What Time Is It in the Transept?

An introduction to the astronomical instruments in some of Europe's greatest churches.

THE SUN IN THE CHURCH

Cathedrals as Solar Observatories.
By J. L. Heilbron.
Illustrated. 366 pp. Cambridge, Mass: Harvard University Press. $35.

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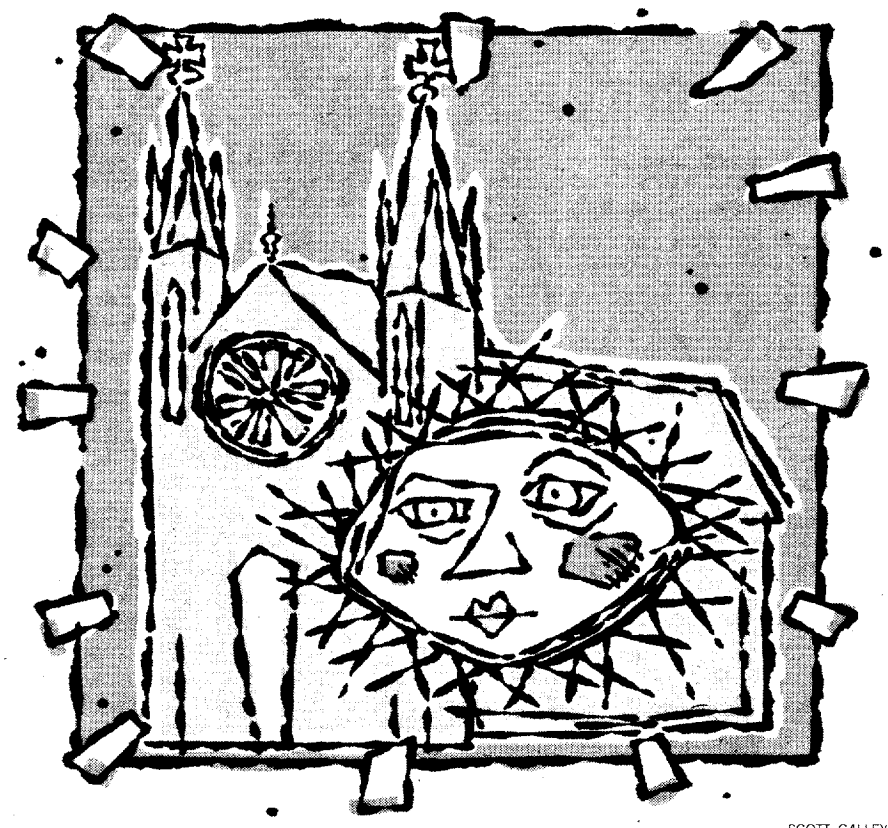

SCOTT GALLEY

EXPLORING Paris in student days, I met a rake — the wayward youngest son of a beleaguered aristocratic family — who climbed cathedrals by night, shinnying up downspouts and grappling gargoyles. His greatest exploit was summiting that baroque giant, St. Sulpice, on whose dome he planted, irreverently, a large Batman flag. I shunned his antics, but did have a question for him: On his way up (via a gutter on the south transept) had he spotted a suspicious oculus, a hole, perhaps fitted with a lens, about 70 feet up?

The query came out of a curious discovery: at Mass I had noticed a mysterious brass line laid into the stone floor near the communion rail; graduated like a ruler, it ran across the chancel and up an exotic obelisk standing in the north transept. A little snooping revealed that the device had to be a gnomon, an astronomical instrument something like a giant sundial. The sun, shining through a small aperture on that south wall, would mark the passage of the solar year: summer solstice to winter, autumn equinox to spring.

At least in theory. Neither I nor my human-fly acquaintance ever found the oculus. Having now read "The Sun in the Church," by J. L. Heilbron, I know why. After narrowly escaping antireligious vandals during the French Revolution, the gnomon fell into disrepair: the windows that had been covered to create a thin pencil of significant light were thrown open to brighten the cavernous interior. The gnomon was dead. Remarkably, though, it had probably saved the church. When the revolutionary rabble set to work upending statues and snatching ecclesiastical treasures, two pharmacists in the parish intervened on behalf of the device — the fruit of French science and a monument to enlightened Reason. Desecrate the sepulcher perhaps, but a precision instrument, never.

This improbable tale is just one of the gems recovered by Heilbron — a historian of science at the University of California and Oxford — in a book that lingers lovingly over these forgotten instruments. Once big science, now architectural curios not infrequently buried under flagstones and pews, gnomons (or meridian lines, as they are more properly called) lie at the luminous conjunction of mathematics, philosophy, architecture, astronomy and church politics. Dusted off in this idiosyncratic history of astronomy during the scientific revolution, they provide an occasion to revisit perennial questions about the relationship between science and religion, reason and faith.

To see how, ask the obvious question: How did a precision metrical instrument for positional astronomy end up a few steps from the sacristy, not just in St. Sulpice, but (if you look closely) in Santa Maria del Fiore in Florence, San Petronio in Bologna, Santa Maria degli Angeli in Rome and even the Duomo of Palermo? Understanding this, it turns out, demands recalling a problem as forgotten as the tools constructed to solve it — the problem of the calendar, and specifically the correct date for that original "movable feast," Easter. Unlike other Christian days of jubilation — say, Christmas — Easter is not simply pegged to a particular date in the calendar year. Instead, its annual placement depended (and depends) on several unpalatably technical celestial constants, most notably the length of the lunar month (an ungainly 29.53059 days) and the solar year (the equally unmanageable 365.2422 or so days). Fixing the date of Easter, and particularly extrapolating dates for future Easters, demands not only a good deal of arithmetic but some very fine measurements of heavenly bodies as well.

Enter the ecclesiastical meridian line, which made cathedrals into solar observatories. Heilbron uses the story of these instruments to tell a history of "significant figures," in two senses: on the one hand he follows the lives of key individuals in French and Italian science in the 17th century (Egnatio Danti, Francesco Bianchini, the Cassinis) who built and used meridians. At the same time, this is a book about numbers, a book in which decimal places can play protagonist.

Why take on the history of increasingly precise measurements of difficult physical constants? Because doing so provides an opportunity to correct an unfortunately simplistic (yet dismayingly pervasive) story about the relationship between the Roman Catholic Church and science in the wake of Galileo's trial. One must, too often, hear perfectly well-educated people assert that the church denied the earth's motion until sometime in the mid-1970's. Even those better informed will be surprised to discover what Heilbron shows: that the Catholic Church served as perhaps the largest patron of sophisticated astronomical research throughout the controversies over Copernicus and his sun-centered scheme.

This is not to say that the notorious question of a spinning, revolving earth did not cause trouble. It did. Galileo's condemnation had made it clear that those who dabbled in heliocentric theories could wind up on the wrong side of ecclesiastical laws. It might be expected that this would prove an insurmountable obstacle for those pursuing astronomical researches at observatories right inside the walls of the church: how could they remain abreast of cutting-edge astronomy if they had to forswear, on principle, one of the best hypotheses going?

It is in answering this question that the detailed and often technical approach of "The Sun in the Church" pays dividends. In a rich section on the history of church censorship, Heilbron reveals just how complex ecclesiastical law was. Having trouble getting your astronomy primer past the censors for the Index? Try doing an end-around and sending your manuscript directly to a friend at the Hqly Office instead. A great deal, as it turned out, depended on the finer points of politics: one author who flirted with Copernicanism had the tact to dedicate his manuscript to his censor's boss. The censor got it off his desk in a hurry, approved. Nor was the church the monolith it pretended to be. The Bologna Academy of Sciences learned as much when the cardinal-president of the Index itself gave them an elegant model of the heavens to display in their quarters — with the sun at the center! He had a taste for Copernicus himself, but it made them so nervous that they made two earth-centered models to go next to it.

In the end, the cleric-astronomers at their meridians never had to forswear the Copernican hypothesis, precisely because that was the church's only hard and fast rule: the sun-centered universe had to be treated *as a hypothesis*. As long as one said somewhere that one was not dealing in absolute truth, one was largely free to get on with the business of technical astronomy. And here lay a happy coincidence: the emerging spirit of the scientific revolution was quite at ease with the language of hypothesis. The new sorts of claims to truth coming out of laboratories and observatories in the period increasingly had about them a certain self-consciousness; they went forward with the hedge that they could be shown wrong by further work. Anything else had the odor of dogma.

IT is a most surprising observation: the fig leaf that the church insisted scholars wear over their Copernicus just happened to be a leaf plucked from a new and vigorous tree of knowledge; calling the theory "hypothesis" proved part old-fashioned ruse and part newfangled epistemology. Could this be something more than coincidence? How ironic it would be if the church's seemingly backward attitude toward heliocentrism actually nurtured a powerful and emergent scientific method.

Heilbron, probably rightly, does not go so far, but he brings readers up to the edge of the question, and in doing so he certainly turns the tables on tired stories of the war between science and religion. This is not a perfect book: it is woven out of so many threads that there are some tangles in the braid; even where smooth, some readers will probably feel like they are being sneakily subjected to a section of the old math SAT. But even in this there lies a lesson: the history of science, and its readers, must do justice to the science of the past in order to do justice to its history. □

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