

The Galileo affair

You have all learned that Galileo was prosecuted by the Catholic Church for publishing what was called the Copernican or heliocentric theory of the earth's motion. The details are well known and the battle is now very much over (unlike the battle over evolution which threatens to go on forever). I would like to review it in some detail to see if we can make some sense of it.

The notion that the earth revolves around the sun was suggested by Pythagoras in the 6th century BCE. The precise order of the planets and rough estimates of their distances from the sun was worked out by Aristarchus of Samos in the 3rd century BCE. This work was largely forgotten in the Middle Ages however, and the prevailing view was that the earth was at the center of the solar system – the so-called Ptolemaic model. True, St. Augustine had written, “What concern is it to me whether the heavens as a sphere enclose the earth in the middle of the world or overhang it on either side?” but the Ptolemaic model accorded well with scripture. For example, Peter Lombard, professor at the University of Paris in the 12th century wrote, “Just as man is made for the sake of God – that is, that he may serve Him – so the universe is made for the sake of man – that is, that it may serve *him*; therefore is man placed at the middle point of the universe, that he may both serve and be served.” This design had its finest artistic flowering in Dante's *Divine Comedy* in which the earth is placed at the center of the universe with the heavens arranged in concentric spheres around it.

One of the first Europeans to realize that the earth and planets revolve about the sun was Nicholas Copernicus. He explained the idea to a few close friends when he was a professor in Rome in 1500. As he became more certain of the idea he felt that Rome was not safe and withdrew to his native Poland. His book, *The Revolutions of the Heavenly Bodies* was eventually published in 1543 with the editor's preface that it was just a hypothesis. A copy was placed in Copernicus' hands a few hours before he died. There the matter rested until 1616 when Galileo proclaimed it not as a hypothesis but the *truth*, and this is when the trouble started. The book was taken up by the Roman curia. Galileo was forbidden to teach or discuss the Copernican system, and to read the work of Copernicus was to risk damnation.

The rest of Galileo's life is a complicated story full of intrigue, betrayal, and a certain massive naiveté on Galileo's part. I will skip over the details which are well known. Suffice it to say that in 1633 Galileo was taken before the

Inquisition, imprisoned, and threatened with torture. He was forced to recant as follows:

I Galileo, being in my seventieth year, being a prisoner and on my knees, and before your Eminences, having before my eyes the Holy Gospel, which I touch with my hands, abjure, curse, and detest the error and the heresy of the movement of the earth.

He was exiled and placed under house arrest where he died several years later.

It is interesting to look at some of the charges raised against him. For one thing it was known that there could only be seven planets. This was clear from the seven golden candlesticks of the Apocalypse, by the seven-branched candlestick of the tabernacle, and by the seven churches of Asia. Galileo's telescope showed the moons of Jupiter so it was concluded that he had contrived a demonic instrument to create them. Galileo showed that the moon shines from light reflected from the sun. This contravenes a line in Genesis that the moon is a "great light." Joshua "made the sun stand still" therefore it must be revolving around the earth, not vice versa. And so on.

It would be comforting to believe that the Protestants were above all this, but no, they simply lacked the means to act on their prejudices. Martin Luther said, "This fool wishes to reverse the entire science of astronomy; but scared Scripture tells us that Joshua commanded the sun to stand still, and not the earth." Melancthon wrote "Now it is a want of honesty and decency to assert such notions publicly, and the example is pernicious." Calvin condemned all who asserted that the earth is not at the center of the universe, "Who will venture to place the authority of Copernicus above that of the Holy Spirit?"

Galileo's works were placed on the *Index* prefaced with a bull from the reigning pope forbidding "all writings which affirm the motion of the earth." This prohibition was not removed until two centuries later in 1835 in which there was issued an issue of the Index from which the condemnation of works defending the double motion of the earth was left out. But in 1873 there was published in St. Louis at the publishing house of the Lutheran Synod of Missouri a book by a well-known author that proclaimed, "The entire Holy Scripture settles the question that the earth is the principle body

of the universe, that it stands fixed, and that the sun and moon only serve to light it.”

After the heliocentric theory became an accepted fact, there followed several centuries of work by the Church’s apologists to make the Catholic Church appear in a better light. I will mention two arguments simply to entertain you. One was that the Pope yielded to pressure from the Protestants. The other was that Galileo was not tried for heresy but rather contumacy – he hurt the Pope’s feelings!

The same sort of battle was fought over other issues that we now take for granted. I will mention a few of them.

Noah’s flood raised serious questions regarding the number, fixity, and distribution of species. Remember that all animals today are descendents of animals in the arc. Well then how did kangaroos get to Australia? Evidently they were carried by angels; but didn’t the angels have anything better to do?

What about the shape of the earth? A writer from sixth century put it this way, “We say therefore with Isaiah that the heaven embracing the universe is a vault, with Job that is joined to the earth, and with Moses that the length of the earth is greater than its breadth.” He goes on to say that on the last day God will condemn all that do not believe this doctrine. Even when the world was generally accepted to be a sphere it was held that there could not be people living at the antipodes, those places diametrically opposite to Jerusalem. St. Paul declared that “Verily their sound went into all the earth, and their words unto the ends of the world.” Since those preachers did not go to the antipodes, the antipodes can’t exist. This idea persisted in one form or another until 1519 when Magellan sailed around the world and met people living at the antipodes!

The Old Testament contains careful chronologies of the major figures from the early history of Israel. From these chronologies together with secular history of the last few centuries BCE one can calculate that the world was created around 4004 BCE. What then was one to make of fossils? The prevailing view in the Church up to the middle of the 19th century was that they were artifacts of Noah’s flood. To explain why fossilized sea shells are found at high altitudes it was postulated that the crust of the earth was violently buckled as a consequence of man’s sin.

One of the oddest episodes in the conflict between medical science and Christianity centers on the church's opposition to inoculation and vaccination against smallpox. One defense against smallpox is inoculation in which a small amount of smallpox virus is scratched into the skin of a healthy person. Inoculation had been practiced in China for centuries and was introduced to Europe and America in the early 18th century. It was not entirely safe, but the benefit to risk ratio was very large. Nonetheless the opposition to it was considerable. It was first used in America by Zabdiel Bolyston in 1721 with the support of Cotton and Increase Mather. So great was the opposition that an attempt was made on Cotton Mather's life. It was argued that smallpox is a judgment of God on the sins of the people and that to avert it is but to provoke him more. The modern practice of vaccination was discovered in 1796 by Edward Jenner. Almost immediately the Anti-vaccination Society was formed by physicians and clergymen who called on the people of Boston to suppress vaccination as "bidding defiance to Heaven itself, even to the will of God," and declared that the law of God forbids the practice.

Although the details are different, all these stories follow the same plotline. A theory survives from the Middle Ages, e.g. the world is like a tabernacle and God hangs out the sun every morning. The images are based on a fanciful reading of the scriptures. For our point of view, they seem charming, imaginative, and naïve; like something out of a children's picture book. But with the renaissance comes what we would call science with its own methodology and its own claims to truth. At this point a nasty battle breaks out. Accusations are made such as heretic, blasphemer, infidel, and atheist. Universities and professors are censored. Careers are ruined. In some cases great harm is done to innocent people. In a few cases there are tribunals, imprisonment, torture and execution. Eventually the new truth prevails and the issue is forgotten, or, as in the case of Galileo, apologists try to rewrite history in such a way as to exculpate the church. Why does all this happen?

Two explanations come to mind immediately which are not viable. One is that these people were just stupid. Not true – these were some of the most brilliant and best educated men of their respective generations. The other is that the conflict was due to what we call fundamentalism, i.e. the belief that the Bible must be read literally. Although we sometimes refer to it as "that old-time religion," it is really the product of the early twentieth century. As you have seen the medieval readings of the Bible were often very fanciful.

So far as I can tell from reading historical reviews, there are very few instances in which one of these protagonists changed his mind. The old ideas faded away, not because their champions became convinced of the new truth, but because they got old and died! In this sense the conflict between science and Christianity seems like a series of social or cultural revolutions. There is a famous episode in the field of geology that illustrates this well.

Johann Beringer, Professor at the University of Wurzburg was firmly convinced that fossils are simply “stones of a peculiar sort, hidden by the Author of Nature for his own pleasure.” His students, as one version of the story has it, had carved some 2000 fake fossils of fantastic creatures, some with Hebrew and Arabic inscriptions. They then bribed some workmen to present the fossils to Beringer claiming that they were found at a nearby site. He was completely taken in by the hoax and published a treatise bearing the title *Lithographiae Wirceburgensis* in which he claimed that this remarkable find completely vindicated his theory. He finally became convinced that fossils were fakes when one turned up with his name on it! He tried to buy up all the copies of the books, spent all his money and died in poverty in 1740. The books are now valuable collectors’ items. I found one offered by a German dealer for \$13,000. Several hundred of the “fossils” survive, some at the University Museum, Oxford, and some in the hands of private collectors. The point is that his students (or in another version of the story, two younger colleagues) all knew that his theological explanation of fossils was silly, but Beringer was so convinced that he was vulnerable to a crude hoax. Let’s remember the words of Oliver Cromwell, “I beseech you in the bowels of Jesus Christ, to think that you may be wrong.”

There was one other battle that I would like to mention because I think it touches on a modern conflict. There was a belief in the church for over a thousand years that insanity is the result of demonic possession. There is some sanction for this idea in the Gospels. There are numerous references to the casting out of demons. Mary Magdalene herself had seven demons cast out. We all remember the incident in the land of Gad where Jesus cast out a legion of demons who then entered a herd of pigs. Later the power of casting out demons was cited as proof of the divine origin of Christianity. In the early middle ages insane people were treated with exorcisms. There is a record of the Jesuit fathers at Vienna who in the year 1583 cast out 12,652 living devils. One charming exorcism consisted of insulting the devil. Since

the devil's overweening sin is pride, it followed that if he were insulted sufficiently he would leave the victim!

Later the unfortunate theory took hold that cruelty to madmen was punishment of the devil within. Flogging the victim was the most common torture, deprivation of sleep was another. I found a footnote regarding the asylum at St. Nunnespoole's Well in Cornwell in which insane people were treated by what we would call today, waterboarding! The theory of demonic possession became tied up with the medieval notion of witchcraft. It was believed that insane people had been cursed by witches or were witches themselves. The punishment for witchcraft was torture and death. It is estimated that some tens of thousands of women and young girls were put to death in this way. There is a famous quote from John Wesley in 1768, "The giving up of witchcraft is in effect the giving up of the Bible."

The notion of witchcraft lost currency in the eighteenth century and by the end of that century the first asylums appeared in France, England, and America based on the modern idea that insanity is a disease, and insane people are to be treated first with care and compassion. Science was at least partly responsible for this change in two interesting ways. The devil in medieval theology was often called The Prince of the Power of the Air, and one of the most common charges brought against putative witches was that they caused lightning storms. Ben Franklin's lightning rod or "heretic's rod" as it was called, showed that lightning was just an electrical discharge, and the great cathedral spires, so often the target of the devil's attacks, could be protected with a long copper wire! Eighteenth century doctors were able to show by dissecting cadavers that madness at least sometimes had recognizable physical causes such as brain tumors or encephalitis.

I mention all this because it runs parallel to a very divisive issue in our society, the place of homosexuals in the church. This is not usually regarded as a battle between religion and science, but consider the following. Psychologists have made a strong case that homosexuality is not a "disease" that must be treated nor is it in most cases a freely chosen "lifestyle." Moreover, sexual orientation is a subtle matter with many variations. People who deny this do so on the basis of Biblical passages, some of which have the same antiquity and force as that famous line in Exodus, "Thou shall not suffer a witch to live." (Exodus 22:24) We hope that "cures" of homosexuality like the exorcism of witches will come to be regarded another grotesque superstition.