are somewhat fuzzy. Lippershey tried to market these first telescopes as military devices to the Dutch Government. Galileo, hearing about the invention through his correspondences with other scientists in Europe, built his first telescope in one night, sometime

during the fall of 1609. Galileo also recognized the military significance of the telescope, but also comprehended its scientific importance as a tool for expanding humankind's understanding of the Universe. In this sense, he accelerated the growth of astronomy as a modern science and provided its most important research instrument.

Telescopes are Constructed Mainly to Magnify the Objects being Observed

Telescopes are an extension of the human eye. An object too faint to be seen by the unaided eye must first be made bright enough to be seen before it can be studied. This has always been the primary function of any telescope--to gather light, not to magnify an image. Every time the diameter of the primary lens or mirror is doubled, the gathering of light is increased by four. The light-gathering "power" of a telescope is therefore, the prime consideration of a telescope's usefulness.

Since the Moon always faces Earth, it Does Not Rotate

The moon completes exactly one rotation about its axis in the same period of time it takes to make one revolution around the Earth. This period is equal to about 27 1/3 days. That is why we always observe the same hemisphere of the moon facing us.

The North Star is the Brightest Star in the Sky

Not even close ... Polaris barely makes it into the top 50, and actually ranks as the 48th brightest star in the night sky. Polaris is relatively easy to spot even from an urban location, but its real importance stems from the fact that its position is near the place where the Earth's north polar axis intersects the celestial sphere. As a result, the Earth's rotation causes the sky to appear to circle around this star, making it an excellent marker to determine the direction north at night. The brightest star of the nighttime sky is Sirius, in Canis Major.

Polaris has Always Been the North Star

As the Earth spins on its axis like a giant top, it also slowly wobbles like one, completing one cycle in a period of about 26,000 years. This circular wobble is known as Precession, and is the movement of the direction in the sky to where the polar axis points. At present, the axis points very close to the star Polaris. However, 5,000 years ago when the Stonehenge in England and Great Pyramid at Giza, Egypt, were being constructed, the Earth's north polar axis pointed fairly close to Thuban, a star in the constellation Draco. About 12,000 years from now the axis will circle its way towards the bright star Vega, in the constellation Lyra.

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