

# ***The Church's Own Astronomers: Far From Shunning Science, Rome Operated Solar Observatories***

---

***By William J. Broad***

*(In the May-June 1999 issue of Tripod, we published an article entitled, "Science and Religion: A Brief Discussion," by the Chinese scholar, Li Shen. That same issue carried a commentary on Li's article by René Gilbert. Recently, Tripod received a note from Father Fernando Galbiati, in Rome, who had also read the article and thought he had found a perfect answer to Li in the October 25, 1999, International Herald Tribune. We have obtained the permission from the International Herald Tribune/ New York Times Service to publish the article in Tripod.)*

**M**any people know that the Roman Catholic Church once waged along and bitter war on science, and on astronomy in particular. But that seemingly well-established fact of history, it turns out, is wrong.

While it is true that the church condemned Galileo, new research shows that centuries of oversimplifications have concealed how hard Rome worked to amass astronomical tools, measurements, tests and lore.

In its scientific zeal, the church adapted cathedrals across Europe, and a tower at the Vatican itself, so their darkened vaults could serve as solar observatories. Beams of sunlight that fell past religious art and marble columns not only inspired the faithful but provided astronomers with information about the Sun, the Earth and their celestial relationship.

Among other things, solar images projected on cathedral floors disclosed the passage of dark spots across the Sun's face, a blemish of change in heavens that theologians once thought to be without flaw.

In a new book, *The Sun in the Church*, John Heilbron, a historian of science, reveals the remarkable ubiquity of the solar observatories, which were little known to modern scholars. And he shows that the church was not necessarily seeking knowledge for knowledge's sake, a traditional aim of pure science.

Rather, like many patrons, it wanted something practical in return for its investments: mainly the improvement of the calendar so church officials could more accurately establish the date of Easter.

When to celebrate the feast of Christ's resurrection had become a bureaucratic crisis within the church. Traditionally, Easter fell on the Sunday after the first full moon of spring. But by the 12<sup>th</sup> century, the usual ways of predicting that date had gone awry.

To set a date for Easter Sunday years in advance, and thus reinforce the church's power and unity, popes and ecclesiastical officials had for centuries relied on astronomers, who pondered over old manuscripts and devised instruments that set them at the forefront of the scientific revolution.

According to Mr. Heilbron, the church "gave more financial and social support to the study of astronomy for over six centuries, from the recovery of ancient learning during the late Middle Ages into the Enlightenment, than any other, and probably all other, institutions."

Mr. Heilbron, 65, is professor emeritus and vice chancellor emeritus at the University of California at Berkeley and a senior fellow at Worcester College, Oxford, England. He lives in England and travels widely to study old solar observatories.

He said he was astonished by the old instruments, which he first saw eight years ago in Bologna, Italy, at the Basilica of San Petronio.

"The church itself was beautiful, somber," Mr. Heilbron recalled. "When the sun crawled across that floor, there was nothing else. That's what you had to look at. It was intense."

After discovering that other churches throughout Europe had solar observatories, he produced a book rich in old drawings, equations, geometrical figures and astronomical lore.

Owen Gingerich, a historian at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, praised the work as re-creating a lost world.

"It's a very important piece of scholarship," Mr. Gingerich said.

In the book and an article in *The Sciences*, a journal of the New York Academy of Sciences, Mr. Heilbron shows that the observatory findings (usually made in sight of a cathedral altar) often contradicted church dogma of that time.

The Jesuits, for instance, used the observatories to confirm theories about the movement of the Earth that they were forbidden to teach.

Over the centuries, Mr. Heilbron said, observatories were built in cathedrals and churches throughout Europe, including Rome, Paris, Milan, Florence, Bologna, Palermo, Brussels and Antwerp. Typically, the buildings, which were dark inside, needed only a small hole in the roof to allow a beam of sunlight to strike the floor below, producing a clear image of the solar disk. In effect, the church had been turned into a pinhole camera, in which light passed through a small hole into a darkened interior, forming an image on the opposite side.

On each sunny day, the solar image would sweep across the church floor and, exactly at noon, cross a long metal rod that was the observatory's most important and precise part. The noon crossings over the course of a year would reach the line's extremities – the summer and winter solstices, when the Sun is farthest north and south of the Equator. The circuit, among other things, could be used to measure the year's duration with great precision.

The path on the floor was known as meridian line, like the north-south meridians of geographers. The rod, in keeping with its setting and duties, was often surrounded by rich tile inlays and zodiacal motifs.

The instruments lost much of their astronomical value around the middle of the 18<sup>th</sup> century because of advancements in the telescope. But, as Mr. Heilbron writes, the observatories still played a significant role because the solar timepieces were often used to correct errors in mechanical clocks and even to set time for railroads.

One of the observatories also impressed Charles Dickens, who in his book *Pictures From Italy*, wrote that he found little to like in Bologna except “the Church of San Petronio, where the sunbeams mark the time among the kneeling people.”

Today, the surviving cathedral solar instruments are lovely anachronisms that baffle most visitors, who are usually unaware of their original use or historical importance.