The Centre of the Universe Doug Hayhoe, April 2025

Does the physical universe have a centre? And is there a moral universe with a centre?

For the Ancient Mexican tribes, Teotihuacan was the centre of the universe. It was the "birthplace of the gods." Today, thousands of kilometers farther north in Victoria BC, the Dominion Astrophysical Observatory (Figure 1), owns the website centreoftheuniverse.org. This is in honour of its century old research in mapping the Milky Way. On the other side of Canada, citizens of the country's largest city, Toronto, where I live, are sometimes criticized for thinking their city is the centre of the universe. And the critics probably have a point!

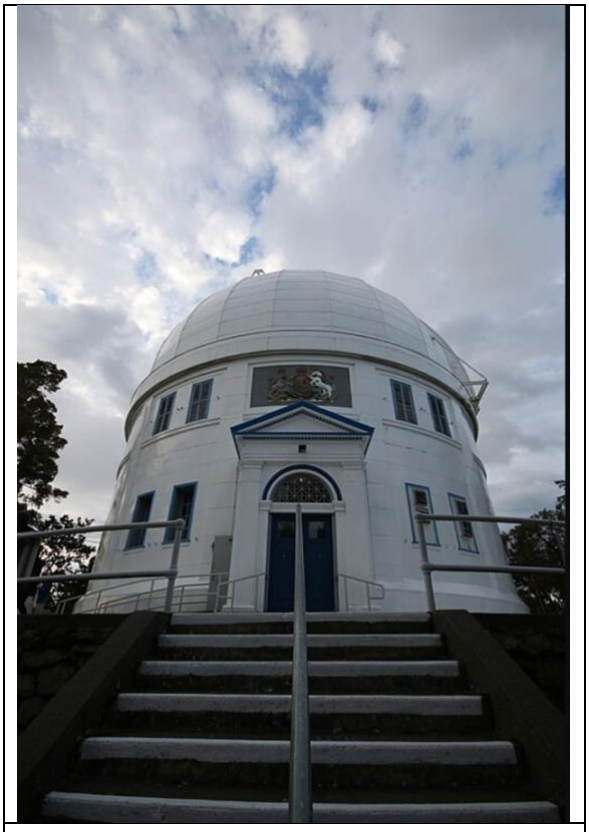

Figure 1: Dominion Astrophysical Observatory (photo by Colin Stephey)

Earth as the centre of the universe

Almost all ancient peoples considered the earth to be the centre of the known universe. The early Hebrews and Christians were no different. The first chapter in the Bible says that God set the sun and moon in the sky to give light to the earth (Genesis 1:14-18). The sun "rises and sets," the Bible says (Ecclesiastes 1:5), but "the earth … can never be moved" (Psalm 104:5). Many other verses show that the Bible represents a geocentric view of the solar system.

The ancient Greeks even worked out a complicated system to show how a geocentric view of the solar system could account for the irregular movement of the planets in the sky. It contained many geometric devices such as the epicycle, equant, and deferent, which had the planets going in circles upon circles as they orbited the earth. I tried to confound my introductory astronomy students one year, by teaching the geocentric model of the universe, and backing it up with all kinds of ingenious film strips and models developed by the education department at Harvard!

This geocentric view continued to the 15th century. Then Copernicus, a lonely Polish priest, showed that a sun-centred, heliocentric model was simpler. And Galileo's telescopic observations soon proved it. (See my essay, *How the Telescope changed the world*.) What a huge change in perspective it was to accept the fact that the earth was not the physical centre of the universe! Unless we lived at that time, it's impossible for us to understand what this meant.

How to find the physical centre of objects in space

Most entities, such as a country, a planet, or a galaxy, have a physical centre. For some countries, you can cut out a piece of stiff cardboard the shape of the country, and try to balance the cardboard on a pin. The balance point will be the physical or geographical centre of the country in two-dimensional space.

But how do you find the geographical centre of the world? In 1989, I stood on the 0° latitude line in Ecuador (Figure 2). Then, in 2016, I stood on the 0° longitude line in Greenwich, England. But I still haven't stood on the place where these two Prime Meridian lines cross. It's an unimportant spot in the Atlantic Ocean! In fact, the Greenwich 0° meridian itself is completely arbitrary. It might have gone through Moscow or Toronto!

Figure 2 Standing on the equator with my wife in 1989

Of course, if you consider all three dimensions of the planet we live on, it does have a physical centre. It's in its very middle, a hot metallic liquid place where no one would survive. But this is not the geographical centre of the earth's surface.

Figure 3 Andromeda Galaxy (photo by Luc Viatour)

Galaxies like planets also have a physical centre, often inhabited by a large black hole. Since galaxies rotate, as planets do, we can estimate where this centre is by finding the axis of rotation, and locating a point on this axis that is in the plane of the galaxy. Our neighbour Andromeda, for example, contains up to one trillium stars that either rotate around the centre in gigantic spiral arms, or as part of a central bulge (Figure 3). At the centre of this bulge is a double nucleus, containing a supermassive black hole.

Does the physical universe have a centre?

The scientific evidence is in favour of a "Big Bang." The universe began with a giant explosion 13.7 billion years ago, and has expanded ever since. Every part of the universe is moving away from every other part. As Google AI puts it, "Light from distant galaxies appears redder than expected because the expansion of the universe stretches the wavelengths of light as it travels through space, making it appear redder, a phenomenon called "cosmological redshift."

Remember the time you were standing by a highway and you heard a noisy truck approaching at high speed. When it passed you and traveled away, you might remember the frequency of its sound shifting to a lower frequency. This is called the Doppler Effect. It's true of both sound and light, as they both travel in wave form.

Now, the frequencies of well-known electromagnetic waves coming from far away galaxies are all shifted to lower frequencies, *no matter where we are located in the universe.* Well-known blue spectral lines arrive at earth shifted to red. This show that they are moving away from us. Just as the sound of a noisy truck, when it's moving away from us, shifts to a lower frequency. But does this mean that everything in the universe is moving away from one physical centre?

In my earlier days teaching physics, I thought so. I used this analogy. Imagine you slowly blow up a spherical balloon with tiny yellow dots (i.e., galaxies) scattered across its two-dimensional surface. No matter where any given dot is located on the balloon's surface, it will appear that all other dots are moving away from it as the balloon expands. And any rays emitted by the yellow dots will shift from blue to red (Figure 4).

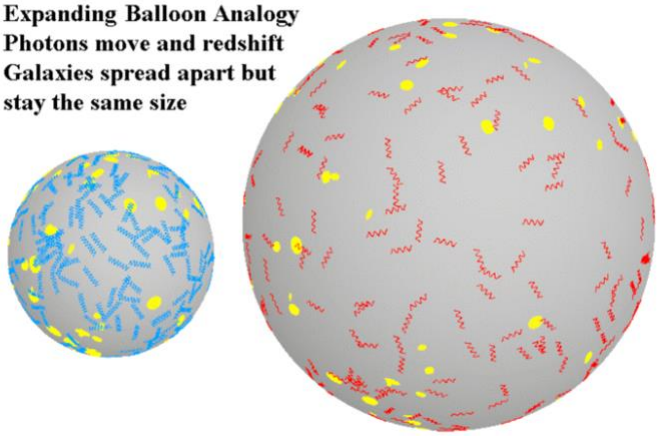

Figure 4 In the expanding balloon analogy, the galaxies (yellow) all move farther away from each other, and their light rays shift from blue to red.

In this model, there is no centre to the two-dimensional "universe" of yellow dots. But the balloon really exists in three dimensions, and its physical centre is inside the balloon, in the third dimension. If we go back in time, before it was blown up, the tiny unblown balloon would be at this centre.

Now, move this up a dimension. The three-dimensional universe is expanding. To find its centre, we could go back in time 13.7 billion years and consider that point of creation to be its centre. However, this assumes that the universe is expanding into space already there, like the balloon. But before the Big Bang, there was no space the universe could expand into.

So, I was wrong! There is no centre to our universe. In reality, the expanding universe *has no centre*! (For more on the fallacy of the expanding balloon analogy see here.)

Is there such a thing as a moral universe, and if so, does it have a centre?

Scientists as prominent as Einstein never believed that science was the answer to everything. (See my essay on *Albert Einstein*.) Sean Carroll is another prominent physicist who, although not a Christian, doesn't believe that morals can be reduced to science. Rather, a world of morals and values exists outside of science. But what is the standard for these morals? This question opens up a hugely complex field in philosophy and ethics, addressed in depth by scholarly books such as *The Moral Universe* (2024), by Professor John Bengson et al., which I haven't yet read.

For me, the basic question is whether there is indeed a moral universe. And, if so, how such moral standards are communicated to us. If a good and all-powerful God exists, a personal God, then it is quite reasonable that he not only created us persons in his image, as the Bible claims, but he can also communicate with us. (See my essay, *Why trust the Bible*.) It is also reasonable to think that there is an absolute system of "right and wrong concerning the meaning of the universe," to borrow a phrase from C. S. Lewis's outstanding apologetic *Mere Christianity*.

Roger E Olson, in his 2019 blog, What is a moral universe? explains it this way:

> "A 'moral universe' is one in which some *dispositions toward being* are universally and absolutely wrong and others are universally and absolutely right—regardless of what people think. In other words, we are (or should be) attempting to *discover* right and wrong rather than *creating* right and wrong."

Olsen then gives the example of love and justice as two important aspects of this moral universe. If you ask chatGPT what God's moral attributes are, according to Judaism and Christianity, you find love and justice, again, as well as mercy and compassion, faithfulness, holiness, and truthfulness. Of course, God has revealed all of this in his Word.

My good friend, Dr. John Kraulis, compares the physical and the moral universes this way. First, the word "universe" implies a unifying truth or reality. And we know that "there is one unifying truth in science, the accurate discovery of reality, and there is one unifying truth in morality and religion as defined by the Creator who not only put it all into action but determined what the rules should be!"

He continues, if the physical universe shows God's power, the moral universe shows his love: "One thing God has spoken, two things I have heard: 'Power belongs to you, God, and with you, Lord, is unfailing love'" (Psalm 62:11-12).

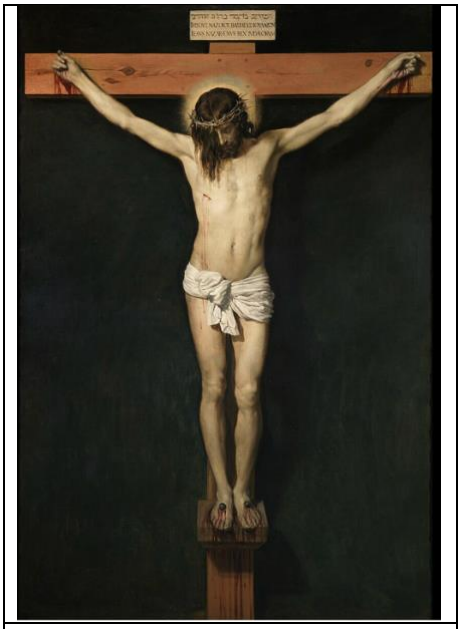

Figure 5 Christ Crucified, Diego Velázquez, 1632. Museo del Prado. (In the public domain, Wikipedia.)

We have seen that the physical universe doesn't have a centre. But is there a centre to the moral universe? Is there one place or time when God's moral attributes all came to a climax? Yes, the cross and resurrection of Jesus Christ. This is the moral centre of the universe and of time itself. That's why Easter is the most important celebration of the Church, not Christmas (Figure 5). On Easter Friday, we remember the crucifixion of the one person who never sinned. On Easter Sunday, we celebrate the resurrection of the one person who couldn't be kept in the grave. Of course, many Christians remember the cross in communion every week or month, not just once a year.

The cross of Christ, set up on Mount Calvary, was the greatest demonstration of God's love and mercy, in the sacrifice of his only Son (Romans 5:8; 8:32). At the same time, it was the greatest demonstration of God's justice and righteousness (Romans 3:25). God can't wink at sin; can't just pretend it didn't happen. But his justice and holiness were fully honoured in punishing his own Son for our sins, to break the power of sin (Hebrews 2:14). And nowhere was God's wisdom demonstrated so remarkably as at the cross, as the apostle Paul argues: "we preach Christ crucified … Christ the power of God and the wisdom of God" (1 Corinthians 1:23-25).

If you like classical singing groups, you might look at this one. The Gaither Vocal Band sings "I believe in a hill called Mount Calvary."

So, in conclusion, the existence of a personal, all good God ensures the existence of a moral universe, and his word reveals that the cross of Jesus Christ is the centre of this universe!