

Holy Smoke -- The Vatican Runs Quite an Impressive Observatory

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Astronomers use the Vatican Advanced Technology Telescope (VATT), shown with its shutters closed, for varied observations from monitoring the brightness of an asteroid in our own solar system to capturing images of distant galaxies. The previous Vatican Observatory at the Papal Summer Residence at Castel Gandolfo, near Rome operated from 1935 to 1993. When it became clear that there wasn't a site on Italian territory that was suitable for the newly planned VATT, an observatory to house the larger and more powerful telescope was built on Mount Graham in Arizona where advanced work continues today. (Image Credit: Vatican Observatory, FOTOSMITH)

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"From the Galileo case we can draw a lesson which is applicable today in analogous cases which arise in our times and which may arise in the future... It often happens that, beyond two partial points of view which are in contrast, there exists a wider view of things which embraces both and integrates them." John Paul II 1 November 1992, in a speech where he officially pardoned Galileo and admitted that he had been right all along.

In its historical roots and traditions, the Vatican Observatory is one of the oldest astronomical institutions in the world. Serious astronomical work undertaken by the Vatican can be traced to 1582, when Pope Gregory XIII formed a committee to study the scientific data and implications involved in the reform of the calendar. The committee included Father Christoph Clavius, a Jesuit mathematician from the Roman College, who explained the importance and necessity of calendar reform. From that time to the present day, the Papacy has manifested an interest in and support for astronomical research, especially in the last couple of hundred years.

Vatican-sponsored astronomical research reached a climax in the mid-nineteenth century with the research of the famous Jesuit, Father Angelo Secchi at the Roman College in Italy. He was the first to classify stars according to their spectra.

In order to counteract the longstanding accusations of hostility of the Church towards science, Pope Leo XIII in 1891 formally founded the Vatican Observatory and located it on a hillside behind the dome of St. Peter's Basilica. In 1935, the observatory was moved from the Vatican to Castel Gandolfo, the Pope's summer residence located south of Rome. The observatory was moved to escape the increase in artificial sky illumination from Rome's city lights. In 1956, a Schmidt Telescope was added. This wide-angle camera required the darkest skies possible and in the 1970s, the observatory began to face the problems of light pollution once again. The effectiveness of the Schmidt Telescope at that location was threatened.

According to George Coyne - former director of the Vatican Observatory, while observatory staff began to address the issue of a move, it was the wish of Pope Paul VI that they limit their search to Italian national territory. "Considering that we are (today operating) in southern Arizona, we have here an interesting example of how times and mentalities change, as do Popes," says Coyne.

It became clear that there wasn't a site on Italian territory that would merit a move of the Vatican Observatory. As various European and South American locations were considered, the decision was made to move people instead of telescopes. Several Jesuits, either already trained or pursuing training in astronomy, eventually joined Coyne as part of the research staff that would determine the future of the observatory.

Coyne's ties to the University of Arizona presented the Vatican Observatory with the opportunity and an invitation from the UA to join in the construction of an advanced technology telescope. "We wanted to have a good firm anchor in top-rate science. This was an excellent choice and it remains so because of the University's involvement in astronomy through Steward Observatory. It's a great place to be," says Chris Corbally, S.J., Vice Director for the Vatican Observatory Research Group and Adjunct Astronomer at UA's Steward Observatory.

"We came in the early 1980s, when the big telescope projects were getting under way," says Corbally. "This mirror was the first one that was actually spun cast with the ceramic molds and spinning furnace. The new technology was used all the way through, including the stressed lap polishing technique. All of that technology was tested out on this mirror. It was very exciting."

The Vatican Advanced Technology Telescope was inaugurated in September 1993 on Mount Graham in Graham County, AZ. "And," Corbally continues, "10 years

later we realized that we undertook a great deal of work."

Corbally says that a decade after installation, the telescope is working reliably and people are getting good observations. What is needed now are upgrades and adjustments to the instrumentation and software to make the telescope even better and easier for observers to use and to maintain good images.

The next phase will be to have mirror adjustments made solely by automation instead of needing the observer to tweak the telescope during the night. "We don't need a vast amount of instrumentation," says Corbally. "But a telescope is almost a living thing. If you stop working on it, it will die. Every telescope that is working is always being improved. People want to use this telescope and observers from all over the world keep coming back."

Corbally refers to himself as "primarily a spectroscopist" who, until recently, didn't have a spectrograph. There is now an infrared one on loan to VATT from the University of Virginia and construction of the VATT's optical spectrograph is under way.

Recent research highlights achieved using the VATT include the discovery by William Ryan, from the New Mexico Institute of Mining and Technology, of the first binary Vesta chip. Ryan and collaborators used the efficient imaging of VATT to monitor, night after night, the brightness of an asteroid in the Asteroid Belt known to have been split off from the much larger asteroid, Vesta. The only way they could explain tiny differences from the expected variations was if the "chip" itself had a little companion chip. This discovery will give insights into the original impact that Vesta experienced and how the solar system formed.

Another significant research project, the search for MASSive Compact Halo Objects (MACHOS), required extensive observation over numerous successive clear nights that Mount Graham's atmosphere provides. Corbally says that what was required was a telescope that collaborators Richard Boyle and program designer Arlin Crotts of Columbia University in New York, could use to "stare at Andromeda, a galaxy much like our own, night after night. The observations," Corbally, continued, "are telling us how significant a part these massive compact halo objects were of the dark matter of the universe that we know to be out there. What are these stellar-mass objects? The mystery continues." And, so does the research.

When presented with the age-old question of whether he believes that there is a conflict between the continued quest for scientific knowledge and his role as an Astronomer-Priest, Coyne replies that he doesn't believe that there should be a conflict nor even a debate. "Dialogue is more productive. At a time when religious fundamentalism frequently makes headlines and when astronomical discoveries are being made at a dizzying pace, respectful dialogue about the respective roles of science and religion in our lives takes on new urgency."

For more info:

<http://clavius.as.arizona.edu/vo/R1024/VATT.html>

<http://clavius.as.arizona.edu/vo/R1024/Research.html>

<http://www.baltimoresun.com/news/health/bal-hs.astronomer20apr20,0,7228751.story?coll=bal-health-headlines>

<http://uanews.org/ror/summer04/vatt10.html>