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## Vatican's Celestial Eye, Seeking Not Angels but Data

By GEORGE JOHNSON  
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MOUNT GRAHAM, Ariz. — Fauré's "Requiem" is playing in the background, followed by the Kronos Quartet. Every so often the music is interrupted by an electromechanical arpeggio — like a jazz riff on a clarinet — as the motors guiding the telescope spin up and down. A night of galaxy gazing is about to begin at the [Vatican's](#) observatory on Mount Graham.

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Associated Press

An image of a spiral galaxy 102 million light-years from Earth taken by the Vatican Advanced Technology Telescope in Arizona.

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Chris Ware/Keystone Features/Getty Images  
The Vatican observatory at Castel Gandolfo, the pope's summer residence, in 1946.

As Dr. Corbally rushes from station to station flicking switches and turning dials, he seems less like a priest or even an astronomer than a maintenance engineer. Finally when everything is ready, starlight scooped up by the six-foot mirror is chopped into electronic bits, which are reconstituted as light on his video screen.

"Got it. O.K., it's happy," says Christopher J. Corbally, the Jesuit priest who is vice director of the Vatican Observatory Research Group, as he sits in the control room making adjustments. The idea is not to watch for omens or angels but to do workmanlike astronomy that fights the perception that science and Catholicism necessarily conflict.

Last year, in an opening address at a conference in Rome, called "Science 400 Years After [Galileo Galilei](#)," Cardinal Tarcisio Bertone, the secretary of state of the Vatican, praised the church's old antagonist as "a man of faith who saw nature as a book written by God." In May, as part of the International Year of Astronomy, a Jesuit cultural center in Florence conducted "a historical, philosophical and theological re-examination" of the Galileo affair. But in the effort to rehabilitate the church's image, nothing speaks louder than a paper by a Vatican astronomer in, say, The Astrophysical Journal or The Monthly Notices of the Royal Astronomical Society.

On a clear spring night in Arizona, the focus is not on theology but on the long list of mundane tasks that bring a telescope to life. As it tracks the sky, the massive instrument glides on a ring of pressurized oil. Pumps must be activated, gauges checked, computers rebooted. The telescope's electronic sensor, similar to the one in a digital camera, must be cooled with liquid nitrogen to keep the megapixels from fuzzing with quantum noise.

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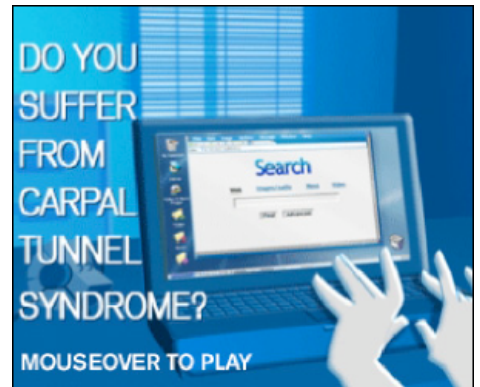
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"Much of observing these days is watching monitors and playing with computers," Dr. Corbally says. "People say, 'Oh, that must be so beautiful being out there looking at the sky.' I tell them it's great if you like watching TV."

Dressed in blue jeans and a work shirt, he is not a man who wears his religion on his sleeve. No grace is offered before a quick casserole dinner in the observatory kitchen. In fact, the only sign that the [Vatican Advanced Technology Telescope](#) is fundamentally different from the others on Mount Graham, the home of an international astronomical complex operated by the [University of Arizona](#), is a dedication plaque outside the door.

"This new tower for studying the stars has been erected on this peaceful site," it says in Latin. "May whoever searches here night and day the far reaches of space use it joyfully with the help of God." At that point, religion leaves off and science begins.

The Roman Catholic Church's interest in the stars began with purely practical concerns when in the 16th century Pope Gregory XIII called on astronomy to correct for the fact that the Julian calendar had fallen out of sync with the sky. In 1789, the Vatican opened an observatory in the Tower of the Winds, which it later relocated to a hill behind St. Peter's Dome. In the 1930s, church astronomers moved to Castel Gandolfo, the pope's summer residence. As Rome's illumination, the electrical kind, spread to the countryside, the church began looking for a mountaintop in a dark corner of Arizona.

Building on Mount Graham was a struggle. Apaches said the observatory was an affront to the mountain spirits. Environmentalists said it was a menace to a subspecies of red squirrel. There were protests and threats of sabotage. It wasn't until 1995, three years after the edict of Inquisition was lifted against Galileo, that the Vatican's new telescope made its first scientific observations.

The target tonight is three spiral galaxies — Nos. 3165, 3166, 3169 in the New General Catalog — lying about 60 million light-years from [Earth](#), a little south of the constellation Leo. Sitting at a desk near Dr. Corbally is Aileen O'Donoghue, an astronomer from St. Lawrence University in Canton, N.Y., who is interested in how these gravitational masses tug at one another, creating the stellar equivalent of tides.

"Exposing, 30 minutes," she says. As Celtic ballads play in the control room, data is sucked up by hard drives, and a column of numbers scrolls down her computer screen. Dr. O'Donoghue, who was raised Roman Catholic, is the author of "The Sky Is Not a Ceiling: An Astronomer's Faith," in which she describes how she lost and then rediscovered God "in the vastness, the weirdness, the abundance, the seeming nonsensicalness, and even the violence of this incredible universe."

In person she's not nearly so intense. While waiting for an image to gel, she steps out on a balcony for a look at the unprocessed sky. The Beehive Cluster, one of the first things Galileo saw with his telescope, is sparkling in the constellation [Cancer](#). Next to it is Leo, where Dr. O'Donoghue is looking for the gravitational tides.

"It's the real sky that matters," she says. She describes how she makes her undergraduate students go outside and look at the Big Dipper at different times of the night. "They come back and say, 'It moves!'" — words Galileo legendarily muttered after he was forced to recant. "You can tell students that the Earth rotates, but until they see that with their eyeballs, they're not doing science," she said. "You might as well be teaching theology and Scripture."

Back inside the control room she explains how the gravitational tides she is studying might be stellar nurseries. As one galaxy brushes by another, clouds of gas are stirred so violently that they give birth to stars.

In the Vatican Observatory's annual report, at the point where a corporation might describe its business strategy, is a section delineating the difference between creatio ex nihilo (creation from nothing) and creatio continua: "the fact that at every instant, the continued existence of the universe itself is deliberately willed by God, who in this way is

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continually causing the universe to remain created.”

Theologians call these “primary causes,” those that flow from the unmoved mover. Sitting atop this eternal platform is another layer, the “secondary causes,” which can be safely left to science.

Dr. Corbally and Dr. O’Donoghue continue working through the night, collecting data on secondary causes — galactic tides, stellar birth. Sleep will wait until morning, and thoughts about primary causes for another time.

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