

How big is the Christian universe? Making room for science in Christianity.

by Stephen Milton

"How big is the universe?" It's a question every kid has asked at some point. Most parents just shrug and say something about infinity, and move on. But if you had asked that question at the beginning of Christianity, in the second century, for example, you would have received a pretty clear answer. The distance from Earth to the stars was about eighty million miles in today's terms. That number was calculated by Ptolemy, a second century mathematician.

Like everyone else of his time, including the Church fathers, Ptolemy believed that all of the stars were simply lights attached to a vast, solid dome that rotated around the Earth. Think of the domed roof of a planetarium, and you've got the right idea. The stars were fixed to this dome, so all of them were equally far away from the Earth. This made the universe a relatively small place. The stars were like a roof over the Earth, and in the Bible we read of the stars being like a tent pitched over the Earth.

The only objects in the sky that actually moved on their own were the Sun, the Moon, and the five known planets. The word 'planet' actually means wandering star. So stars were lights attached to a dome, and Mars was a wandering star. This is all wrong, of course, but this is

what early Christians and Romans believed. It agreed with what their senses perceived — the sun does seem to come up and go down. The only time they had real problems was when a comet appeared, which seemed to break all the rules, being a star that moved. Not surprisingly, comets were usually taken as a bad sign. New stars weren't supposed to be possible, and thus signaled some sort of supernatural event. A *moving* new star was a kind of double-whammy of exceptions, so it's little wonder that the Nativity's new star seemed so special.

The new universe

Today we perceive a very different universe, but our religion doesn't seem to be catching up. In the 1609, Galileo created modern astronomy when he took a new kind of eyeglass and, instead of using it to see ships coming into harbour, he pointed it at the sky. The new invention was what we now call a telescope. For the first time in history, a person could see further than any human eye. At first, Galileo studied the moon, where he was the first to see mountains and craters. But it was when he looked at Jupiter that he changed history, and started a fight with Christianity that we have never recovered from.

Using his very primitive telescope, Galileo noticed four small lights next

to Jupiter that no one had ever seen before. What made these new stars so important was that they were in a different position each night — they were moving. Galileo spent a few months watching them, noting that each one seemed to disappear and re-appear periodically. Galileo correctly concluded that these moving lights weren't stars at all, but moons of Jupiter. At this time, no one had ever seen moons around any planet other than Earth. Indeed, the whole point of the Christian universe was that everything revolved around the Earth, and nothing else.

This is where Christianity fumbled the ball. Galileo knew that fifty years before, a monk called Nicolai Copernicus had suggested that the orbits of the planets were easier to predict if one assumed they were revolving around the Sun, not the Earth. Copernicus was no fool. He knew his theory would upset Church authorities, so he had his work published after he died, so he didn't have to face the music.

Mathematicians like Galileo were impressed by Copernicus' equations, but the Church censured the work, and quietly suppressed it. Now, thanks to the moons of Jupiter, Galileo had proof that not everything revolves around the Earth. So, Galileo wrote a few books promoting his evidence-based argument that the Sun, not the Earth, was the center of the universe. And for this, he was ultimately sentenced to twenty years of house arrest, his books banned, his career as an astronomer ruined.

The reason the Church banned his work was simple — it contradicted common sense and scripture. The Pope and his advisors could easily find passages in the Bible where holy men like Solomon spoke of the sun rising and setting. This only made sense if the sun was circling the Earth. Could Solomon be wrong? Of course not — Galileo was. The message was clear — scientists could investigate the universe, but don't expect religion to endorse your work if it contradicts scripture.

A Bigger universe? No thanks, we're Christians.

As a result, the universe grew, but the Christian universe didn't. When the New Testament was put together, scholars believed the universe was 80 million miles wide, from the Earth to the stars. Now we know that just the distance from the Earth to the Sun is more than this — 92 million miles. The nearest star, Alpha Centauri, is 240,000 times further away than that. We live in a universe that is vastly different from the one the first Christians knew. For them, the universe was entirely visible — every human eye could see the furthest star. Thanks to the telescope, we now know that God's universe extends far beyond what our modest eyes can see, but not further than our minds can imagine, with a little technological help.

Yet, for most Christians who go to church today, it seems like time has stood still. Our church services rarely make any mention of the universe the scientists know, except when new technologies pose thorny moral

problems, such as abortion or contraception. Since Galileo's time, a truce has been worked out between Christianity and science. Scientists are free to explore the facts, but Christianity is in the business of exploring what life means.

The paleontologist Stephen Jay Gould wrote a short book about this, *Rocks of Ages: Science and Religion in the Fullness of Life*, just before he died in 2002. Gould had been a popularizer of evolutionary theory, and often locked horns with Christians who rejected Darwin in favour of Genesis. Not surprisingly, Gould dismissed creationist arguments, but he didn't dismiss religion as superstition. Instead, he saw it as a way human beings take facts and invest them with meaning — why are we here? What are human beings supposed to do with their lives? These are questions scientists can't answer based on discoveries about ape men or black holes. So Gould endorsed a polite division of labour — scientists will search for facts, while religion can invest them with spiritual meaning.

This seems reasonable, but there's one major problem — few Christians know much about science. How many of us know how many stars are in our own galaxy? Or how many galaxies exist in the universe? Or when our earliest ape ancestor became distinct from the chimpanzees? The answer is not to stick our heads in the sand and declare that Adam and Eve's story is literally true, or declare that the Big Bang never happened. That's simply cowardice, and explains why

Christianity has become increasingly sidelined as a major religion in the modern world. Today it is the Dalai Lama who meets each year with major scientists to create a dialogue between science and spirituality. He has said that Buddhism must change to incorporate scientific discoveries. Which major Christian leaders would say the same?

The latest discoveries

Christians have no reason to be afraid of science since scientific discoveries can deepen our sense of awe and wonder about God. Right now, the most impressive work in astronomy is being conducted by a project called the SLOAN digital sky survey. Using a series of electronic (i.e., digital, not optical) telescopes, astronomers are trying to completely map one quarter of the night sky, capturing every single star and galaxy. The results have been extraordinary. So far, they have found 50 million *galaxies*, each with up to 100 billion stars. More impressive still, they have found that galaxies are not just randomly spread out through space. Instead, SLOAN has discovered that galaxies come in clusters. Many appear to be lined up around areas that are empty, making a bubble shape. Astronomers speak of galaxies being aligned in filaments and walls.

This is not what scientists expected to find. Most assumed that galaxies would be randomly spread out, all flying away from each other in the aftermath of the Big Bang. Instead, they are taking pictures of galaxies that are obeying the rules of gravity,

creating gigantic shapes in space. Far from being an endless void of chaos, the universe appears to be structured at the largest possible level.

From a religious point of view, this is inspiring. God appears to play with *galaxies* the way we play with marbles. Using gravity, God creates patterns and shapes out of groups of stars that number in the billions. If the delicate structure of a leaf or flower is inspiring to us, then surely so is the revelation that God's love of pattern and order extends into the largest scale of the universe itself.

In church we say that God has created and is creating. This is borne out in spectacular fashion by recent studies of galactic evolution. Galaxies collide with each other, creating new patterns. Indeed, it is now believed that our own galaxy, the Milky Way, has cannibalized other galaxies already, and will one day collide with the Andromeda galaxy. That play of change and pattern which we see all around us on Earth is also at work at the furthest reaches of the universe. The God who made us, and who somehow chooses to pay attention to us, is also creating works where galaxies are his bricks and mortar. Why should scientists be the only ones to know about this? Surely, works this impressive merit our praise and wonder. There is no reason to claim that this is 'science', and we're in the religion business. God made these galactic walls, science only discovered them. Religion is devoted to loving God, and to know His works better can only lead to loving Him more.

We remain ignorant of science at our own risk. Let's take another example from astronomy. The next stage in telescopes is called a space-based interferometer. It floats in space, and is designed to find planets as small as Earth, circling other stars. It is composed of five telescopes, each of which sees distant star systems from a different angle. Computers combine the light each telescope receives, and then allows the light waves to cancel themselves out by interfering with each other, hence the name. With the glare of a star removed, it is possible to see small, Earth-sized planets circling alien stars.

This kind of telescope is being planned with the hope of finding alien life. Not all earth-sized planets will have life, of course. However, the telescopes will be able to detect light that has shone through the kind of atmospheres which only occur if life is present. For example, a lifeless world doesn't get to keep its oxygen for long, because oxygen is so easily absorbed into rocks. Mars is like this - that reddish colour is basically oxidized rocks. However, Earth's rocks don't absorb all of our oxygen because plants keep producing it. So, if the interferometers discover planets with oxygen atmospheres, it will be a clear sign of life beyond Earth.

So what will Christians do when the headlines read 'Alien Life Discovered outside the Solar System'? How will that be digested at a time when so many Christians insist on choosing between the Bible and science? Christianity is hardly

going to be able to keep up, if evolution itself is rejected by so many faithful.

This scenario isn't far fetched — there are at least 200 billion stars in our galaxy alone. If even a tiny fraction have life, we're facing millions of living worlds. At this point, such a revelation would leave most of our reverends, ministers and Popes dumbfounded, looking hopelessly backward, rather than being leaders of a forward-looking, flexible religion. This won't be a case of science running ahead of religion. Those planets were always out there. This will be a case of religion running far behind God.

God's universe is more impressive than the one the disciples knew —bigger, more expansive, more astounding. It deserves our attention and praise. There is no reason why the knowledge of nature should be divorced from the love of God.

Galileo saw this clearly in the early 1600s before he ran into trouble with the Catholic Church. " Holy Scripture and Nature are both emanations from the divine word: the former dictated by the Holy Spirit, the latter the observant executrix of God's commands." Now, in the 21st century, Christians may love nature, but we leave it to science to explain it. This stands in the way of our love of God. Christianity needn't be just the religion how people get along with each other. Christ knew that we could learn to live by watching the sparrows and the lilies of the valley, because God is at work in them, too.

So how do Christians see this new face of God? The best start is to take an interest in science. Fortunately, there are now lots of good books about science which don't assume the reader knows anything about the subject. Since major scientists are often quirky, these books are often a lot of fun to read, featuring strange people discovering amazing things. Few have any religious focus, but for the spiritually inclined, the astounding nature of the discoveries will provide ample opportunity for awe and wonder. The next step would be to get basic science into the curriculum of our seminaries, so a more sophisticated knowledge of nature could be featured in sermons. Perhaps then, we could finally begin to answer the question, " How big is the *Christian* universe?"

Further Reading:

Timothy Ferris, *Coming of Age in the Milky Way.*

A terrific overview of the history of astronomy. Ferris brings out the bizarre characters who have contributed to many of the most important discoveries about the universe. Highly readable, and lots of fun.

David Bodanis, *E=mc²: A Biography of the World's Most Famous Equation*

A terrific way to get up to speed on Einstein's theory of relativity. Bodanis provides a fascinating and entertaining profile of over a dozen scientists who contributed theories and discoveries which made

Einstein's breakthrough possible.
Relativity for people who like to be entertained without any equations in sight.

Richard Panek, Seeing and Believing.

A very nice little book that gives a quick romp through the history of astronomy.

Dava Sobel, Galileo's Daughter.

That rare book : a biography of a scientist that understands the importance of religion. The story of Galileo's battle with the Church is told through his relationship with his brilliant daughter, Maria Celeste, who lived as a nun through the entire episode. A fascinating look at the birth of science at a time when the best place for a single woman was a convent.

Bill Bryson , A Short History of Nearly Everything.

A fascinating and readable overview of the most important scientific discoveries of all time. Filled with hilarious stories of discoveries from every branch of science, and loaded with fantastic 'water cooler' facts that will amaze and delight.