Space School: Vatican Observatory Supports Rising Stars in Astronomy

by Carol Glatz
Catholic News Service

CASTEL GANDOLFO, Italy (CNS)—It looked like a mini-United Nations, but the attendees were wearing shorts and T-shirts and, over coffee, they talked about the birth of star clusters rather than a ban on cluster bombs. Also, the location wasn’t Manhattan or Geneva, but a refurbished monastery immersed in the papal gardens behind the pope’s summer villa south of Rome.

The 25 young men and women from 23 different countries were future astronomers and astrophysicists brought together by the Vatican Observatory to spend the month of June discussing “The Formation and Evolution of Stellar Clusters,” which are groups of stars populating the galaxies.

Every other year, the Jesuit-run observatory holds a monthlong summer school dedicated to a different area of research in the astronomical sciences, examining everything from comets and meteorites to the nuclei of galaxies.

The students this year were chosen from 150 applicants from all over the world. The Vatican organizers make sure each group is as culturally and geographically diverse as possible, with an emphasis on accepting young people from developing nations, who receive scholarships covering 75 percent of traveling and living costs.

The students listen to daily lectures by visiting scholars and participate in evening seminars with the Vatican Observatory staff, who are all Jesuits and accomplished scientists.

The students also present papers on their own research or the research being done at their universities and engage in a variety of laboratory exercises.

Despite their vastly different backgrounds — coming from countries that include Madagascar, Vietnam, Nepal, Armenia and Taiwan — the students share a love for, and language about, the universe.

“Astronomy is probably the most universal science because the sky is the same for everyone,” said Nikolay Kacharov, a 24-year-old Bulgarian Ph.D. candidate at the University of Heidelberg in Germany. He is studying the chemical composition of star clusters in the Milky Way.

“In the past, every culture in the world has worshipped the skies, now they study them” to ponder the same eternal questions of how the world came into being and how it is evolving, he said.

“We owe all the fancy things we own, like smartphones and computers, to the fundamental sciences and physics,” which is what all future technological developments will depend on as well, Kacharov added.

According to Lori Beerman, 29, who studies star clusters in the Andromeda Galaxy at the University of Washington in Seattle, astronomy is important because “it’s about knowing what is going on with the world; it’s being curious and having this sense of discovery that I think is important for your spirit,” she said.

(continued on pg 5)
The VOF Legacy Program

Farsighted support ensures that excellence in science in the Catholic tradition will continue for generations to come

Over the years my wife, Diane, and I have been fascinated, entertained and enlightened by the many seminars and presentations we have attended at the Vatican Observatory. Whether it be a subject on the birth and death of stars, the expansion of the universe, the geology of the earth or a discussion on why Pluto is no longer a planet these Jesuit scientists never fail to deliver. They have become some of the world’s leaders in the fields of astrophysics, geology and mathematics and for these reasons alone we would have incentive to participate in the VOF’s Legacy program. But our motivation runs deeper than that.

In today’s increasingly secular society we are routinely moved by the news media, the entertainment industry, literature and the like—all of which have a profound influence on our younger generation—to believe that science and religion are in conflict with each other. Our experience with these Jesuit scientists is quite the opposite. Not only do they prove by their very existence that there is no conflict but their research in fact reinforces their faith and their strong belief in the existence of a God and the Creator of the universe.

We see the Vatican Observatory and its scientists as a much needed nexus between science and religion in today’s world, and as Catholics we need to insure that their work continues in perpetuity. Contributing to the Legacy program of the VOF is one way to help make sure this happens.

— Jim and Diane McGee, Legacy Benefactors & VOF Board Member

“Why make a legacy to the Vatican Observatory? The Vatican Observatory occupies a unique niche in the worlds of both science and religion. While they are often at odds, the Jesuits of the Observatory bridge that gap. Their work as men learned in both faith and science announces to both sides: come, look, and learn.”

— Pam Snyder, Legacy Benefactor

2013 Calendars Are Here!

This year we’re celebrating 20 years of the Vatican Advanced Technology Telescope: 1993 to 2013. Help us celebrate some of the important discoveries achieved with the telescope! Calendars are available for $25 each; bulk discounts available. Purchase using the enclosed envelope and write “calendar” on the envelope or check, or purchase online at www.vofoundation.org.

2013 Annual Meeting in San Francisco

Please join us for the Circles of Giving Awards Reception and Dinner with guest speaker Dr. Alexei Filippenko, Astronomy Professor at UC Berkeley and member of the team that received the 2011 Nobel Prize for their discovery of the Expanding Universe. The dinner will be held on Friday, February 22, followed by a VOF Seminar on Astrobiology on Saturday, February 23.

For more information on both the Legacy Program and the 2013 Annual Meeting please contact Katie Steinker: (805) 901-6591 or katie@vaticanobservatory.org
Guardians Trip to Rome 2013

Save the Date! We’ve just started planning a stellar trip to Rome, Italy, for early November 2013. Plan on joining us for insider’s tours of historic Jesuit, Vatican and astronomical sites, as well as great food and fellowship. We’ll be commissioning new Guardians of the Vatican Observatory in a special ceremony, and all are welcome. For more information on the Guardians Program, visit the “Ways to Give” section of our web site: www.vofoundation.org.

Noteworthy

Fr. David Brown, S.J., joined colleagues including Fr. Rich Boyle, S.J., and Fr. José Funes, S.J. at St. John Lateran University in Rome, which was the site of this year’s European Study Week in Astronomy. Father Funes introduced the Symposium on Stellar Populations to celebrate the 55th Anniversary of the famous Vatican conference on this topic. Fr. Boyle gave an invited talk about his work on stellar photometry carried out with VATT.

On July 9, two scientists from the European Gaia Spacecraft mission, which will be launched next year, came to the Specola to talk about a possible collaboration using the VATT to complement the data collected by the ESA mission. They emphasized that the VATT would be an ideal instrument for their work, following up transient discoveries and improving the navigation and pointing of the space telescope. Present at the gathering were Fr. Richard Boyle, S.J., Br. Jonathan Stott, S.J., Br. Guy Consolmagno, S.J., William Thuillot (Paris Observatory, France), Fr. Jean-Baptiste Kikwaya, S.J., Martin Altmann (Heidelberg), Fr. David Brown, S.J., and Br. Bob Macke, S.J.

Fr. Chris Corbally, S.J. was among more than 50 participants from the International Network of Catholic Astronomical Institutions (INCAI) to gather at the Catholic University of America in July for presentations on space science and astronomy. Among the speakers was John Mather, Ph.D., 2006 Nobel Prize laureate in physics and a NASA scientist. The INCAI workshop is in its second year, and alternates locations between the United States and South America.

Dr. John Mather addresses the INCAI group
Traditional activities of the Vatican Observatory Summer School include lectures and team projects centered on the theme of the school, informal gatherings around pizza in the evening, and a weekend in Florence and Pisa (the latter is home to the Galileo Museum). Students this year were also privileged to observe a rare transit of Venus across the face of the Sun on the morning of June 6 from the telescopes on the roof of the Papal Palace.

“Seeing the transit was especially exciting to me because I had read so much of the history about transits,” said Nora Lützgendorf, a student from Germany. “It was amazing to think that we are seeing the very same thing that they saw.”

“It was a special thrill to be able to see it from the Pope’s palace,” added Zara Randriamanakoto, from Madagascar. “We were lucky to just be in the right place at the right time.”

Zara came to the school from her studies at the University of Cape Town, South Africa. “I knew I wanted to come to this school when I saw who the faculty were. These are the scientists whose work I reference all the time. It is exciting to actually meet them and have them give me advice on my work.”

The faculty of this year’s school, under the direction of Dr. Douglas Heggie of the University of Edinburgh, included two alumni of previous summer schools: Dr. Nate Bastian, of the Excellence Cluster (a consortium of universities associated with the European Southern Observatory in Munich), and Mark Gieles of the University of Cambridge. Rounding out the faculty was Dr. Francesca D’Antonia, of the Italian National Institute for Astrophysics (INAF) and the Astronomical Observatory of Rome, who has also been a lecturer at previous Vatican Observatory summer schools.

This year marks the thirteenth Summer School in Astrophysics held at the Vatican Observatory. Begun in 1986, the schools were created to increase dialogue and interaction between the astronomers at the Observatory and younger researchers. The goal is to give young astronomers an in-depth exploration of some particularly important aspect of modern astrophysics.

The 25 students for this year’s school were selected from 150 applicants. The main criterion for selection was that they show promise of a successful professional career in research astronomy. In fact, of the 300 students who have graduated from these schools since they were founded, about 85% are still active in research.

Fr. José Gabriel Funes S.J., the director of the Vatican Observatory, expressed his delight that this year’s class was able to take advantage of the Observatory’s facilities to see the transit of Venus. The schools are an important part of the Observatory’s mission, he noted. “The Vatican Observatory is not only involved in astronomical research but is also committed to offering educational opportunities for the next generation of astronomers.”
VOSS students prepare to watch and film the Transit of Venus on the roof of the Papal Summer Palace.

Pope Leo XIII formally established the Vatican Observatory in 1891 as a visible sign of the church’s centuries-old support for science. At that time, Brother Consolmagno said, a myth was forming that somehow the church and science were opposed.

The observatory traces its origins back to the observational tower erected at the Vatican by Pope Gregory XIII in 1578 in preparation for reforming the Western calendar.

"The church has always supported science," he said. "You had to learn astronomy as one of the seven courses in medieval universities before you got to go on to theology or philosophy."

This was only logical, he says, because "if you believe that God created the universe, knowing how God created the universe is a way of getting to know God. And appreciating this creation is a way of letting God speak to us through creation because God does speak to us through the things that he made."

The first papal observatory was moved from the Tower of the Winds inside the Vatican walls to the papal summer residence in Castel Gandolfo in 1935. And then the Jesuit observatory staff set up a second research center in Tucson, Ariz., in 1981 after Italian skies got too bright for nighttime observation.

Both Beerman and Kacharov said they were curious to see priest-astronomers in action, having previously heard about the work of the Vatican Observatory.

"I always wondered how that worked," said Beerman. Seeing men merge their faith with their love for science "is not a problem for them, they’re both astronomers and have the calling to be priests," she said.
On January 2, the Holy Father confirmed me as Director of the Vatican Observatory for another five-year term. I am grateful to His Holiness for such an honor and for the support we have received from others in Vatican City State, our Jesuit Superiors, and the friends of the Vatican Observatory Foundation (VOF) throughout my service in this role.

I am most grateful to the Lord for all we have accomplished in the last five years, especially for the renewal of Observatory staff. Today sixteen people form the staff. Five of them arrived in the last four years, and we are poised to welcome another four in the coming five years. This is a sign of the vitality of this work of the Catholic Church, crucial in witnessing the complementarity of science and faith.

The beginning of my new term was an appropriate time to call a “retreat” of the Observatory staff to examine the ways we might better fulfill our mission and focus our efforts in that direction. From July 3-6, we met in the beautiful city of Loreto in central Italy. Fr. DiUlio, VOF President and Mr. Rich Friedrich, Chairman of the Board, joined the group to share valuable insights about the Foundation as well.

Science

I am pleased to report that we have science groups (not just individuals!) doing research in Planetary Sciences, Stellar Astronomy, Extragalactic Astronomy, and Cosmology. Second, though the Vatican Advanced Technology Telescope (VATT) is twenty years old, we have not yet exhausted its capabilities. In fact, with remote-observing opportunities and the available instruments (CCD Camera, GUFI CCD Camera, and VATT Spectrograph), there are many exciting projects that can be carried out with VATT. These include:

- observation of Near Earth Objects and Trans-Neptunian Objects in order to put limits on their physical properties,
- examining globular clusters in order to determine how many of the extreme horizontal branch stars are in binary systems,
- doing follow-ups to large surveys like Pan-Starrs, Kepler, etc.,
- the identification of multiple stellar populations in globular clusters,
- observation of active galaxies in the central regions using the VATT Spectrograph,
- direct imaging of nearby galaxies using broad-band, narrow band, and SLOAN filters to study stellar populations, and
- using VATT in combination with large telescopes and space-telescopes for multi-wavelength surveys.

Science and Faith, Public Outreach

An important aspect of our mission is to be part of the dialogue in science and faith. This is an important frontier in the New Evangelization. Our scientific expertise and religious background allow us to contribute especially to the formation of priests and Church leaders, as well as students and the general public.

There are certainly challenges ahead, but with strong staff, a focused mission, and the support of friends like you, the Vatican Observatory will continue its vital work at the Ultimate Frontier.
Beijing Hosts IAU

The 28th General Assembly of the International Astronomical Union, held in Beijing in China this year (August 20-31), proved to be a fascinating experience. The triennial gathering of more than 2,000 astronomers and astrophysicists from all over the world served as an opportunity to exchange ideas and to bring everyone up to speed on what’s happening in the world in astronomy, thus, in a sense, putting everyone on the same page. The dialogue also served the purpose of allowing scientists to get to know one another and begin new collaborative efforts in research. Four members of the Vatican Observatory attended the General Assembly, continuing the Holy See’s important role in the world of astronomy.

Fr. Funes in Taiwan

Fr. José Funes, S.J., Director of the Vatican Observatory, visited Taiwan in August at the invitation of the Ministry of Foreign Affairs of the Republic of China. Stops included several universities, the National Science Council, Central Weather Bureau, Taipei Astronomical Museum, and the Taipei Ricci Institute for Chinese Studies.

Fr. Funes also visited with Msgr. Paul Russell, Charge d’Affaires of the Holy See to the Republic of China (Taiwan) and headed south to Kaohsiung, where he met with the Most Rev. Peter Liu, Archbishop of Kaohsiung, and visited the Mount of Beatitude’s Pastoral Center and Fo Guang Shan.

The trip marked Fr. Funes’ first visit to Taiwan, and provided the opportunity for him to better understand local culture, as well as recent developments in the Catholic Church in Taiwan and cross-strait relations. In addition, the trip provided a platform for strengthening exchanges in astronomy between the Republic of China (Taiwan) and the Holy See.

Experience China on a 13-day Ignatian Pilgrimage

October 26 - November 7, 2012

Historical places of interest include:
The Forbidden City, Tiananmen Square, North Cathedral of Beijing, Tomb of Jesuit Matteo Ricci, Great Wall of China, Terra Cotta Army, She Shan Basilica and many other places

For information or to reserve your spot, please visit:
www.jesuitscalifornia.org/chinatrip
katie@vaticanobservatory.org
Vatican Observatory Physicist Reflects on 'God Particle' Discovery

by Fr. Gabriele Gonti, S.J.

Many people think that the Higgs particle is called “God’s particle” because it might be connected to “God’s Shadow” and the possibility of experimentally revealing God; this is completely misleading. The Higgs boson was named “God’s particle” after a famous book by physicist Leon Lederman who wanted to stress that this particle was quite elusive to be detected. In the past thirty years, many experimental physicists have hunted this particle with famous accelerators like Tevatron at Fermilab and LEP at CERN — without any trace of it.

The Higgs particle is a consequence of the Higgs mechanism, which was introduced in the theory of the electro-weak interaction in the physics of elementary particles in the seventies. Electro-weak interaction is a fundamental “force” which unifies the Electromagnetic and the Weak interaction at sub-nuclear scale. In its original formulation, this theory was unable to give mass to the elementary particles. At the beginning of the seventies, theoretical physicists proposed a mechanism to give mass to elementary particles known as the Higgs mechanism. This mechanism was already used in solid-state physics, in particular in superconductivity. The idea is that, originally, the physical system, described by massless fields (which represents the elementary particles), has a larger symmetry than the ones we observe in nature. In this state, there is a massless elementary particle and a Higgs field. At some point, a “spontaneous symmetry breaking” happens and the elementary particle gets a mass while a new particle (called the Higgs particle) appears as a consequence of the symmetry breaking. The recent discovery with the Large Hadron Collider appears to confirm that the electro-weak theory is completely right.

Although CERN has only said that “it is most likely that this detected heavy particle is the Higgs particle,” its measured mass is very interesting: 125-126 Gev (the proton mass is 1 Gev). This value of the Higgs mass is still too high for giving any hint about further physics of supersymmetry, for which the LHC was built. There is no evidence at all of it. Furthermore, a mass of 125-126 Gev for the Higgs particle means that our universe is “metastable” or that the fundamental state of our universe (the physics in which we live) is not the “fundamental minimum.” There exists a lower minimum for our universe in which it may jump. This means that it is possible that our successors may live in a different universe — as regards its physical characteristics — from the universe in which we live today!