



Refuting the Copernican principle.

By Rick DeLano
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WHAT is "The Principle"? Five-hundred years ago, you were crazy if you thought the Earth was going around the sun. Today, you are crazy if you think it is not. What changed? That is a fascinating question, one which involves profound issues of science, faith, and identity. While most people assume that it has long since been experimentally proven that the Earth is orbiting the sun, no such experimental proof ever has been obtained. As historian Lincoln Barnett states in *The Universe and Dr. Einstein* (which contains a foreword by Albert Einstein): "We can't feel our motion through space, nor has any physical experiment ever proved that the Earth actually is in motion."

Remarkably, physics had to be reconceptualized entirely by Einstein at the beginning of the 20th century, in part because no experiment directly had been able to measure this universally-assumed motion of the Earth around the sun. What Einstein could not foresee, however, was that the reconceptualized physics he offered in his special relativity theory in order to keep the Earth moving and the speed of light constant was superseded 10 years later by his general relativity theory which, by his own covariance equations, allowed the Earth to remain fixed and the speed of light to be variable.

Like Sisyphus rolling the huge rock up the hill only to see it fall down right before he reached the peak, in a strange way the principle of relativity made Einstein's own theories relative. Perhaps he realized this truth in his 1938 book, *The Evolution of Physics*, in which he said: "The struggle, so violent in the early days of science, between the views of [Claudius] Ptolemy and [Nicolaus] Copernicus would then be quite meaningless. Either coordinate system could be used with equal justification. The two sentences: 'the sun is at rest and the Earth moves,' or 'the sun moves and the Earth is at rest,' would simply mean two different conventions concerning two different coordinate systems."

Physicist Stephen Hawking said much the same in *The Grand Design*: "So which is real, the Ptolemaic or the Copernican system? Although it is not uncommon for people to say that Copernicus proved Ptolemy wrong, that is not true. As in the case of our normal view versus that of the goldfish, one can use either picture as a model of the universe, for our observations of the heavens can be explained by assuming either the Earth or the sun to be at rest."

So, two of our greatest scientific revolutions--the Copernican revolution and relativity--intimately are associated with this question of Earth's place in the larger scheme of things.

The Copernican Principle simply states that the Earth is not in any special or central location in the cosmos. It is sometimes generalized as the "cosmological principle," which holds that there are no special locations in the cosmos. On this fundamental assumption, which modern cosmology defines as the "isotropy and homogeneity of the universe," everything will look very much the same everywhere we look, and it will look very much the same no matter where we might be looking from.

If, for instance, we examine a bottle of homogenized milk, we see that there are no lumps of fat circulating in the milk nor resting on top. The milk would look the same no matter what part of it we examined. The Copernican and cosmological principles say much the same about the universe. Its matter and space are homogenized, as it were. To say it another way, these principles state that we are not able to distinguish one place from another in the universe. There is no up nor down, no left nor right, and no place where either we nor ET can claim to be in a special or central location.

This principle is named after Copernicus, since, in the 16th century, he revived the ancient Greek Pythagorean model that took Earth out of the center and put it among the other celestial bodies. As we then grew in our knowledge of the vastness of the universe from such icons as Einstein, Sir Isaac Newton, Ernst Mach, and Edwin Hubble, it was then we found out precisely what Copernicus' removal of Earth from the center meant, as Carl Sagan stated so eerily in *Cosmos*: "We find that we live on an insignificant planet of a humdrum star lost between two spiral arms in the outskirts of a galaxy which is a member of a sparse cluster of galaxies, tucked away in some forgotten corner of a universe in which there are far more galaxies than people."

Did this new view of Earth's position have an effect on mankind's view of himself, his culture, and even his reason for existence? It most certainly did, and in the most profound way. As the poet Goethe put it: "But among all the discoveries and corrections probably none has resulted in a deeper influence on the human spirit than the doctrine of Copernicus ... considering all that went up in smoke as a result of realizing this change."

Historian Herbert Butterfield, in *The Origins of Modern Science*, indicates that the Copernican revolution "outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes, mere internal displacements, within the system of medieval Christendom ... while transforming the whole diagram of the physical universe and the very texture of human life itself, it looms so large as the real origin both of the modern world and of the modern mentality, that our customary periodization of European history has become an anachronism and an encumbrance."



Even more profoundly, the famous God is Dead movement of the 1960s, which had its roots in the late 19th-century nihilism of Friedrich Nietzsche and moved him to write the philosophical novel, *Thus Spoke Zarathustra*, blames the "death of God" on the Copernican revolution. As Zarathustra, put it: "Where has God gone? I shall tell you. We have killed him--you and I. We are his murderers. But how have we done this? ... What did we do when we unchained the Earth from its sun? Whither is it moving now? Whither are we moving now? Away from all suns? Are we not perpetually falling? Backward, sideward, forward, in all directions? Is there any up or down left? Are we not straying as through an infinite nothing? Do we not feel the breath of empty space?"

The implications and repercussions of the Copernican Principle are far-reaching, but there is one important fact that no one should forget: the Copernican Principle is not a scientific fact; rather, it is a metaphysical assumption. It is that one assumption that is the basis upon which all the evidence from our telescopes and microscopes is evaluated, and modern academia has shown itself deeply disinclined to entertain any other metaphysical assumption.

So let us ask: what if the Copernican Principle is wrong? If it is wrong, we only can conclude that everything we think we know about our universe also is wrong. For the first time in the modern age, it is precisely this question about the "metaphysical assumption" known as the Copernican Principle, and its implications, that are addressed in "The Principle".

More specifically, this film engages with the leading cosmologists, physicists, and theoreticians who presently are wrestling with the implications of recently obtained observational evidence from NASA and the European Space Agency probes that this foundational assumption of our scientific world view--the Copernican Principle--indeed may be wrong, and that our Earth may be very special after all.

The observations are numerous, but perhaps the most puzzling is the so-called "Axis of Evil," a name which was borrowed from Pres. George W. Bush's labeling of Iran, Iraq, and North Korea. In cosmology, the "Axis" is dubbed "Evil" because, if it does exist, it completely nullifies the cherished Copernican Principle upon which modern cosmology presently is based, and ultimately destroys the foundation of modernity itself.

Briefly, the Axis of Evil is a never-before-seen alignment of the Earth with the cosmic microwave background radiation (CMB), a radiation that spans the entire known universe. In other words, it is like saying that the whole universe is centered on or aligned with our tiny Earth. A little thought will show the astounding nature of this Axis. It would be like saying that our solar system of some 6,000,000,000 miles in diameter is aligned with a basketball.

Obviously, this alignment between Earth and the CMB is highly problematic, since the Copernican Principle assumes that, on the largest scales, no preferred direction or space exists in the cosmos. There is such a preferred direction in the CMB, however. Three separate missions have confirmed it--Cosmic Background Explorer in 1990, Wilkinson Microwave Anisotropy Probe in 2001, and Planck in 2009. While there are many ideas concerning what this alignment might mean, the observational fact of its existence no longer can be ignored. The Axis is there and it is not going away.

Even more puzzling is the fact that this is not just any preferred direction. The direction is aligned with the ecliptic plane (the plane of the orbit of the planets around the sun), and with the equinoxes (the equatorial plane of supposedly insignificant Earth). In other words, the entire known universe is aligned within the 23.5 degree margin of tilt between the Earth and the sun. How can this be?

Physicist Lawrence Krauss of Arizona State University boldly addressed the implications in 2006: " ... When you look at CMB map, you also see that the structure that is observed is, in fact, in a weird way, correlated with the plane of the Earth around the sun. Is this Copernicus coming back to haunt us? That's crazy. We're looking out at the whole universe. There's no way there should be a correlation of structure with our motion of the Earth around the sun--the plane of the Earth around the sun--the ecliptic. That would say we are truly the center of the universe."

Many other cosmologists have admitted the same. For example, in a 2010 paper, the team of Craig Copi, Dragan Huterer, Dominik Schwarz, and Glenn Starkman, which has done extensive research into the CMB anomalies, not only confirmed the Axis' alignment with Earth, but ruled out any alignment with our Milky Way galaxy, stating: "Our studies indicate that the observed alignments are with the ecliptic plane, with the equinox or with the CMB dipole, and not with the Galactic plane." This means that the CMB is Earth-centered, not galactic-centered, an astounding fact to contemplate.

This question of the Earth's placement in the larger scheme of things, which already has launched two great scientific revolutions, seems, as Krauss said, to be coming back to haunt us. As astronomer Lawrence Vescera put it: "The discovery that the CMB is cosmically aligned to the Earth should make the hair on the back of your neck stand up. It points to the fact that the Earth is at a special place in the universe and that God wants it to be known."

If we consider the dramatic changes in culture and world view that accompanied previous cosmological revolutions, it is not too early to begin to consider what it would mean for our future, and the future of our children, if it were to be established that the Earth is in a special position in the cosmos--that we truly are, in some sense, the center of the universe?

Rick DeLano is the producer of "The Principle," due for release later this year.