# Man's Place in the Universe: from Copernicus to Newton

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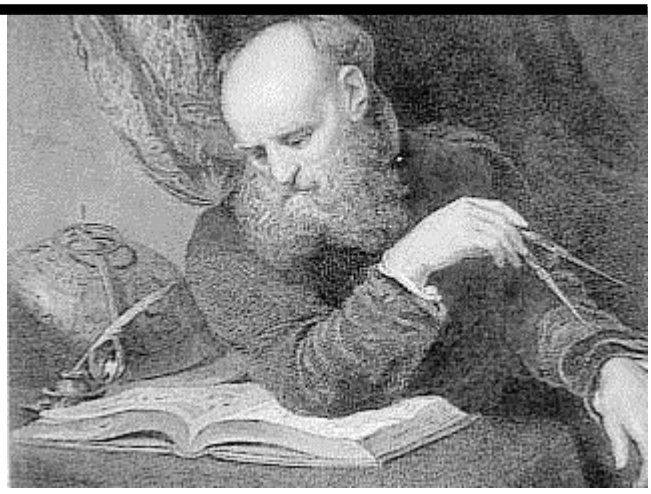
When Polish priest Nicolaus Copernicus died in 1543, the theories concerning his hypothesis that the planets, including the earth, rotate around the sun remained unpublished. Copernicus feared the outrage that they might cause and to avoid scandal, especially with the Catholic hierarchy, left the manuscript on his geocentric theory to a future generation to publish and ponder. Finally, just months before the respected priest and professor died, *De Revolutionibus Orbium Colestium (On the Revolutions of the Heavenly Orbs)*, finished by Copernicus thirteen years earlier, was put into print by a Lutheran publisher from Nürnberg, Germany. The book and some later posthumous releases of his notebooks turned the worlds of religion, philosophy, society, and eventually, government upside-down.

The theories of *Orbs* did not catch on for quite some time and weren't exactly new. Several ancient thinkers held true to a heliocentric theory but never had the evidence to prove it true. Copernicus gained that evidence in the systems of trigonometry and geometry being developed in Europe during his lifetime. While the currently accepted geocentric theory of Ptolemy did explain the movement of "celestial orbs," there were several inconsistencies, causing problems with its mathematical proof.

The primary shortcoming of the geocentric theory was the inadequate explanation of the retrograde motions of Mars, Jupiter, and Saturn. Astronomers and Ptolomeic theorists stated that these strange orbits were the result of cycles and epicycles. Mathematicians from Arabia to Europe went to work trying to prove that the epicycles could exist, but never came to a definite conclusion the way that Copernicus did.

*Orbs* was ahead of its time, despite the scientific evidence and was not received enthusiastically by the public and by most intellectuals. The small number of "natural philosophers" who *did* work on Copernicus's theory (only ten published work on it in the 16th century), went on to transform the globe. They did not, however, avoid controversy.

The proud Galilei Galileo went to work on laws of universal motion to help further prove the Copernican theory, running into much criticism because he rejected Aristotle's and the Bible's interpretations of the universe. In 1612 he published a book on floating bodies and predicted the victory of the Copernican system. After being removed from his pulpit by an old order, Medici-influenced bishop, Galileo wrote an intellectual assault on the Catholic church and the irrelevance of Scripture in scientific research. In this letter to Rome he called for a separation between religion and science. By 1616, Galileo's fame among the learned brought about the censorship of all Copernican books and a Jesuit, Cardinal Robert Bellarmine, going back on previous support for Galileo's scientific research, officially called for an end to Galileo's defense of the heliocentric theory. Galileo remained silent on the issue until 1624 when he began "Dialogue on the Tides," wherein he proved the Copernican system by use of the tides. The book was licensed by Rome and printed in 1632. The instant popularity of the work among Northern intellectuals provoked the Church into summoning Galileo to Rome to defend himself against the Inquisition's charge of "grave suspicion of heresy." In 1633 he was sentenced to life in prison (later lessened to house arrest.) Despite all of this, Galileo continued to write, with much acclaim from Protestant thinkers, until his death.



**The revolutionary scientific and philosophical works of Galileo Galilei set off a series of events that changed the course of Western Civilization forever. He was rewarded with punishment by the Church.**

An admirer of Copernicus and, much later, of Galileo was the German scientist Johannes Kepler (1571-1630). Kepler stated that the simplicity of the heliocentric theory was proof that it was part of God's plan for the universe. He went to work and published *Mysterium Cosmographicum* in 1596, in which he mathematically proves Copernicus's theory (with a slight 5% error) by offering the orbits of the planets as ellipses and not circular as Copernicus suggested. The book earned Kepler a position assisting the anti-Copernican Tycho Brahe. After the death of Brahe, Kepler acquired the office of imperial mathematician and court astronomer of Holy Roman emperor Rudolf II. The respect that he earned in the Church was waning, though, as Galileo clashed with hierarchy. The Church eventually banned Kepler's books along with Galileo's shortly after his death. The theories of Copernicus, Galileo, and Kepler met with much resistance from the public. They acted to many as an insult to intelligence. Any man could look up in the heavens and see the stars and sun moving throughout the day across the sky. Men did not feel the earth move under their feet. They quickly rejected the revolutionary ideas and dismissed them as heresy against tradition and common sense. Intellectuals, however, had recently been over-

come by the empirical philosophies of Sir Francis Bacon, and were more willing to consider the theory.

Bacon emphasized that men are the servants and interpreters of Nature. He believed that knowledge could be borne only by experience or by sensory evidence and not by authority. He contributed to the method of ampliative inference or inductive reasoning. Earlier thinkers arrived at their conclusions by deductive reasoning or enumeration. The earlier method involved drawing general conclusions from previous data. The inductive method made use of analogy. The method of Bacon was cemented into the scientific method after its use resulted in improved hypotheses and evidence.

Bacon presented scientists with a new outlook. The mysteries of the universe were theirs to come to know through experience and experimentation. Mathematicians and scientists then went to work trying to put order to and make sense of the universe. Questions arose and after each revolutionary proof and theory, the European man gained a greater sense of pride and individuality. He was no longer subject to the authority's explanation of the world and his place in it. He could now arrive, through experimentation and logic, at his own conclusion of the world and his place in it.

Europe was revitalized as free enterprise (of the personal kind) became a way of life or, at least, a goal. The new method of scientific reasoning spilled over into other realms of society, especially after the popularity of Britain's Sir Isaac Newton.

Newton had gained fame while rallying against King James II's attempts to turn Cambridge university into a Catholic institution. After the Glorious Revolution he was offered presidency of the Royal Society, a royal intellectual organization, a position he held until his death. Using his connections with the new regime, Newton was able to gain support for the publication of several of his earlier works in physics, calculus, and, most importantly, astronomy. The support he gained from the anti-Catholic rule of William and Mary, institutionalized and legitimized his and other scientists' proofs to the Protestant public (a group that championed William of Orange.) Newton's ideas further proved the Copernican theory as he named the force involved in orbits as universal gravity. His formula of universal gravity proved that mass played a large role in the orbits and gravitational pulls of the planets. Since the sun was thousands of times larger than the earth, it was impossible for the sun to rotate the earth. Immediately the legitimacy and respect that Newton's name held was applied to Copernicus's theory. As Newton, himself, said, "If I have seen further than other men, it is by standing on the shoulders of giants." The heliocentric theory from then slowly became accepted at the popular level.

Eventually philosophers like Pierre Bayle began to apply the skeptic nature of science to other ideas and wrote that most popular beliefs were without foundation. A sense of evidence enveloped European thought and existential attitudes about man and his place in Nature began to very slowly take form. Only after the shock and disillusion of the great World Wars have the existential philosophies become popularized. And although it is noted as a purely 20th century phenomenon, existentialist tendencies have been influencing Western civilization at least since the Reformation and especially since the acceptance of the Copernican theory, a theory that proved man to be a little less important than he originally thought.

The over-spilling of the scientific method and of skepticism first took hold of religion. Beginning with Martin Luther and John Calvin, several Christians began to question the traditional beliefs and revolt to the point of bloodshed. These "dissenters" called for foundation to their beliefs and tended to stray from the Medieval Catholic traditions of obedient faith and theology of tradition. The European man had outgrown that, though, and was desperately seeking for foundation and this faith was not enough. Luther and Calvin and other fundamentalists veered away from tradition and based their theologies on only Scripture. Religious dissent was only the tip of the iceberg.

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In 1680, a fellow British contemporary of Newton's, John Locke published his *Two Treatises on Government*, a book heavily soaked in the empirical method and in the natural law that Newton popularized. In it Locke proposes that men have natural rights that cannot be taken from him, even by his government, and those are the rights to life, liberty, and property. He further went on to say that government existed only through the consent of those governed. Locke stated that if these governments attempted to rape

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man of these rights then man had the responsibility to establish a new government. Within a century of the book's release revolutionaries like Thomas Paine, who wrote *Common Sense*, went on to popularize Locke's political philosophy. First in America and then in France revolution sprung up as men demanded their individual rights.

The Masons, a deist group, proved the popularization and application of science. The group, legitimized by the memberships of George Washington and Benjamin Franklin, proposed a strictly empirical and inductive philosophy that harkened back to the works of Locke and the even earlier Bacon. The Masons believed that the Creator set the world and natural laws in motion. An aspiration toward achieving compliance with nature was the focal point of the movement.

Existentialist attitudes became apparent shortly after the proof to Copernicus's theory came about. Man was seen as unimportant to many people. The earth no longer seemed so special and intricate to God's plan, whatever it was. There was no longer faith in what was, at first, seen to be true. A general feeling of cautious skepticism and a need for analysis was evident by the end of the 17th century. No longer was there a blind faith in tradition and moral assumption. The questioning of tradition continued on into the 1800's with the works of Ralph Waldo Emerson and Frederich Nietzche, both philosophers who reviled conformity. Men questioned the importance of life and fell further and further away from organized religion, sometimes to the point of atheism. As Nietzche wrote, "God is dead."

While pessimism was the outlook for some, most thinkers fell into a proud display of optimism. Faith in the human race soared. To these thinkers, man was seen to be capable of anything and progress was his only fate. Science and invention became bound as men like Thomas Edison brought a better quality of life. Science, by way of engineering (application,) was viewed as the motivator of a civilization's progress and strength. Darwin and Einstein's ideas have quickly become popularized and applied to other branches of society. The progressive and optimistic ideas of the "scientific revolution" are still very much believed today, although a strong undercurrent of pessimistic existentialism (an abhorrence of technology and science in some forms) also exists, more so after WWI than in the days of the Enlightenment.

The knowable order of the universe provided man with a capability to understand truth and natural law by his personal reason. Each and every man had unlimited power if he set his mind to attaining knowledge. Because of this faith mankind has gained in himself and his faith in the advancement of civilization by science and technology, the millennium will end in brilliant light, rather than the vast darkness in which it began.