



THE VATICAN OBSERVATORY

ANNUAL 20
REPORT 25





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During the calendar year 2025, the following were permanent staff members and associated scholars of the Vatican Observatory, Pontifical Villas of Castel Gandolfo, and the Vatican Observatory Research Group (VORG), Tucson, Arizona, USA:

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- GABRIELE GIONTI, S.J., Vice Director
- PAVEL GABOR, S.J., Vice Director for VORG
- RICHARD P. BOYLE, S.J.
- DAVID A. BROWN, S.J.
- CHRISTOPHER J. CORBALLY, S.J., President of the National Committee to the International Astronomical Union
- GUY J. CONSOLMAGNO, S.J., President of the Vatican Observatory Foundation
- ROBERT JANUSZ, S.J.
- JEAN-BAPTISTE KIKWAYA-ELUO, S.J.
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Adjunct Scholars:

- ALDO ALTAMORE
- LOUIS CARUANA, S.J.
- ILEANA CHINNICI
- MICHELLE FRANCL-DONNAY
- JOSÉ G. FUNES, S.J.
- CHRISTOPHER M. GRANEY
- MICHAEL HELLER
- ADAM HINCKS, S.J.
- DANTE MINNITI
- MARIA ELENA MONZANI
- GIUSEPPE TANZELLA-NITTI

Other Scholars:

- CLAUDIO COSTA, Technical Expert
- MATTEO GALAVERNI, Associate Scholar

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Letter from the Director

Chapter ONE

TRANSITIONS

R.D'SOUZA

The year 2025 has been one of transitions for the Church and the Specola (Vatican Observatory).

Pope Francis passed away after nearly twelve years at the head of the Catholic Church. In his stead, Pope Leo XIV was elected on May 8, 2025, ushering the Church into a new era. The choice of the name 'Leo' echoes the name of his predecessor Pope Leo XIII who was known for his intellectualism and his attempts to define the position of the Catholic Church with regards to modern thinking.

It was Pope Leo XIII who re-founded the Vatican Observatory in 1891 with the *motu proprio* 'Ut Mysticam' stating that the mission of the Specola is "to make it clear to all that the Church and her Pastors are not opposed to true and sound science, whether human or divine, but that they embrace it, encourage it, and promote it with every possible effort." Pope Leo XIV continues in the tradition of his predecessor. Shortly after his election, the Observatory had two encounters with Pope Leo XIV: he received the students of the Vatican Observatory Summer School (VOSS) on June 16; later, on July 25, he paid his first visit to the historic telescopes of the Vatican Observatory at Castel Gandolfo.

Similarly, 2025 marked a transition in the leadership of the Specola. On July 31, Pope Leo XIV appointed me as Director of the Vatican Observatory, taking over from Br. Guy Consolmagno, who stepped down as Director after ten years in office. He will continue as President of the Vatican Observatory Foundation (VOF) in the United States, which is responsible for raising funds to maintain our telescope in Arizona. In those ten years, Br. Guy raised the profile of the Observatory internationally. He is the author of several books—at least four of them published during his tenure as Director. His latest book entitled *The Jesuit Guide to the Stars* was published in January 2025. He has appeared on the front page of the *New York Times*; he has been featured in the *New Yorker*, as well as

several Italian publications. He was awarded the St. Albert Award by the Society of Catholic Scientists in 2022, and more recently in October of this year, he was appointed to an Honorary Fellowship to St. Edmund's College of the University of Cambridge. Br. Guy will continue to work at the Specola, and we are fortunate to be able to enjoy the fruits of his guidance for some years to come.

The year 2025 was also a year of transition for the city of Rome. With the Vatican and the Church celebrating a jubilee year, the city of Rome got an extra boost of life, with nearly 33.5 million pilgrims passing through the holy doors, not including regular tourists. Among the many visitors to Rome, we can also count the nearly twenty-five students and six faculty who took part in the 2025 VOSS on "Exploring the Universe with JWST". A particular joy for us is when former students of our summer school return to teach at it. This year we had a record, with three of the VOSS2025 faculty, including Eiichi Egami, Roberto Maiolino and Almudena Alonso Herrero, being former VOSS students. An extensive report on the school is found in this Annual Report. Each summer school is unique and beautiful, but one common element in all our summer schools is the work required from the staff of the Specola. We are already looking forward to the next school to be held in 2027, and the call for proposals has already been sent out.

As part of the broader jubilee event of the Church, on October 31 the Specola, together with the Space Telescope Science Institute (STScI) and Johns Hopkins University (JHU) of the USA, inaugurated a temporary exhibition on the latest images from the Hubble and JWST space telescopes. Ray Jayawardhana, provost of JHU (and former VOSS student), Massimo Stiavelli (STScI) and Ileana Chinnici (INAF, Palermo and Vatican Observatory Adjunct Scholar) spoke at the inauguration function at Castel Gandolfo and later at a public lecture at St. Ignatius Church, Rome. (Incidentally, Ray Jayawardhana was appointed in January of this year as president of

Caltech, with his term starting on July 1, 2026.) The exhibition is open to the public at our visitor center in Castel Gandolfo.

Our museum spaces are also quietly undergoing a transition. At the end of 2024, we opened the two historic domes on top of the Apostolic palace in Castel Gandolfo to the public with the help of the Vatican Museums. The other historic telescopes found within the gardens were already open. In 2025, the Vatican Museums welcomed nearly 12,000 persons to visit these domes, with nearly 95% of the guests going through the domes on the Apostolic palace. Our collaboration with the Vatican Museums continues to bring in much good publicity to the Specola, while liberating the Specola staff to concentrate on their research activities.

The transition of the Vatican Advanced Technology Telescope (VATT) in Arizona (USA) continues apace, thanks to the financial support of the VOF. The VATT is over thirty years old and is made up of two components, the Alice P. Lennon telescope and the Thomas Bannan astrophysical laboratory. In 2024, we completed the successful installation of the ‘Don’ robotic telescope control system implemented by ProjectSoft HK—enabled by a generous donation from the Thomas Lord Charitable Trust, Mrs. Judy Alstadt (whose late husband Don Alstadt is honored) and Mr. Mickey Pohl. Over the course of 2025, the users of the VATT were introduced to the ‘Don’ system. The unguided open-loop tracking of deep sky objects with the new ‘Don’ system is excellent. In September 2025, we had the first full remote run of the telescope and we are now tweaking environmental triggers across various seasons for an automated shutdown. The process of upgrading the VATT 4k CCD, the electronic camera of the telescope, now in use for the last twenty years, has been delayed due to various administrative

difficulties. We hope to make more progress on this front in the coming year. Upgrading the VATT camera is part of a long-term program of improving the instrumentation on the telescope, in the hope of giving a boost to its scientific productivity.

Perhaps the most exciting part of the transition of the VATT is its opening up to educational activities for students from Jesuit universities around the world. Thanks to a generous donation from Mrs. Kim Bepler in honor of Fr. Joe McShane, S.J., we will be starting a pilot program in which we will offer a few nights of the VATT to undergraduate students from Jesuit universities in the United States, starting in the second semester of 2026. Fordham, Creighton and Le Moyne Universities are participating in this program. Success in this pilot program will allow us to offer the VATT to other educational institutions around the world. In the 1980s, the Specola pioneered the summer schools for students from countries around the world. We hope that, in a similar way, we can make a research-grade telescope accessible to those who otherwise lack such opportunities.

Finally, the staff of the Vatican Observatory is in transition. In the next few years, several of our staff members will retire, while we prepare the next generation of Jesuit scientists and astronomers to work at the Specola. This transition is underway as the world of science and astronomy is itself undergoing a quiet revolution: today most astronomy research is done in the context of large-scale surveys and large collaborations. How the Specola chooses to adapt to this new world of science remains to be seen. But it is an exciting time for the Specola, and it is our hope that, for decades to come, the Specola through its research and activities continues to demonstrate that “faith and science” go together.

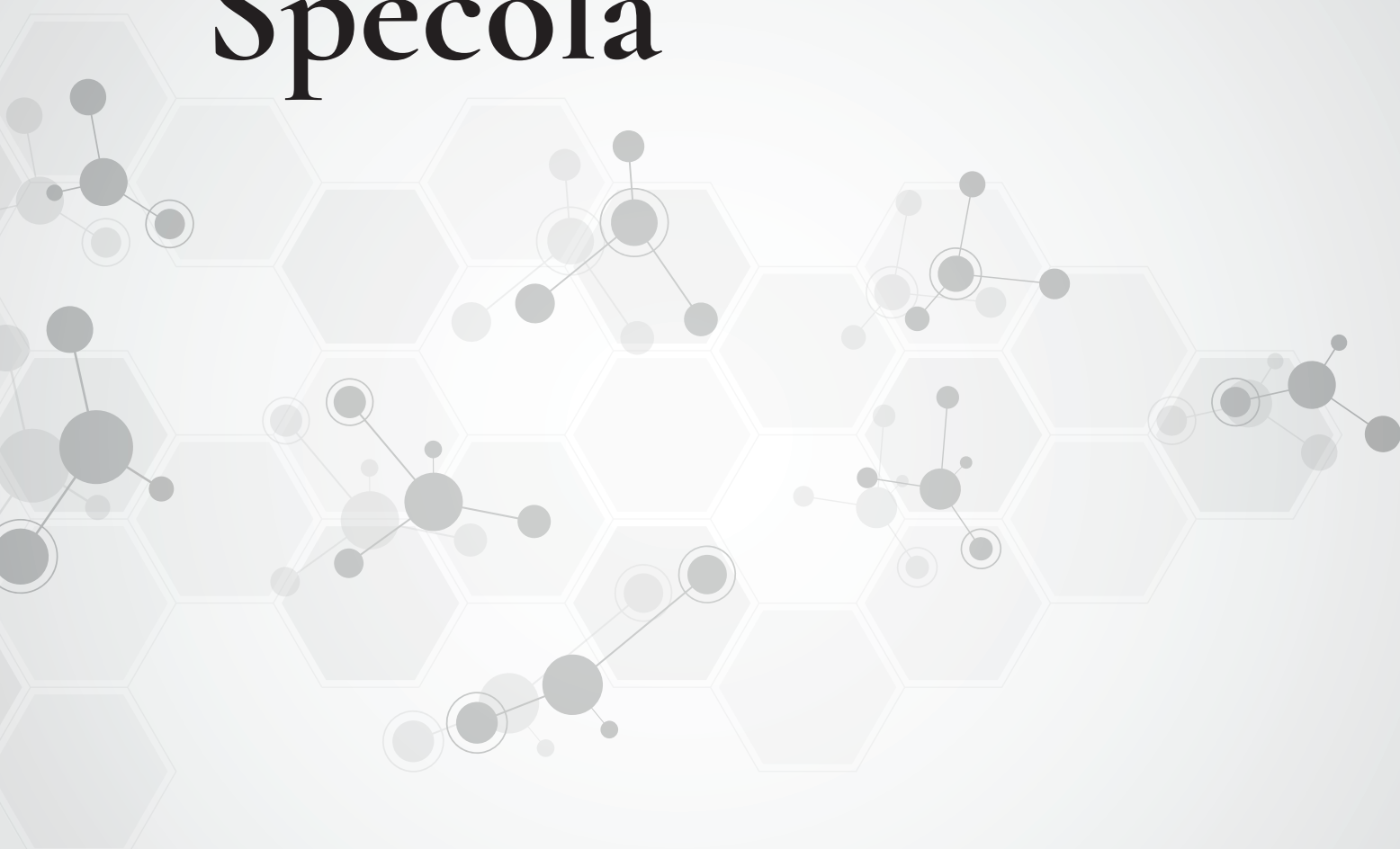


Pope Leo XIV appoints Fr. Richard D'Souza, S.J. Director of the Observatory on 31 July 2025.



Prof. Massimo Stiavelli speaking at the opening of the exhibition "Wonder Bound" at Castel Gandolfo, organised together with JHU and STScI.

Life at the Specola



Chapter TWO

LESSONS LEARNED

G. CONSOLMAGNO

On September 19, I officially retired as Director of the Vatican Observatory. After a delightful ten years in the post, I am happy to turn the keys over to Fr. Richard D’Souza, S.J. But I figure a few reflections on what I learned in that position might be helpful... maybe for him, maybe for the rest of us.

1. *Humility is power.*

You’ll get blamed for what you never did; perhaps that means that you can modestly take credit where it’s equally unearned? I will merely point out that, during the time that I was Director, North America experienced two marvelous solar eclipses! (Any clouds that got in the way were *not* my fault.)

But more seriously, getting credit should be the least important reason for doing what we do. I say this not just from a pious endorsement of the virtue of humility, but for a very practical reason.

The most important, and most difficult, job in running any scientific organization is dealing with scientists and their personalities. Alas, the kinds of people who wind up being scientists are often the least adept at typical social interactions... and graduate schools in astronomy rarely teach management techniques!

I once heard a naïve new director at an observatory wondering why he was having so much trouble with his task. It turns out, he was trying to tell everyone who worked under him how to do their jobs. “I thought the title ‘director’ meant I was supposed to *direct*!” In reality, once you’ve let everyone know their goals and tasks, a director’s job is just to enable each of them to be able to get on with their own jobs... giving them the resources they need, helping coordinate their tasks.

But it also means that the credit for a job well done goes to them, not you.

The most important things you do as a director—motivating folks, smoothing over personal conflicts—are the very things you can never brag

about, much less claim credit for. These must be done invisibly. The world will never see the blow-ups that didn’t happen, the conflicts that were avoided, the toxic work environment that didn’t materialize. You can’t take credit for the jobs that wouldn’t have gotten done if you hadn’t said the right word to one person... or if you hadn’t bitten your tongue when they were doing things differently from the way you would have done them, but good enough to get the job done.

Being humble about what you have done allows everyone else to do their jobs better.

2. *God answers prayers by sending people.*

When I first started running the Vatican Observatory Foundation, a year before I became Director, I realized that we needed a good web site to engage folks who might want to know about faith and science. But I had no idea how to set up such a site, and of course no time to do that even if I knew how. One day, visiting some friends, I mentioned my dream of having a great web site. One of those friends, Bob Trembley, gave me a funny look. “You realize, I do that for a living.” For the past ten years he’s worked full time, at half-time pay, building and maintaining www.vaticanobservatory.org.

The Vatican Advanced Technology Telescope (VATT) was cutting edge when it first saw light... thirty years ago. It’s gotten a little less advanced since then, however. It desperately needed a complete overhaul including the ability to be run remotely from anywhere in the world. Turns out, the best outfit in the world to do that work is in the Czech Republic; they mostly automate breweries, so if the Czechs can trust their beer to these guys, we can trust our telescope. But could we explain the complicated details of our project over the barriers of distance and language? It just so happens that our Observatory’s vice-director in charge of the telescope in Arizona is Fr. Paul Gabor, from the Czech Jesuit province. Right person, right place, right time.

And at just that time, a donor joined our Foundation board with just the right connections to come up with the funding to pay for that upgrade. The work is now complete... on time, on budget.

Having a Jesuit astronomer on staff who speaks Czech seems rare enough. Finding more young Jesuits anywhere in the world with an interest and ability in astronomy and its related sciences would seem almost impossible. But actually, there's a remarkable list of young Jesuits in formation with advanced technical degrees, interested in joining us some day. (They include men from Australia, Canada, Congo, Indonesia, and India, with others in the wings.) You might almost suspect that maybe God thinks this work is worth supporting.

A final example... one day out of the blue I got an email about some translations from Latin of a 17th century astronomy book. (Yawn.) It was from some guy who taught astronomy in a community college. (Right.) In Kentucky. (Right.) But he happened to be in Chicago on a certain day when I would be there, so I agreed to meet him for coffee.

Today? Alongside a series of articles in history of astronomy journals and a couple of scholarly books from Notre Dame Press that have completely revolutionized our understanding of Galileo and his rivals, my good friend Chris Graney and I have published our own take with Paulist Press on *When Science Goes Wrong*. And he provides a lot of the content on that web site I mentioned above. He's now an Adjunct Scholar of the Observatory.

3. Failure is not an option; it's a requirement. Chris Graney's work has outlined a number of great stories in the history of astronomy where people were almost right—which is to say, wrong. And yet the science grew precisely because they were wrong. Rather than worshiping science as the last word in truth, or beating it up when it's less than perfect, consider that science can only go right when it's not afraid to go wrong. We learn by mistakes; indeed, that's mostly the only way we learn! That lesson is all

the more relevant in these times of science denialism.

It's also a lesson for learning how to do our jobs, day to day. We can't be afraid of making mistakes... or admitting when we've made them. Rather, that is how we learn how to do our job better. This does not mean charging ahead without worry of making a mistake. Rather, just the opposite, it means realizing at every step that you could be wrong; inevitably you will be wrong, somewhere. That way you know to pay attention, looking for signs of mistakes early on, so you can catch them and correct them.

The mistakes in my tenure as Director that taught me my hardest lessons? Sorry, I do have secrets to keep!

4. *Vaudeville will never die!*

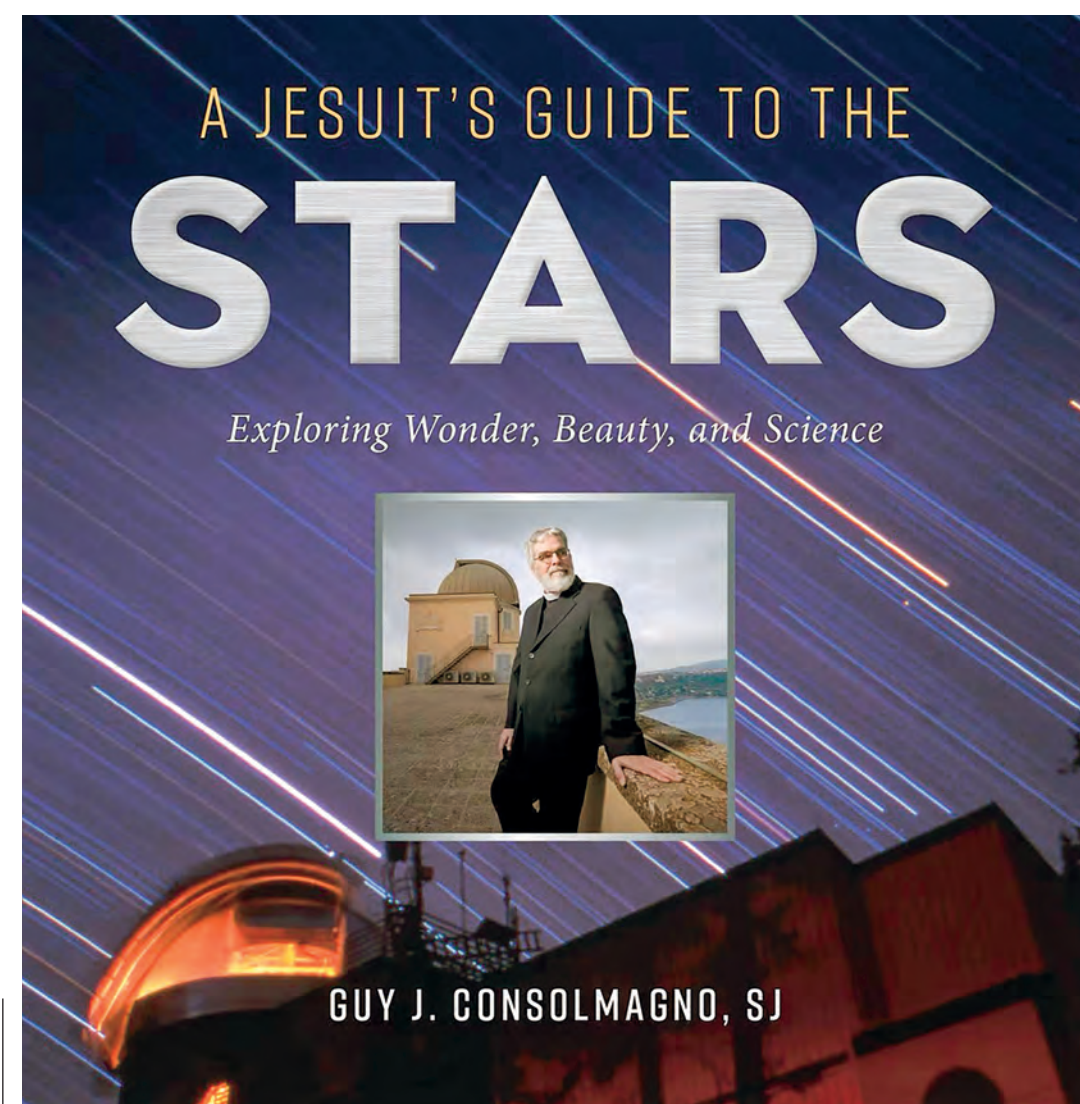
I give about 50 to 100 public talks a year. Over the last ten years, that's upwards of a thousand talks. As this annual report shows, the other dozen members of our staff are at least as busy giving tours and talks, both at our observatory sites in Rome and Tucson, and in their home countries... India, Africa, Italy, Latin America. Our job at the Observatory is to show the world that the Church supports science; these guys are providing the science and showing the world.

I love giving these talks; but then, it's in the blood. Several of my Italian grandmother's brothers (my great-uncles) were Vaudeville performers a hundred years ago. (Vaudeville was a kind of entertainment popular in the United States and Canada from the early 1870s until the early 1930s, comparable to British Music Halls, a descendent of the Italian *commedia dell'arte*.)

My great-uncles passed their song-and-dance skills on to their children, and also my dad; Dad passed it on to my brother, a musician, and me. But it turns out that in this day of YouTube and Zoom, binge-watched canned entertainment, there's a great hunger for live performance. That's what we provide at the Vatican Observatory!

Photo by Leticia Rodriguez Magni.

Gabriele Gionti and Guy Consolmagno gave a joint presentation at the Spanish Embassy to the Holy See as part of the Jubilee Year's week of Higher Education, 28 October.



Cover of latest book by Guy J. Consolmagno, S.J.

The main task of the Director is to be sure that the other astronomers have the tools they need. Pictured here is Jean Baptiste Kikwaya Eluo at the upgraded control panel of the VATT.



Photo by Paul Schulz.

Who knew my family legacy would be in such demand?

5. Comparisons are odious... and pointless.

Every director of the Vatican Observatory has arrived at a unique time, facing a unique set of issues with his own strengths and weaknesses.

When I took over in 2015, my predecessor Fr. José Funes had had to face one of the most turbulent periods in the history of the Specola. He had to oversee our move from the Papal Palace to a new headquarters near Albano—and arrange for the rebuilding of that new location to meet our needs. He had to deal with a complete turnover of our lay staff, and replacing half of our Jesuit astronomers. And he also had to deal with significant changes in the Vatican itself, including two Papal transitions—first to Benedict, then to Francis. What he accomplished is nothing short of breathtaking.

But it meant that my first task, indeed my major task for the past ten years, has been completely different from his. He dealt with change; I dealt with settling into the aftermath of those changes. Sometimes that meant learning how to live in our new space: trying out different arrangements of office space or adding finishing touches (like sound baffling) to our new rooms. Some of it, like the Visitor Center in the Papal Gardens, was building on the hard work and vision already started, but not completed, by the previous administration.

In turn, Richard D’Souza will be facing new challenges completely different from what José and I had to deal with. Some of those challenges we can see on the horizon, as our staff and facilities get older. Others will no doubt be a surprise to all of us.

When we first faced the prospect of moving from the Papal Palace, then-president of the Governorate, Cardinal Lajolo, promised that

our headquarters would be a “flower in the lapel” of the Vatican. His promise was kept. My promise to myself when I was named director was that the Specola would be a place whose atmosphere would be the envy of other Jesuit apostolates: where we all love being here and seeing great things happen around us. How much I succeeded is beyond my ability to judge. I can only hope that my fellow workers at the Specola have enjoyed being a part of this team, as I have enjoyed being their companion and director.

(At the same time, unlike José before me or Richard going forth, I was also serving as president of the Vatican Observatory Foundation. The big task then was to breathe life into an organization that had been slowly consuming its own resources—for a variety of reasons—but which continues to be essential to our work in Tucson.)

My goal at the Specola has been precisely not to introduce novelties or major advances. Rather, I just wanted to maintain the atmosphere of the Specola as a place where we could find satisfaction in our scientific work. Satisfaction; and joy. Joy in our work is a true sign that the Holy Spirit is with us.

(Adapted from “Of Heaven and Earth: Five lessons learned as director of the Vatican Observatory”, *America*, 233, October 2025, 44-45.)

THE STATE OF THE SPECOLA

G. CONSOLMAGNO

Today the Specola supports the active scientific research of a dozen Jesuit astronomers in a number of different fields including cosmology, stellar spectroscopy, meteoritics, and minor planet observations; plus the work of the Adjuncts, who are often invited to join us precisely because of how their fields complement the work done at the Specola. It would be hard to find an area of modern astronomical research where the Specola is not present.

This work has also expanded to include cutting edge research in the history and philosophy of astronomy, led in many cases by these Adjuncts. Among them, Ileana Chinnici and Christopher Graney have both produced award-winning books in the field of the history of astronomy, while Louis Caruana and Fr. Giuseppe Tanzella-Nitti have added important research in the philosophy and theology of science.

Just in terms of numbers of papers published, compared to thirty years ago we have tripled the amount of peer-reviewed work done at the Specola.

One measure of the significance of a scientific paper is simply to see how often it has been cited by other papers. By that measure, the most cited paper by a member of the Specola over the past ten years is work on the stripping of gas from galaxies led by Bianca Poggianti, which included contributions from Specola astronomer Alessandro Omizzolo. Since its publication in 2017, this paper has been cited 344 times in the scientific literature (according to the NASA ADS database).

Two other highly cited papers include observations in support of the LAMOST survey of stars with contributions by Chris Corbally, cited 123 times so far, and a review paper on meteorite physical properties that includes both Guy Consolmagno and Robert Macke as authors, cited 114 times. Of particular note is a paper in the prestigious journal *Nature* in 2018

by Richard D’Souza on the evolution of the Andromeda Galaxy, which has been cited 134 times and was also featured on the cover of *Sky and Telescope* Magazine.

One problem with using only citations as a criterion for significance, however, is that older papers are over-represented, as they have had a longer time to be cited. Thus I would like to point out two more recent items of research which in my opinion have the potential to be very significant in the future.

The first is the work on cosmology from Gabriele Gionti and Matteo Galaverni. Their mathematical calculations on the different sorts of approaches to cosmological questions has been published in a very prestigious physics journal and marks a significant step forward in the ways that we attempt to understand the nature of the universe itself at the very earliest moments after creation. In this sense it is a small step, but in a very large and important question.

Second, the work on measuring the physical properties of both samples of asteroid Bennu returned by the recent NASA mission and meteorites that appear to be good analogues for that material, done primarily by Robert Macke, along with his work on NASA’s Lucy mission to the Trojan asteroids, is equal to any science being done in the field today. His discoveries of how these samples behave at asteroidal temperatures will be fundamental to our understanding of the asteroids from a scientific perspective; his discoveries are also crucial to our ability to exploit, or deflect, these asteroids as they approach Earth. Complementing that work are the observations of those asteroids by Jean Baptiste Kikwaya Eluo.

All of this technical astronomy is essential to our mission, given to us by Pope Leo XIII in 1891, to show the world that the Church supports science. But along with the science, we also have

the responsibility to show the world what we are doing. That includes individual presentations by many of our staff, as well as a vigorous presence in various forms of mass media, from interviews in magazines to appearances in popular videos and documentary films. This annual report gives evidence of just how successful these efforts have become.

One important aspect of this public dissemination, however, is to be sure that we do not dilute our message by appearing in media that is only interested in sensationalism. A number of controls are now in place to ensure that our message is not exploited by those who would associate our work with quack ideas or false messages about science or the Church.

Finally, it is important to see the role of the Specola Vaticana in our society and culture today. Astronomy has made remarkable progress in the last 70 years, based on strong government support for scientific research, first within the United States and eventually throughout Western Europe, Japan, and now India and China as well. This support has come from across the political spectrum and held steady across social trends. But that progress is now under threat, most immediately in the United States but also in other parts of the world.

The issue is not merely uncertainty over the availability of money to support this science, but a large change in societal attitudes. Where once people might argue whether one religion or another was true, now the very concept of truth itself is under attack. Why is this happening? At least in part, I believe that many people fear dealing with uncomfortable truths that challenge their privilege, their personal comfort, and their sense of security. Ironically, both science and religion are afflicted by this cultural attack, as they both insist on the existence of an objective truth.

The existence of a Vatican Observatory stands strongly against this cultural trend. First, it insists that pure knowledge of God’s creation is worthwhile in and of itself. Secondly, it insists that having such knowledge, even if imperfectly, is possible and a worthwhile goal to one’s life. And finally, of course, the Vatican through its Observatory provides the stable resources to discover and disseminate that truth. By standing up for science, and for truth, the Vatican Observatory is making a strong statement in a climate where such statements are in fact both needed and courageous.

A FAITHFUL INSTRUMENT IN THE HANDS OF GOD: COMMEMORATING FR. SABINO MAFFEO, S.J. (1922–2025)

G. GIONTI

The history of the Catholic Church in the 20th and 21st centuries is often told through the lives of Popes and world leaders. Yet, its most profound impact is frequently found in the quiet, steadfast service of those who labor behind the scenes—men like Fr. Sabino Maffeo, S.J. A physicist, educator, administrator, and historian, Fr. Maffeo passed away on January 21, 2025, at the age of 102. His life was a remarkable “adventure”, as Pope Francis described it, spanning over a century of service that conjoined deep religious faith and the rigors of modern science.

Born in Somma Vesuviana on November 1, 1922, Sabino Maffeo’s life was entwined with his faith from the beginning. Born into a family of profound conviction—his father had prayed for one of his sons to become a Jesuit—Sabino entered the Jesuit Apostolic School at the age of 11. On November 1, 1937, his fifteenth birthday, he entered the novitiate. It was the start of an extraordinary journey within the Society of Jesus that would last 87 years. Fr. Maffeo’s formation was intellectually rigorous, characteristic of the Jesuit tradition. After studying philosophy at the Pontificia Università Gregoriana, he pursued a degree in physics at the Universities of Rome and Bologna. This scientific foundation was not merely academic; it became the lens through which he viewed the Creator’s handiwork. Ordained in 1953, he began his ministry not in the pulpit, but in the classroom.

At the Collegio Massimiliano Massimo in Rome, Fr. Maffeo became a legendary figure. As a professor of physics and religion, and later as Rector, he was known for his humanity and brilliance. He delighted in bringing science to life, using optical experiments to create “virtual realities” that left his students applauding in wonder. However, his greatest legacy at the school was his integrity. A famous anecdote tells of a struggling student who confessed to Fr. Sabino that he felt oppressed by the school’s atmosphere and was only there because

of his parents’ wishes. In an act of radical honesty, Fr. Sabino convinced the parents to move the boy to a different school, prioritizing the child’s happiness over the institution’s financial gain. This “honesty before profit” left a lasting impression on generations of students who went on to become prominent academics and politicians.

In 1968, Fr. Maffeo was called to leadership as the Provincial of the Roman Province of the Society of Jesus during the difficult post-conciliar years, where he was remembered for his kindness and generosity. Following this, in 1973, he was called to a mission of global scale as the Technical Director of Vatican Radio. This was a pivotal era for the Church’s voice in the world. Working alongside Fr. Roberto Tucci, S.J., Maffeo oversaw a period of immense technological growth. Under his leadership, the great transmitting center at Santa Maria di Galeria was revolutionized. He oversaw the installation of the first massive rotating antennas, allowing the Pope’s message to be beamed with precision to every continent on shortwave frequencies. As Saint John Paul II began his historic international travels, Fr. Maffeo’s technical teams were the pioneers on the frontier, ensuring that the sounds of the Papal journeys reached the ears of the faithful in the furthest corners of the globe.

In 1985, Fr. Maffeo moved to the Vatican Observatory (Specola Vaticana) at Castel Gandolfo. Although he was reaching an age when many consider retirement, he began what many consider his most fruitful period of service. As Superior of the Jesuit community and Vice-Administrative Director, he worked closely with the Director, Fr. George Coyne, S.J. During this time, the Observatory was expanding into the digital age and across the ocean to Tucson, Arizona. While younger astronomers conducted cutting-edge research, Fr. Maffeo became the Observatory’s voice. He was a tireless communicator, welcoming schools and visitors, showing them the telescopes, and

demystifying the relationship between the Church and science. He also became the preeminent historian of the institution. His definitive work, *The Vatican Observatory: Nine Popes, One Mission*, remains the essential text on the subject. He spent his final years documenting the history of Jesuit astronomers, ensuring that the legacy of figures like Fr. Angelo Secchi, S.J.—the father of modern astrophysics—would never be forgotten, even completing a publication on the correspondence between Secchi and Fr. Francesco Denza, the first Director of the Specola, just before his passing.

Beyond the titles and the technical achievements, those who knew Fr. Sabino remember his extraordinary cordiality. Even at 88 years old, he was known for a dynamic and youthful mind, never retreating into the rigid stereotypes of religious life. He was a man who embraced his own limits with humility, often sharing stories of his weaknesses or the simple joys of a Jesuit community—like a memory of roasting chestnuts with a bottle of wine during the hardships of the war. His fellow Jesuits recall him as a superior who was exceptionally close to those in difficulty. He was a man of “mercy in action”, often intervening to support confreres who

were struggling or visiting the families of those he mentored. To meet Fr. Sabino was to feel truly seen and loved. This humanity was rooted in a deep understanding of the Beatitudes; he believed that holiness was found in being a “man of God”—someone transparent, humble, and aware of his own poverty of spirit.

As Pope Francis wrote in a letter for Maffeo’s 100th birthday, he was a “faithful instrument in the hands of God”, a companion of Jesus who lived the “wonderful adventure of life”. Fr. Sabino Maffeo’s life was a testament to the idea that there is no conflict between the pursuit of scientific truth and the pursuit of the Divine. Whether he was adjusting a radio antenna, peering through a telescope, or listening to the worries of a student, he did so with the same spirit of service. He died as he lived: peacefully, in prayer for the Church and the Society of Jesus. His 102 years on earth were a bridge between the old world and the new, a century-long “Yes” to the call of the Gospel. For the public he served, Fr. Sabino remains an example of how a life of intellectual rigor can be softened by a heart of immense charity, proving that the greatest discovery one can make is the enduring power of God’s love.



VOSS2025

D.BROWN

The Vatican Observatory Summer School (VOSS) took place during 01-27 June 2025 at the Vatican Observatory (Specola Vaticana), located in the Pontifical Villa of Castel Gandolfo, a distance of about 25 km from Rome. The theme of the summer school was “Exploring the Universe with JWST: The First Three Years” (JWST being of course the James Webb Space Telescope). Twenty-five students, both postgraduate (mostly in astronomy/astrophysics) and undergraduate, participated in the program. The VOSS is organized by the Vatican Observatory on a biennial basis with a new and different theme for each school.

The JWST is the successor to the Hubble Space Telescope. Images and data obtained by JWST are deepening humanity’s understanding of the cosmos. The JWST-themed summer school was the result of one of the many proposals for possible topics for the VOSS submitted in Spring 2024 to Br. Guy Consolmagno, S.J., then Director of the Specola. Having obtained input from advisors, Br. Guy selected the proposal submitted by Eiichi Egami (and other astronomers) having the JWST topic. This would be the theme of VOSS2025, and Dr. Egami would be named as the Chair of the faculty of the summer school. Next, Br. Guy selected Fr. David Brown, S.J. as the Dean of the school. By June 2024 the poster/ advertisement and online application for VOSS had been implemented by Antonio Coretti, IT manager of the Specola. Applications from students from around the world were submitted by 31 October 2024.

The twenty-five selected to participate in the school were chosen from among many impressive and talented applicants. Many students were recipients of financial aid, something made possible by the generosity of benefactors of the Observatory through the Vatican Observatory Foundation. Invitations were then sent to the selected students with a request for confirmation of participation. The VOSS program is intended

to help train future astronomers to do research in different fields of astrophysics. This is an important contribution of the Specola to scientific research in astronomy. The hope also is to foster a community of collaboration among scientists, and to foster dialogue among different cultures, nations, and religions with astronomy as a common language of our shared humanity.

By the beginning of 2025, organization of and preparations for the school had begun in earnest. Federico Balzoni and Maura Turoli handled and organized matters dealing with students (visas, travel arrangements, etc.), and Fr. Brown and Antonio Coretti worked with the VOSS faculty as they organized the program for the school. Br. Guy oversaw the entire process and gave the necessary authorizations when needed. All preparations had been made by the start of the school.

The faculty of the summer school were astronomers from different world-class institutions and universities, all of whose primary research deals with the JWST. Dr. Egami (University of Arizona, U.S.A.; JWST/NIRCam team) served as the Chair of the faculty and was present for the entire month of the summer school. Drs. Almudena Alonso Herrero (Centro de Astrobiología, ES; JWST/ MIRI team) and Roberto M. Maiolino (University of Cambridge, UK; JWST/NIRSpec team) were present for the first two weeks of the program, and Drs. Maria Drozdovskaya (Physikalisch-Meteorologisches Observatorium Davos und Weltstrahlungszentrum - PMOD/WRC, CH) and Thomas Greene (IPAC/Caltech, US; JWST/NIRCam and MIRI team)guided the students during the final two weeks. Fr. Brown, as Dean of VOSS2025, served as the liaison between the faculty, students, staff, Jesuit community, and Director of the Specola. He also served as the daily organizer of the summer school, ensuring that the schedule, lectures, academic and social activities, guest speakers, and meals were organized and executed well. As Director of the Specola, Br. Guy oversaw the entire summer

school and served as liaison between the school, the Vatican Observatory, the Vatican itself, journalists, benefactors, and ambassadors to the Holy See.

VOSS2025 commenced on Sunday, 01 June 2025, with an evening reception/social held at Vatican Observatory headquarters in Castel Gandolfo to welcome the VOSS students and faculty. On Monday, the substantive work of the summer school began. The students spent most of each day at Observatory headquarters participating in the work of the summer school. Both students and faculty resided in a nearby hotel, Villa Altieri, in the town of Albano Laziale, on the far end of the papal villa. An average day in the life of the summer school consisted of the following:

- 1) morning lectures on different topics resulting from ongoing research generated by JWST, guided by two faculty members and punctuated by a coffee break.
- 2) presentations given by three students per day on their own scientific research as well as on their countries and cultures of origin.
- 3) lunch (pranzo).
- 4) hands-on research projects guided by the faculty of the summer school.
- 5) evening lectures (once per week) by guest speakers who were invited to speak about their research using JWST.

Though the focus of VOSS2025 was mainly academic and scientific, its scope was much bigger. It was also cultural, social, and recreational, meant to be a formative experience promoting community, dialogue, understanding, and cooperation among peoples from very different parts of the world, and fostering collaboration among the students in future scientific endeavors in the international astronomical community. Work was put aside during the weekends so that the students could experience Italian culture and get to know one another on a more social basis. On Saturdays of each weekend, group trips were organized for travel to Subiaco, Tivoli, and Ostia Antica. Students and staff of VOSS also traveled to Florence for a day-long trip via the Frecciarossa high-speed train. While there, students visited the Galileo museum.

Afterward, they were free to visit anything they wished in the city (the Duomo, the Dominican Church of Santa Croce, Galileo’s house, etc.). The group returned to Castel Gandolfo in the evening of the same day. At the end of each excursion, students and staff were treated to pizza in the studentdining room in the evening as a way to bring the day of activities to conclusion.

In order to celebrate and to highlight the strong international character of the VOSS that comes from the diversity of countries from which the students and faculty and Specola personnel originate, two Friday night international dinners were organized at the Specola. Students volunteered to cook cuisine typical of their countries of origin and to share it with everyone. Gina Savinetti, a member of the Specola staff who supervised the catering of meals, very graciously assisted the students in buying the food and in their cooking. After the first dinner, the students then proceeded to the courtyard to enjoy an evening of dancing. A star party of viewing the sky with portable telescopes took place on another evening.



Of particular importance to the students was the opportunity to join the ambassadors (to the Holy See) from their home countries for lunch. Invitations were handled by Br. Guy, who hosted the visiting diplomats. Among these guests were diplomats from Egypt, Canada, Argentina, Columbia, Peru, Italy, Morocco, and the United States.

A number of news agencies, sometimes from the countries of the students, visited the Specola in order to do features on the work of the VOSS. Of particular note, the American program “CBS Sunday Morning” filmed the proceedings of VOSS2025 over a few days. Several students were interviewed and appeared on television. Since VOSS2025 was held in the Papal Villa of Castel Gandolfo, the students were able to interact with and to experience the hospitality of the Vatican itself. On Wednesday of the first week of the summer school, students and staff were given a tour of the papal gardens and the papal palace and of the telescopes to be found within them. On 25 June, Sister Raffaella Petrini, President of the Governatorato of Vatican City State visited the Specola and gave a brief address to students and faculty before joining them for lunch. Following her remarks, Fr. Arturo Sosa, Superior

General of the Society of Jesus (the Jesuits) gave some brief remarks before joining for lunch. On the following day, Cardinal Fabio Baggio, the President of the Laudato Si’ Initiative in the Papal Villa (and Under-Secretary of the Migrants and Refugees Section of the Dicastery for Promoting Integral Human Development) visited the Specola and addressed the students and faculty, along with Fr. Manuel Dorantes (Administrative and Management Director of the Higher Educational Center Laudato Si’).

Of course, the culmination of the experience of students and faculty in the Vatican took place on 16 June when they, along with the entire staff of the Specola, were granted an audience with Pope Leo XIV at the Apostolic Palace in the Vatican. Everyone had the chance to greet the Pope personally.

VOSS2025 ended on 27 June. In the morning, students finished giving presentations on their research projects. Afterwards, a graduation ceremony was held in which certificates of participation were given to students. Later in the evening, the summer school concluded with a closing dinner at the neighborhood restaurant, “Il Partico”.



OBSERVING NEAR-EARTH ASTEROIDS ON THE VATICAN ADVANCED TECHNOLOGY TELESCOPE (VATT)

LARRY LEBOFISKY

I have been involved with the Vatican Observatory Foundation and the Vatican Observatory Research Group, as an observer as well as a science educator, for more than a decade. Our observing team uses the Vatican Advanced Technology Telescope or VATT to make astrometric observations of recently discovered asteroids, and of asteroids that have not been observed in the last year and still have uncertainties in their orbits. Among these are asteroids that pose a potential danger to the Earth. The 2025 observing year has been by far our most successful year in ten years of observing asteroids, owing to a number of factors which came together in this year.

Observing is a team effort. Almost all scientific programs require a team effort from individuals who bring different skills to the project. I am proud to be part of such a team. I have been fortunate enough to observe with Mark Trueblood and Robert Crawford who, while not professional astronomers, bring the skills that have made our observing program on the VATT a success. Mark and Robert have the engineering and computer skills that are critical to our program. I am the Small Solar System Bodies expert. Both Mark and Robert have also made significant contributions to the VATT as it transitions to being a fully automated telescope. I want to thank them for their contributions to this report.

THE VATT UPGRADE, “DON”

Mark Trueblood is our telescope operator. For nearly 10 years prior to the upgrade, Mark followed a startup checklist, trekking through the observatory to turn on pumps in the basement, to turn on the mirror coolant chiller and various power supplies and computers, to flip switches, etc. to prepare the telescope for observing. As part of the major

modernization initiative aimed at someday permitting completely unattended observing, the Observatory engaged ProjectSoft to place such tasks under software control. This went into operation in June 2024. The result was our new telescope control system with two parts—a user interface to control the telescope (nicknamed “Don” for Donald M. Alstadt, the former CEO of the trust whose contribution made the upgrade possible), and an infrastructure of sensors and actuators to control the telescope and related equipment.

The Don interface was easy to learn and logically arranged for the telescope operator. The result is that, instead of trekking the observatory, the operator interacts with Don to perform all these functions. Don allows the operator to run automatic open and close sequences that perform all these functions in the correct order, thus minimizing the startup time and increasing the safety of the telescope. This gives the astronomers more time on the sky to meet their science objectives.

Two other upgrades have vastly improved the performance of the telescope. The first, made several years ago, was replacing the old secondary mirror positioning system (at the top of the telescope looking down at the main mirror) with a hexapod, a modern device capable of very precise motion. This made focusing the telescope more reliable and repeatable. The second, made as part of the Don upgrade, was the addition of absolute encoders, which measure the pointing angles of the telescope with high accuracy. As a result, the telescope now points anywhere in the sky to within 3 arc seconds (1/600 the diameter of the Moon and 1/250 the diameter of the telescope’s field of view) and tracks objects for many minutes without the need for guiding

corrections. This permits astronomers to observe asteroids, planets, and other targets that move with respect to the background stars without special guiding hardware and software.

AUTOMATIC FOCUSING AND IMAGE QUALITY

Together with the VATT director and staff and members of the Optical Sciences Department at the University of Arizona, Robert participates in a program that is improving the techniques for aligning the telescope optics. The telescope is called the Vatican Advanced Technology Telescope because its primary mirror is very fast optically (steeply curved), a groundbreaking design when the telescope was built. As a result, the primary and secondary mirrors must be aligned to tolerances of a few microns (millionths of a meter) to maintain focus and image quality. Robert is developing software that observers can use to adjust focus and improve optical alignment each night by analyzing optical aberrations in images.

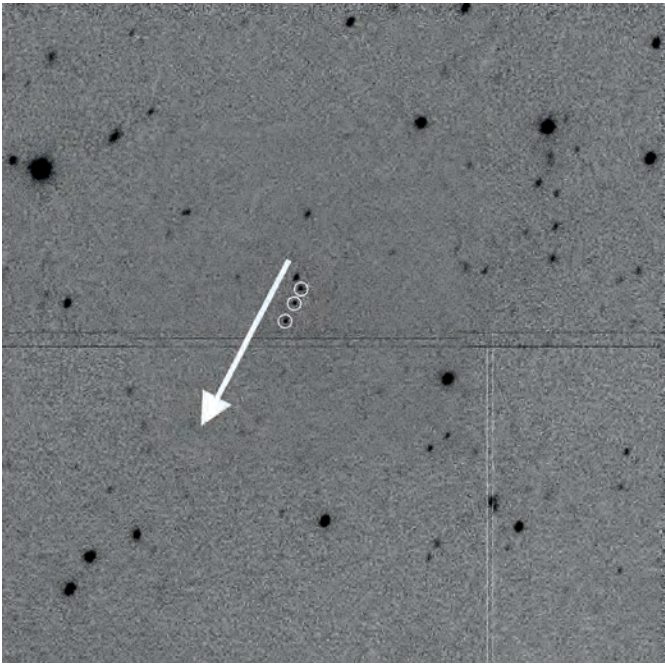
THE ROLES OF THE OBSERVERS

When we observe, Mark is the telescope operator. He slews the telescope and sets it to track the asteroid of interest as it travels across the sky. Before that, he and I choose the objects we will be observing, making sure that they are within the range of the telescope (not too faint or too low in the sky). He also tells me how long we must integrate on the asteroid (the camera exposure time).

I control the camera—integration time, number of integrations, etc. I also keep the logbook. This contains weather conditions, object name, image file number, integration times, etc. You never know when you may go back and look at these images again.

Robert Crawford does the analysis of our asteroid images as they are taken. First, he determines whether he can see the target in the image. We might need a longer exposure if clouds are present. When three or more images are complete, he aligns them by matching the stars in each and verifies that the object moves through the field in a straight line. Finally, the target’s position and brightness are measured, validated for quality control, and then submitted to the Minor Planet Center, the worldwide clearing house for new observations. The entire process (target identification, determination of integration time and other parameters, and analysis of our images) is aided by custom software that was modified or developed for our program, largely by Robert.

Below is an example of a typical series of observations of an asteroid. We must observe the asteroid at least three times to confirm that we are looking at the object of interest, which moves in the correct direction and with the predicted rate of motion relative to the background stars. I have overlain three images of the star field containing asteroid 2025 JB1. Between images, the asteroid moved relative to the background stars. The telescope tracked at the predicted motion rate of the asteroid, so the individual asteroid images are points, while the star images are slightly elongated during the 80-second exposures.





Here are a few pictures of our team at work. At left is Mark at the observer’s console, at center is Robert examining an image from the camera that includes the asteroid, and at right is me researching a potential asteroid of interest and starting to take an image.

DEFENSE FROM NEAR-EARTH OBJECTS

Near-Earth Objects (NEOs, which include asteroids and comets) are defined as objects whose orbits come within 1.3 Astronomical Units (AU) of the Sun (Earth’s distance is 1.0 AU). Because of orbit uncertainties, many of these have the potential of impacting the Earth sometime in the future. There are more than 40,000 known NEOs and over 1,900 NEOs that have a non-zero chance of impacting the Earth in the next 100 years. Our goal is to reduce the orbital uncertainty of recently discovered NEOs, as well as asteroids that have not been observed in a year or more, to improve understanding of the risk of a future Earth impact. Our program contributes to a now worldwide effort at planetary defense against the risk of a possible catastrophic impact.

SUMMARY OF OUR 2025 ASTEROID OBSERVATIONS

Our observing team was granted eight three-night runs on the VATT during 2025 for astrometric observations of asteroids. Four runs were for orbit extension of recently discovered Near-Earth Asteroids during bright time (when few other observatories are open) and four runs were for recovery of Near-Earth Asteroids not observed in a year or more. In total, we observed 15 of 24 nights (some of them partial), with nine nights lost to weather or instrument problems.

From 2015 to 2024 we observed and submitted to the Minor Planet Center 89 asteroid observations. For the first few years, we only had

one or two successful three-night runs, some of them limited by weather. Other runs were canceled due to fires, flooding, and COVID (we could not observe for two years).

This year was our most successful. We observed a total of 97 individual asteroids with multiple observations of 13 for a total of 110 successful submissions to the Minor Planet Center. We recovered three asteroids and removed two asteroids from the “Risk List” (those asteroids with a probability of impacting the Earth in the next 100 years). This shows what can be done by an observing team using the modernized VATT on Mt. Graham in Arizona. We look forward to another successful year in 2026.

HOW DO WE IMPROVE WEATHER FORECASTS?

C. BAYU RISANTO

Weather forecasting is indispensable in the world today. Whether for managing day-to-day personal activities, transporting goods across the ocean, planning a route for a commercial flight, or running an insurance company, people consult weather forecasts. The story of forecasting can be traced back to the 1800s, but the modern weather forecast technique and method was started during World War II, particularly for the preparation of the Normandy landings (Fleming, 2004; Ross, 2014). Since then, weather forecasts have been based on the physical (fluid) dynamics equations that are built into the framework of weather models. Unfortunately, the nature of planetary atmospheres is chaotic, and thus most of the physical equations involved in predicting the dynamics of Earth’s atmosphere are nonlinear. The dawn of modern computers in the 1950s made better weather forecasts possible by exploiting the speedy calculation capability of computers. This method differs from the analog method of weather forecasting, in which a forecaster matches the observations of today with weather patterns from the past to foresee the upcoming weather.

The accuracy of physics-based weather forecasts has been improving since its nascence in 1950s. The latest review (e.g., Ritchie, 2024) shows that today the five-day weather forecast accuracy is above 90% compared to only about 70% in the 1980s. However, there are still many challenges in modern weather forecasts that have not been solved and are still under research.

For instance, the current weather models can be built with high resolution both in space and in time, so that every pixel in the model output is at the scale of, for example, 1 km by 1 km, and every 1 hour. This model, however, still needs microphysical process assumptions, which are built in what we call schemes, to help with microphysical processes calculations, such as the amount of water vapor in the atmosphere and the collision and coalescence of water droplets in clouds (e.g., Risanto et al., 2023). To this date, we still do not know exactly how these processes happen and what the relation is between water vapor and rain.

One possible remedy to these problems is to update frequently certain variables in the model, for instance water vapor, in order to correct the course of the models and reduce errors. This technique is called data assimilation. It is based on Bayesian statistics. One of my projects revolves around this topic.

What is data assimilation? Imagine you find an old black and white photograph. The photo is blurry; the image is faded, apparently due to coffee being spilled on it. You can only guess that the face in the photo is that of your great-grandfather, because the photo was found in a drawer in his old house. Since your great-grandfather died many years before you were born, you cannot ask him directly. So, you ask your mother. Your mother simply says that your great-grandfather was one day supposedly photographed by an allied force soldier. Feeling somewhat convinced, you ask your uncle. He says that your great-grandfather reportedly used that desk to study. Your 80-year-old grandfather tells you that your great-grandfather loved bitter coffee and drank it almost every day. Feeling even more convinced, you continue to seek information from several other people. Based on all the information, you finally become almost 100% certain that the person in the old photo is your great-grandfather.

The above process is called data assimilation, based on the Bayesian statistical principle. That he is your great-grandfather is your first guess or conjecture or initial forecast. The probability that you are correct is uncertain. Maybe he is your great-grandfather, or maybe one of your great-granduncles. The information from your mother, your uncle, and your grandfather is the observational data. Once you apply the information from your mother on your first guess, your forecast is renewed or updated. The probability that the man in the old photo is your great-grandfather increases. The information from your uncle updates your forecast and increases the probability more. The additional information from your grandfather contributes another increase of the probability. Perhaps at the end of the day, you have confidence



Photo by David K. Adams.

A flux tower with a Global Positioning System (GPS) antenna mounted on top (it looks like a round plate) in Mount Bigelow, Arizona.

A colleague setting up a Global Positioning System (GPS) antenna on the automated weather station site east of Tombstone, Arizona.

in your forecast close to 100% that the man in the photo is indeed your great-grandfather. In the framework of weather forecasting, this method of updating the forecast with new observational data can improve the forecast output. How is this conducted? Let's say we want to forecast the weather for the next two days. First, we need to create a series of parallel models, let's say forty of them, and each has slightly different initial conditions to accommodate the uncertainty of the current atmospheric condition. (In fact, no one knows what the true atmospheric condition is because observations are prone to human errors and measurement errors.) Maybe one model is assigned to the temperature of 30.5°C, the other to 30.8°C, still the other to 31.0°C, and so on and so forth.

Then we need observations, let's say temperature measurements every hour from one site. Note that this observation also contains errors or uncertainties that we need to take into account. As we run or crank all forty parallel models into the future, the models will give us, among many variables, the temperature output one hour after the initial condition, two hours after the initial condition, and so on. This temperature output (forty of them) often varies from the observed temperature. Here data assimilation plays its role. Before calculating the state of the atmosphere for the next hour, the temperature is recalculated in such a way (using the Bayesian statistical principle, exploiting the errors in the model output and the observed temperature) so that the temperature in the model is updated. This new temperature falls between the model's first guess temperature and the observed temperature. Thus, the next hour's temperature output does not diverge much from the observed atmosphere and we have confidence in our forecast output. To find out whether in the next two days it will be hot or not, we can simply calculate the average of the model output 48 hours from the initial condition, or calculate the percentage of models that generate high temperatures. In simple words, data assimilation is a tool to correct the course of the weather models.



Photo by David K. Adams.

My team, which is a collaboration between the University of Arizona (USA) and the US National Center for Atmospheric Research (NCAR), conducted a mini field campaign observing atmospheric moisture through Global Positioning System (GPS) antennas located at thirty-one sites across Arizona in the summer or monsoon season of 2021 (Figures 1, 2, 3). The moisture was recorded every five minutes and assimilated to a high-resolution weather model (1.8 km × 1.8 km) every hour for six hours. After this period of assimilation, the model was run freely for the next 18 hours. There were twenty-four rain events during the monsoon season 2021 on which we tested our model and data assimilation. Since the observed data, such as rain and temperature, had also been collected during the field campaign, we could compare the hourly model output against the observed data and assess the skill of the weather model coupled with data assimilation in forecasting all the rain events. We found that our model with data assimilation improved the rain forecast compared to the model without data assimilation (Figure 4). Our model also generates temperatures, dew point temperatures, and atmospheric environments (in terms of the most unstable convective available potential energy) that are more similar to the observed atmosphere than those of the model without data assimilation. This promising result can motivate the establishment of real-time networks of GPS antennas in Arizona to improve rain forecasts during the monsoon season. We presented our results at the American Meteorological Society annual conference in 2024 and the European Geoscience Union annual assembly in 2025 (Risanto, et al., 2025; Figure 5).

A GPS antenna set up north of Tombstone, Arizona.

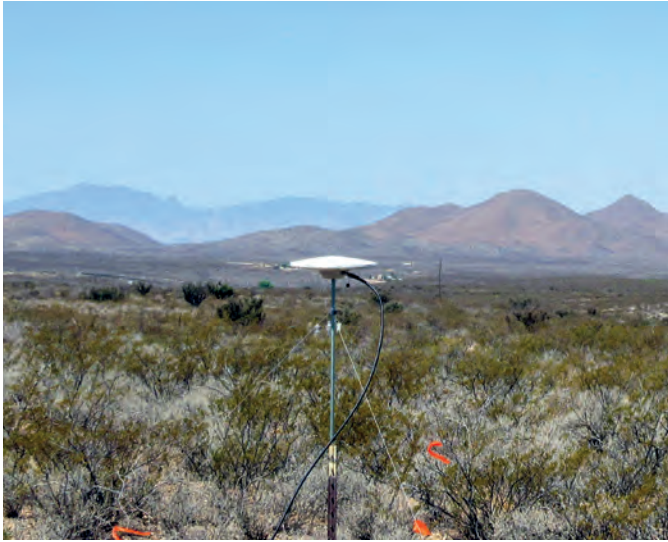
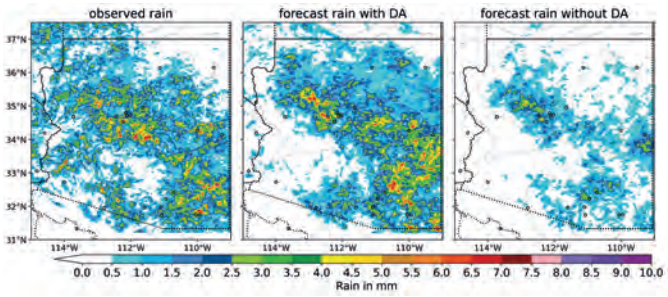


Photo by David K. Adams.

A paper written from this study has been submitted to Monthly Weather Review and is under a second-round review process (Risanto et al., 2026). Thus, the answer to the title above is that we can improve our weather forecasts through data assimilation.

What is next? In theory, having more data to assimilate further improves the weather forecasts. Our team is now exploring the technique of assimilating moisture data observed from a tool called MicroPulse Differential Absorption Lidar (MPD) along with the GPS moisture data. The challenge is how to estimate the distribution of moisture in the atmosphere if we do not have a weather balloon to launch every hour. Is it mathematically possible to make the estimate? This is the question for my next project.



Observed rain (left), forecast rain with data assimilation (DA) (center), and forecast rain without data assimilation (DA) (right) over Arizona, USA. Note that the model coupled with data assimilation improves the total rain closer to the observed rain. Without data assimilation, the model barely produces rain (Risanto et al., 2026 under review).

Posing near the European Geoscience Union welcome board in Vienna, 2025, with colleagues from the Netherlands and the United Kingdom.



Photo by Kwok Chun.

BEACONS OF HOPE: STARS, BLACK HOLES, AND METEORITES

ROB LORENZ - VATICAN OBSERVATORY OUTREACH COORDINATOR

“Mr. Lorenz! What happens inside a black hole?”

I barely started answering his first question when he continued: “I heard that time slows down around a black hole... is that true? Why does it do that? How big is a black hole? Will the sun turn into a black hole, and will the Earth get sucked into it?”

The questions came from a 14-year-old student at Fordham Preparatory High School in the Bronx. After I spoke about the Vatican Observatory in four religion classes earlier in the day, the campus ministry office had arranged for me to host an after-school astronomy discussion over pizza and soft drinks. It quickly became clear that black holes were capturing his imagination as powerfully as they capture light and matter! The other students listened attentively as I outlined what we know and don’t know about black holes. Soon other hands began to shoot up: “If aliens exist, do they pray?” “Do you think there are ‘hidden’ planets in the solar system?” “Why did you decide to become a priest?”

Meanwhile, on the other side of the continent, a California prison inmate was writing me a letter that would eventually make its way to my office desk in Tucson, Arizona. He was one of about a hundred incarcerated men who had reached out to me requesting a 2026 Vatican Observatory Calendar. Upon receiving it, he wrote a touching thank-you note that read, in part: “This is the first gift I got from anyone in 30 years. These pictures of God’s creation are like a light of hope in my life, I look at them every day and remember there is good in the world.”

A week later, on a Vatican Observatory video call to a third-grade class in Pennsylvania, the students’ eyes got wide with wonder when I showed them an ultraviolet satellite image of the sun. When I explained that the sun is actually a star, one girl shouted, “If the sun is a star, why does it look like a big circle in the picture?” (She was astonished to find out that stars in the sky don’t actually have pointy edges!)

And this past autumn, a group of Catholics from San Diego and San Bernardino met in the Mojave Desert of California to embark on a three-day Pilgrimage of Hope for Creation. As part of their commemoration of the 2025 Jubilee Year, the pilgrims prayed and walked together about ten miles each day through the beautiful desert landscape. The pilgrimage was their way of expressing their commitment to care for our common home. They asked a representative of the Vatican Observatory to accompany them and, on two of the evenings, to offer a reflection on the beauty of the night sky. I chose as my theme St. Ignatius’s “Contemplation to Attain Divine Love” in the Spiritual Exercises. Although it was too cloudy to use a telescope, I asked them to consider that God has “labored” for all of us through the work of nuclear fusion in stars, which created the very elements that allow for our existence. Later in the evening, when a small hole in the clouds perfectly framed the five major stars of the constellation Cassiopeia, everyone pointed at them like they were seeing a celebrity! One woman remarked, “Knowing that stars are ‘element factories’ makes me see them as more than just points of light.”

These are all real stories from my experience as the Vatican Observatory outreach coordinator in the United States. What do the people in those stories have in common? For starters, very few of them initially knew that the Catholic Church has a research telescope, or that it is in Arizona, USA! Most of them were also aware of the popular notion that religion and science are mutually contradictory. The Observatory exists to challenge that misconception. As Pope Leo XIII wrote in 1891, the Observatory was created so that “everyone might see clearly that the Church and her Pastors are not opposed to true and solid science, whether human or divine, but that they embrace it, encourage it, and promote it with the fullest possible dedication.” Simply letting people know that the Church is





Photo by Ronald Jacobs, S.J.

Rob Lorenz, S.J., gives a presentation on the Vatican Observatory at Gonzaga College High School in Washington DC.

committed to science is a form of evangelization! Hence the basic importance of outreach. But on a deeper level, my outreach audiences are made up of human beings who all experience pain and brokenness somewhere in their lives. Elementary and high school students may live in poverty or struggle to fit in with their peers; prison inmates experience the sting of isolation and neglect; climate pilgrims are devastated to hear of the latest policies that cause harm to national parks and to the environment. People who yearn for better lives and a better world can often find themselves tempted to give in to despair.

In that context, the Vatican Observatory's outreach efforts find new meaning in the wisdom of more recent popes. Shortly after his election in 2013, Pope Francis articulated his vision for the mission of the Church: "The thing the church needs most today is the ability to heal wounds and to warm the hearts of the faithful; it needs nearness, proximity. I see the church as a field hospital after battle." Echoing that sentiment was Leo XIV in his first remarks as pontiff, when he expressed his desire for "a Church that builds bridges (and) dialogue, always open to receive (people)... everyone, all those who need our charity, our presence, dialogue and love."

The mission of the Church breathes life into the mission of the Vatican Observatory. When I give presentations, write letters, or answer questions about science and astronomy, I try to keep in mind that my task is not just to communicate scientific knowledge. Beneath a student's questions about stars and black holes lies a yearning for order, relationship, and meaning. Perhaps our innate fascination with the night sky is an expression of hope that pain and brokenness will not have the final word. After all, if God can create such a vast and marvelous universe, surely we can trust that same God to heal and to make all things new. In its efforts to show that faith and science can be complementary, the Observatory invites people to glimpse the power of God's love and mercy.

Perhaps the incarcerated man's letter said it best: "Your calendar told me when the recent meteor shower was coming. I looked out my prison window and was able to see just one. Like God, it was awesome and beautiful."



Highlights

Chapter THREE

THE NEVER-ENDING DEBATE ON THE JORDAN AND EINSTEIN FRAMES

G.GIONTI

It is well established that physics is invariant under the redefinition of units of measurement. In essence, one can re-scale a unit by a constant factor, and the measured physical quantity will re-scale accordingly, ensuring that the ratio between the quantity and its unit remains constant. For example, the length of an automobile trip does not depend on whether distances and speeds are measured in miles and mph or in kilometers and kph.

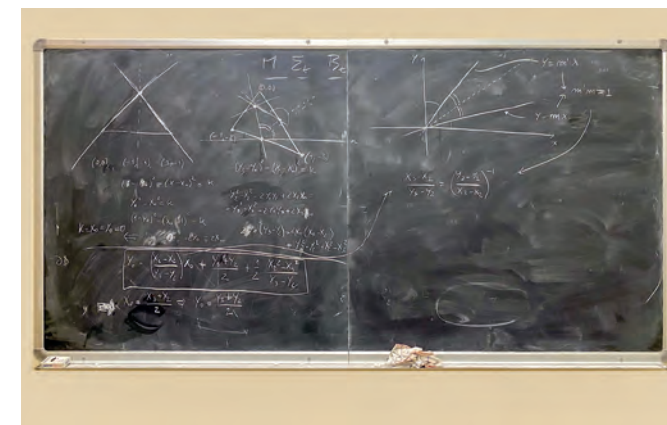
In a seminal 1962 paper, Robert Dicke speculated that if this invariance holds—and if the re-scaling is implemented through a local function (meaning that the units vary from place to place) rather than a constant—then physical observables in General Relativity should be invariant under a Weyl-conformal re-scaling of the metric coefficients. This implies that Einstein's General Relativity should be equivalent to alternative theories of gravity, such as Brans-Dicke theory, scalar-tensor theories, and $F(R)$ gravity (theories involving a generic function of the Ricci scalar), among others. The initial reference frame of the alternative theory is known as the Jordan Frame, while the frame reached after a Weyl-conformal transformation—resulting in an Einstein-like theory—is called the Einstein Frame.

The debate over the equivalence of the Jordan and Einstein frames was reignited by the development of Starobinsky inflation. Starobinsky introduced a $R+\alpha R^2$ theory of gravity (specifically an $F(R)$

theory) to describe the gravitational field during the inflationary period of the universe, following the Big Bang. Because this theory is mathematically difficult, physicists often shift to the Einstein Frame to solve the equations more easily. However, the Russian school of thought has traditionally maintained that the Jordan frame is the “physical” frame, while the Einstein frame is merely a computational tool.

A fundamental question remains: what justifies the mathematical transition from the Jordan to the Einstein frame? How can we be certain that solutions to the equations of motion in one frame remain solutions in the other? While some in the scientific community dismiss this as a mere “field redefinition,” my paper, “Aspects of Geometrodynamics in the Jordan and the Einstein Frames,” summarizes a series of recent works (all co-authored with Matteo Galaverni) that seeks a more rigorous answer.

We found that the most effective way to address this is through the Hamiltonian formalism, specifically by checking if the transition is a Hamiltonian canonical transformation. We have demonstrated that by gauge-fixing the lapse and shift functions and reducing the system to its physical degrees of freedom, the transformation indeed becomes Hamiltonian canonical on this reduced phase space. This represents the first definitive proof of such equivalence; previous attempts in the literature remained incomplete.



In a second paper, “Spherically Symmetric Geometrodynamics in Jordan and Einstein Frames,” Galaverni and I showed that this transformation remains Hamiltonian canonical in the context of spherical symmetry—applicable to black holes and compact objects like stars. This holds true even when accounting for the complex boundary terms required to derive the formula for a black hole’s energy or mass. We also noted that when the transformation between frames is singular, it can map physically distinct solutions.

THE EPISTEMIC READING OF THE BOOK OF CREATION

P.GABOR

Is science a “Promethean” presumption? Is it analogous to the mythical rebellion against jealous gods who wished to keep mere mortals in ignorance? Some churchgoers are (as former Vatican Observatory Director Fr. George Coyne, S.J. put it) leery of science. Is science an attack on religion? Is it theologically nonaligned? Or is it actually a good and Godly pursuit?

In October 2024 I attended the ECOPOSS conference organized by the Catholic University of Lille. It was actually five concurrent conferences whose main theme was integral ecology. The event was held as part of the celebrations of the 150th anniversary of the University, which was founded by committed lay people in 1875. The beatification process of two of them is progressing. If successful, they will be the first blessed industrialists. The university has a practical focus. It prepares people for industry and business, working closely with companies. This model is popular among the 40,000 students.

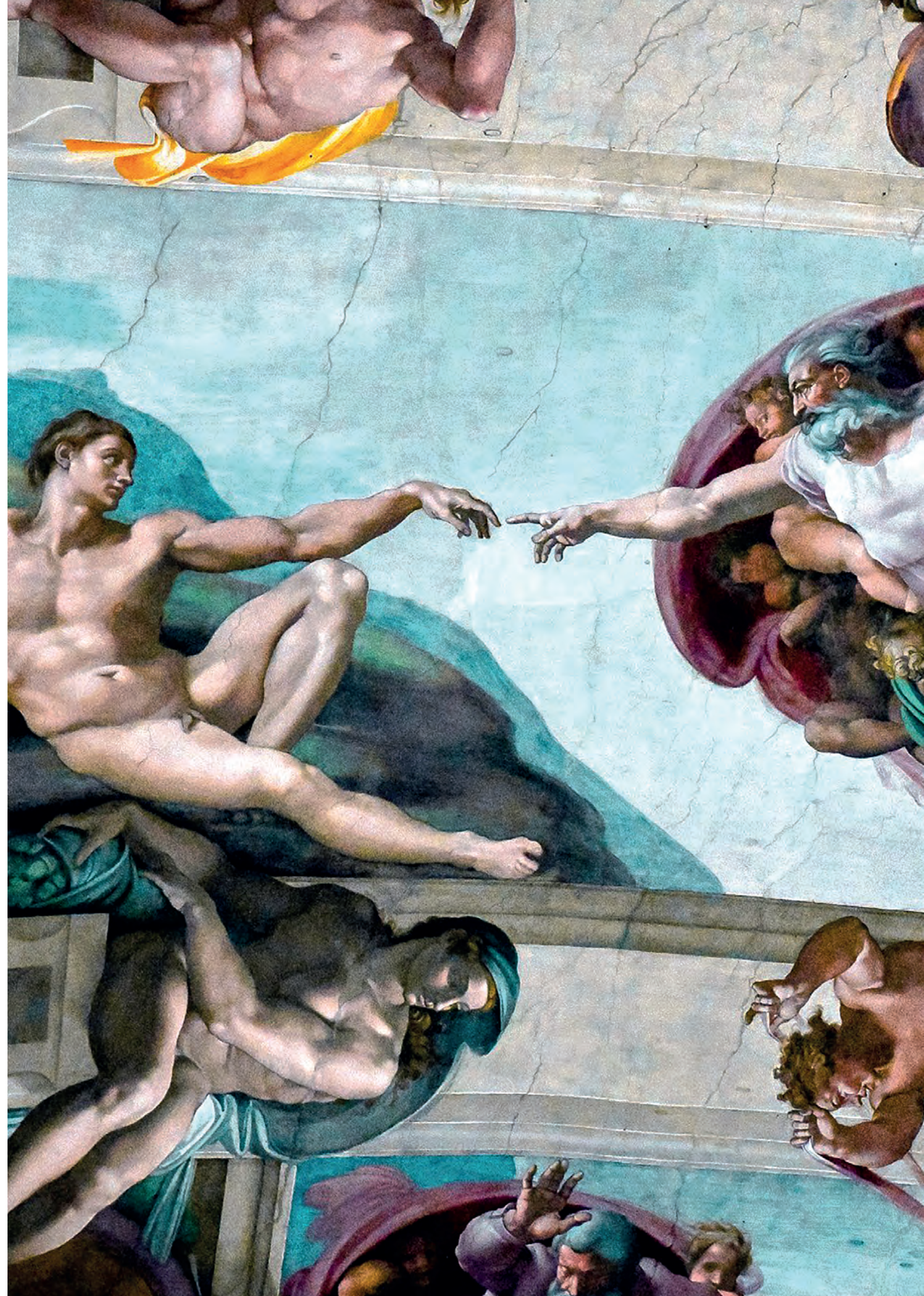
I do not know exactly how it happened, but I was a member of the scientific preparatory committee for the part of the conference that focused on the faith-and-science debate. I was pleasantly surprised that the rector, provost, vice-rectors, and deans of faculties unrelated to theology also attended our sessions.

In the paper I delivered at Lille (published in 2025), I applied the epistemic reading of the Two Books to the question outlined in the first paragraph of this note. The doctrine of the Two Books is usually annunciated in its ontic form: God gave us two “books”—the Book of Creatures and the Book of Holy Scripture. Since the two come from the same Author, they cannot contradict each other. What I call the epistemic reading notices that human beings are capable of understanding both Books. The existence of the Holy Scripture and divine Revelation leads theologians to conclude that God wants to be known—God’s self-communication. The physical world is intelligible;

it is governed by laws which human beings are capable of discovering even though our species has many fundamental limitations. The fact that science “works” is parallel to the theological concept of God’s self-communication.

The symbolism persistent in language and culture, including in sacred and liturgical texts, is often at odds with science (e.g., liturgy invites us to look up “towards heaven” where our Father dwells, even though we live on a spinning geoid). This contributes to generalized confusion and to the perceived conflict between faith and science. Science has not stripped the world of magic. It may have uprooted some ill-conceived imagery, but it unveils new marvels and a renewed sense of wonder.

*“The Creation of Adam” by
Michelangelo Buonarroti, on
the ceiling of the Sistine Chapel
(Vatican Museums).*



A UNIVERSE FULL OF WORLDS LIKE OUR EARTH?

C.M.GRANEY

At the very end of 2025, I had an exciting new book published—*A Universe of Earths: Our Planet and Other Worlds, from Copernicus to NASA* (Oxford University Press). This was not my work alone; Dennis Danielson of the University of British Columbia was my co-author. Indeed, the book was his idea.

A remarkable thing about this book is how much of my contribution to it derived from my work writing for www.vaticanobservatory.org. By the time this 2025 Annual Report is published, I will have been affiliated with the Vatican Observatory and Foundation for more than a decade. That affiliation began in February 2016 with writing for the website. Since then I have written four website articles each month, even as my work for and with the Observatory has grown. All that writing stimulated new ideas and new research, some of which I incorporated into *A Universe of Earths*.

In *A Universe of Earths*, Dennis and I look at the idea of a universe full of other planets like our Earth. It is a significant idea in the history of astronomy, one that has greatly influenced modern views of our Universe. We argue that, whereas people think of this idea as arising from science, science has never really supported it. We present new ideas to support this thesis; a discussion like ours is not to be found in some other book.

Some people assume that a critical look at the idea of a universe *full* of other planets like our Earth is equivalent to advocating that there are no other planets like our Earth. It is not. Our argument is that the ideas we human beings have had regarding this subject (and for centuries, astronomers both presumed that the universe would be full of other earths and insisted that anyone with a functioning brain would agree) have, from the start, not been supported by science.

Dennis and I show that when Giordano Bruno proposed that the universe was full of other earths

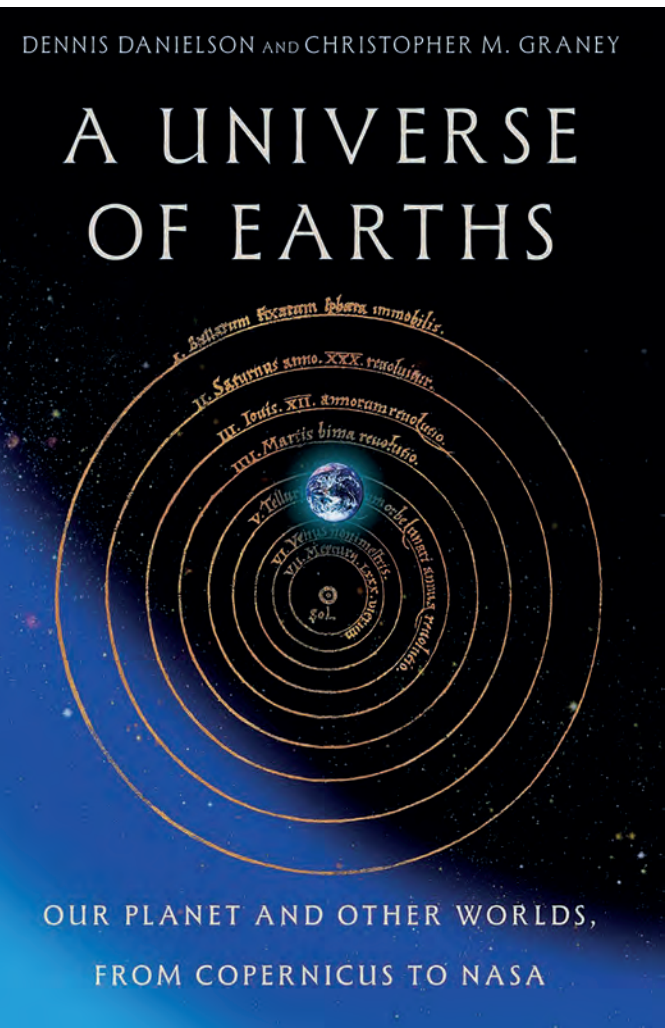
orbiting other suns, the available scientific evidence clearly said otherwise. We point to Johannes Kepler, who argued *scientifically* for the uniqueness of the Sun and its planetary system in the universe. Today we know that Kepler’s arguments against Bruno were erroneous. But no one in Kepler’s time would have known that. His arguments were based on measurements, made with the instruments then available, of the apparent diameters of stars. No one at that time knew that those diameters were spurious, a product of optics. Kepler’s arguments were based on what seemed to be solid, reproducible science. Bruno’s were not.

We also illustrate how, in the nineteenth century, science began to reveal the diversity present within the universe. Planets were shown to be diverse—the planets of the solar system differ significantly from Earth. Stars were likewise shown to be diverse—stars like Deneb and Rigel have the power output of many suns, whereas red dwarfs produce a mere fraction of the Sun’s output. Also in the nineteenth century, science revealed as bogus the idea that life is an ordinary consequence of matter (via “spontaneous generation”), a key idea for a universe of other earths with life on them.

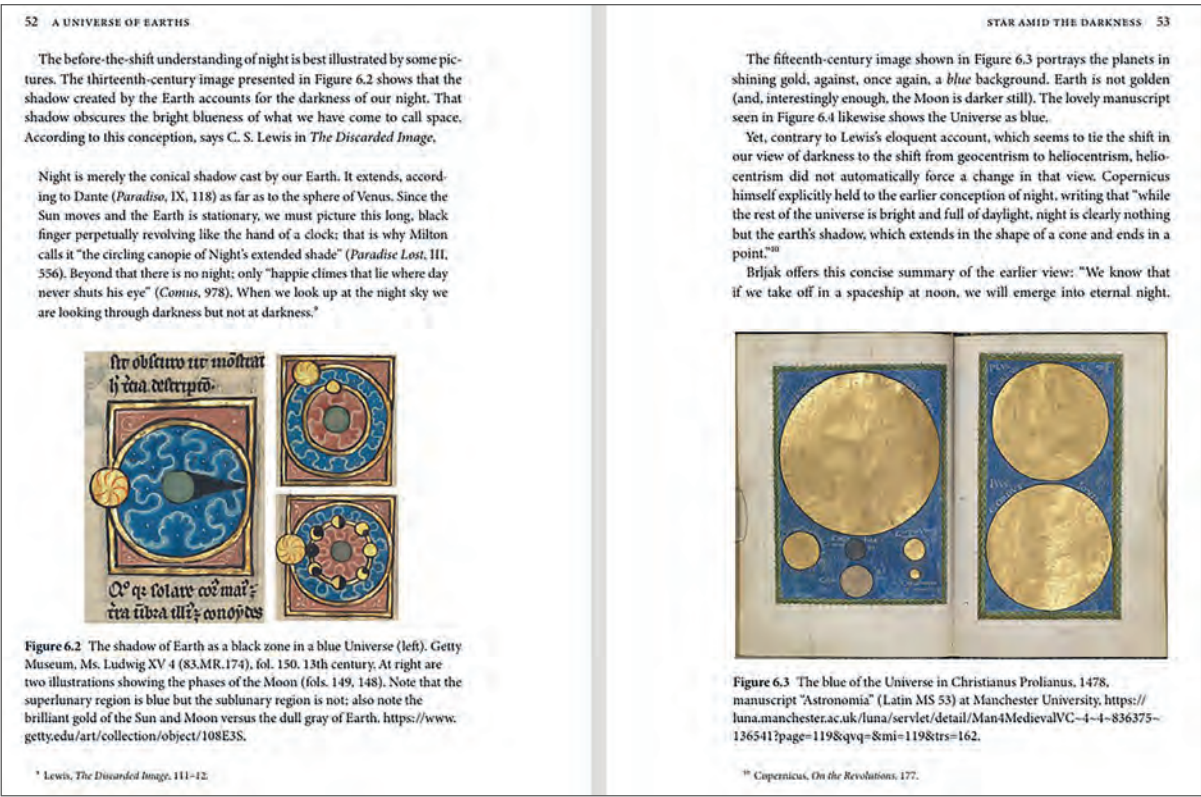
If stars and planets are not necessarily suns and earths, and if life is not a necessary consequence of matter, then that should challenge the idea of a universe full of earths. But we humans disregarded that challenge—and ended up with a modern popular culture steeped in that idea. Thus, on one hand, we have *Star Wars*, *Star Trek*, and the *Marvel Cinematic Universe* and, on the other hand, we have certainty in the eyes of many that “the government” (or “the Vatican”!) is hiding the truth about extraterrestrials and UFOs (UAPs).

Dennis and I speculate regarding why people, including astronomers, hung on to that idea. We connect it to a certain tendency to see the Earth as lowly or low—an idea from the pre-Copernican view of the Universe. In it, the Earth is located

at the center—or, more correctly, *bottom*—of the Universe, where the lowest (Aristotelian) elements pool and coagulate. A low Earth does not belong to the Copernican view. In the Copernican view, our Earth is a thing like Mars or Venus, namely a *wandering star* (that is, a *planet*)—and thus, in the classical sense, *a star*. And science has shown that, rather than being just another world orbiting another sun, our Earth is the garden spot of the Solar System, and, given what we see of the exoplanets, likely the garden spot of a much wider area. The idea of a universe of earths is not supported by science today, and never has been. This needs to be understood by both the scientific community and the wider public.



One of the more colorful page spreads in *A Universe of Earths*.

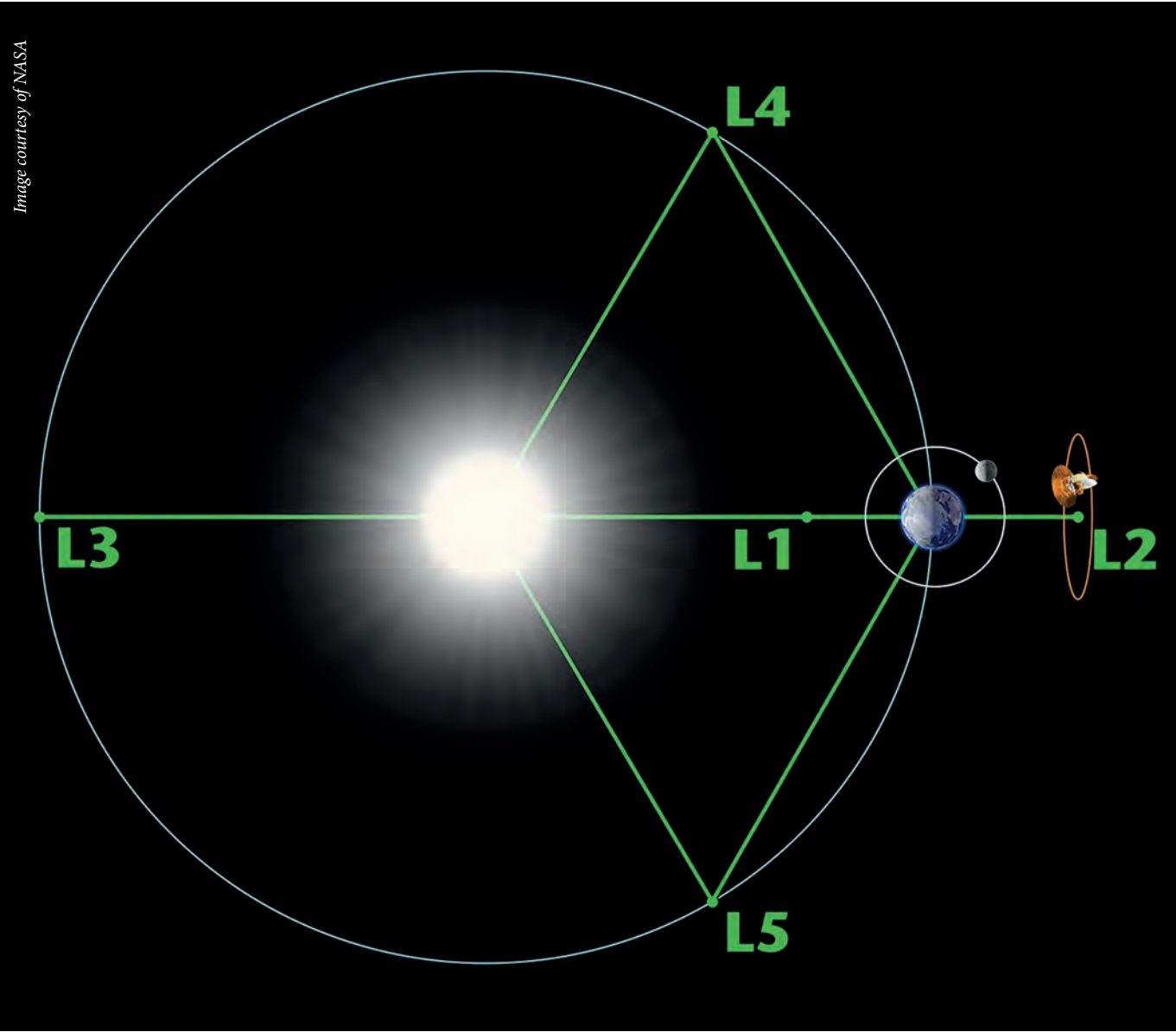


OBSERVATIONS OF PATROCLUS AND MENOETIUS MUTUAL EVENTS WITH THE VATICAN ADVANCED TECHNOLOGY TELESCOPE (VATT)

J.B.KIKWAYA ELUO

From celestial mechanics, we know that between two large bodies, one revolving about the another, there are gravitational forces and centrifugal forces which create five stable or semi-stable points or spots where a third body can remain in the system. These are called Lagrangian points, numbered L1, L2, L3, L4, and L5, and named for the mathematician Joseph-Louis Lagrange. L1, L2, and L3 fall along the line connecting the two bodies, and L4, L5 are at 60 degrees on both sides of the smaller body.

Early in the beginning of the solar system, small objects, like asteroids, were trapped in the Lagrangian points of Jupiter, and are called Trojans. These objects have never been in the main asteroid belt, meaning that they keep the secret of the formation of the solar system. Studying them will result in knowing the solar system from its origin. The NASA mission Lucy (spacecraft launched in 2021) will visit several objects of the solar system, particularly one in the asteroid main belt and several Trojans in Jupiter L4 and L5.



On 20 April 2025, Lucy encountered the main-belt asteroid (52246) Donaldjohanson. Lucy will fly by several objects in Jupiter’s L4 Trojan cloud, particularly (5548) Eurybates and its satellite Queta on 02 August 2027 (15094), Polymele on 15 September 2027, (11351) Leucus on 20 April 2028, and (21900) Orus on 11 November 2028. It will end its mission by flying by a binary system of Trojan (617) Patroclus and (617) Menoetius on 02 March 2033.

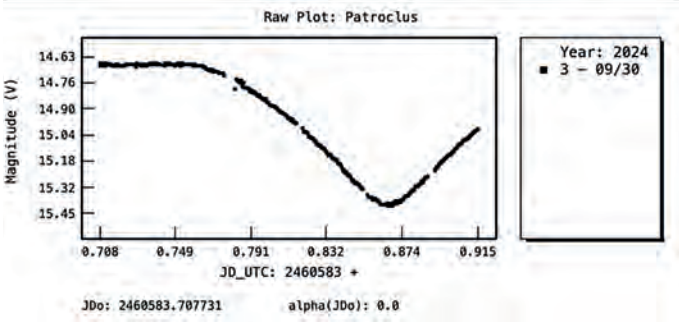
In September 2024, the orbital plane of the Patroclus-Menoetius binary system crossed the Earth’s line-of-sight. This offered a good opportunity to observe the pair in order to produce very precise “mutual event lightcurves” which will help to refine the binary orbit and to determine the sizes and shapes of the two components—important measurements in support of the instrument targeting during the Lucy flyby. Using the Vatican Observatory’s Vatican Advanced Technology Telescope (VATT), we observed the binary system and produced valuable measurements sent to the team of the Lucy mission.

OBSERVATION AND REDUCTION

We conducted an observation campaign which extended across seven straight nights. We used the VATT, an f/1.0 telescope with a primary mirror of 1.8 meters in diameter and a 0.38 m f/0.9 secondary mirror. We used the VATT4k CCD camera with a 4064×4064 pixel, 15×15 μm detector. The summary of the seven nights of observation is reported in *Table 1*.

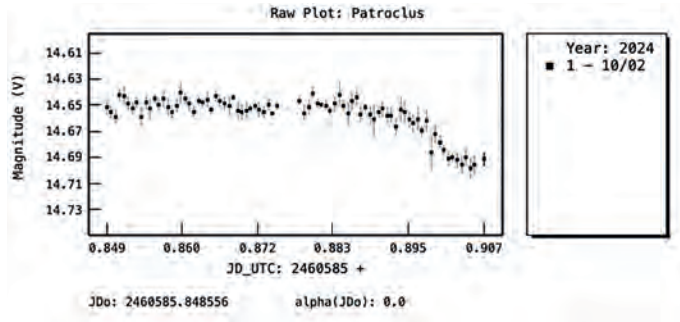
Two lightcurves showing clearly the mutual event of the Trojan binary system (617) Patroclus and (617) Menoetius were obtained on two nights: 30 September 2024 and 02 October 2024. On 30 September 2024, we collected 285 images. We performed photometry, and the lightcurve showed a clear mutual event that started at 06:07:12.0 UT and stopped at 09:57:36.0

UT (Figure 1). The lightcurve was not complete for the simple reason that the target reached the elevation limit of the telescope which is 30 degrees.



Rob Lorenz, S.J., gives a presentation on the Vatican Observatory at Gonzaga College High School in Washington DC.

On 02 October 2024, 87 images were collected and the observations only caught the 18 minutes of a mutual event from 09:28:48.0 UT to 09:46:04.8 UT (Figure 2) from the elevation of 42 degrees until it dropped below 30 degrees, the elevation limit of the VATT.



Superior mutual event lightcurve of binary system Patroclus-Menoetius on 02 October 2024 UT. A drop occurred at the end of our observing window around 09:46:04.8 UT.

Date (UT)	Observation		# Images	Mutual Events	
	Start	End		Predicted (Brozović et al., 2024)	Observed
29 Sep 2024	06:13:41.655	10:06:49.662	204	None predicted	None seen (Fig.1)
30 Sep 2024	04:58:52.942	09:57:31.839	285	PO, PO+PE, AO+PE	PO or PO+PE (Fig.2)
02 Oct 2024	08:21:40.241	09:50:23.478	87	PO, PO+PE, TO	PO or PO+PE (Fig.3)
03 Oct 2024	04:43:32.683	09:42:24.439	285	None predicted	None seen (Fig.4)
04 Oct 2024	06:17:09.119	08:20:59.531	120	PO, PO+PE, AO+PE	None seen (Arizona daytime) (Fig.5)
05 Oct 2024	06:18:11.866	08:38:03.675	137	None predicted	None seen (Fig.6)
06 Oct 2024	08:12:46.186	09:29:13.267	69	PO, PO+PE, TO	None seen (Arizona daytime) (Fig.7)

Table1. Observations done during the campaign on mutual events Patroclus-Menoetius from 20 September 2024 UT to 06 October 2024 UT. Starting time, ending time, and number of images obtained during each night are reported. We put side by side the type of predicted mutual event predicted by Brozovic et al. (2024) and the mutual event observed. The different types are PO (Partial Occultation), PE (Partial Eclipse), AO (Annular Occultation), TO (total occultation).

Diary

Chapter FOUR

ASTRONOMERS OF THE VATICAN OBSERVATORY



During 2025 I did observing runs on the VATT June 19-27, November 11-17, and December 12-23. During the last several years our observing has featured ten stellar galactic clusters. Use of the 4KCCD camera provides the data in the seven filters of the Vilnius Photometric System. From the data we derive for each star cluster its distance, what type of stars it contains, the amount of star reddening caused by dust in the cluster, and its age.

During the nine nights of the June run, I had three purposes: gaining more experience with the new operating system called “DON”; searching for asteroids during the first half of each night; and making further deep exposures in some filters for some of our ten clusters during the second half of each night. Although this run was in the official “monsoon season”, only one of the nine nights was overcast.

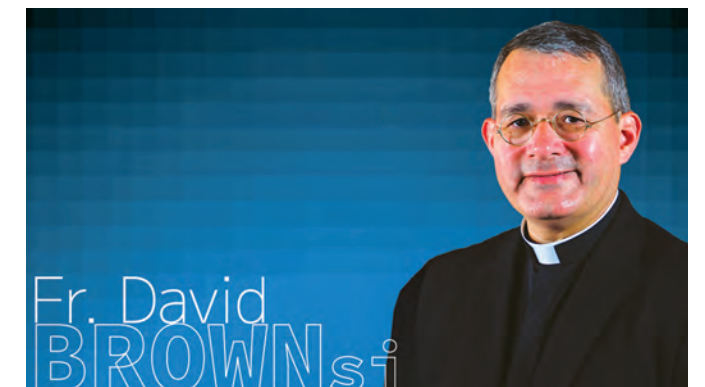
In November, it was mainly clear the first four nights, and overcast the last three. Seasonal changes required that further work on the list of ten clusters happen during the first half of the night. The open cluster M67, which calibrates the photometry for flat-fielding and color, was observed. And I used the second half of the night for asteroid searching.

In December, eleven clear nights out of the twelve beat the odds (usually more like two out of three). Our collaborator Dimitrij Semionov requested that I observe for three of our ten clusters, five extended overlapping regions. With the fine weather, I succeeded to

accomplish my scientific purposes for this run:

- 1) Cluster extension,
- 2) Asteroid searching,
- 3) “DON” control.

My two months working again in person with Robert Janusz at Castelgandolfo from mid-July to mid-September was productive and enjoyable. And we flew from Rome to Vilnius in the beginning of September to confer in person with our collaborators there. We had lunch at the home of the widow and the daughter of our much-missed chief collaborator Dr. Vytautas Straizys. Four of us even toured by car the southern border of Lithuania near Belarus. Robert helped me edit the article by I. Włodarczyk, K. Cernis, and R. P. Boyle titled “Discovery, orbit, and orbital evolution of asteroids observed at the Vatican advanced technology telescope, including Apollo asteroid 2018 BY6”, which will be published in 2026 in the journal *Icarus*. Robert taught me how to carefully use new input from AI. We collaborate by video call every Monday at 10 a.m. Lithuania time.



The year 2025 began quietly for me. I continued to explore the results of the Vatican Observatory–Potsdam PEPSI collaboration, trying also to chart the way forward for the project in collaboration with Potsdam Observatory. The first major external event of the Observatory year came when I attended the Vatican Observatory Foundation Board Meeting and Reception at the Papal Nunciature

in Washington D.C. on 03 February 2025. The following day, I gave a talk to the Catholic Chaplaincy of the United States Naval Academy in Annapolis, Maryland. Then on 06 March, I participated in and gave three presentations at Bellarmine University in Louisville, Kentucky as one of the team members of the St. Albert Initiative (part of the Faith/Science Initiative of the McGrath Institute of the University of Notre Dame), organized for Catholic schools in and around the Archdiocese of Louisville. Back in Tucson on 07 March, Paul Gabor and I sponsored and organized a Star Party for young professional adults of the Diocese of Tucson through St. Thomas the Apostle Parish. Two weeks later on 21-22 March, I participated in and presented a poster (on PEPSI) at the Arizona Astrobiology Symposium, held at Arizona State University in Tempe. Back in Tucson on 08 April, I gave a talk on faith/science to the members of the Fidèles Amici group.

Then it was off to Vatican Observatory headquarters in Castel Gandolfo (Rome) in order to make final preparations for the imminent start of the Vatican Observatory Summer School (VOSS) which would take place during 01-27 June 2025. I served as Dean for VOSS2025, acting as liaison between the Vatican Observatory and the students and faculty of the summer school. I was responsible for the day-to-day running of the summer school. I also gave a talk at the school on 04 June on the PEPSI project. In the aftermath of the summer school, and after helping to assess its performance, I had the privilege of giving Pope Leo XIV a tour of the telescopes on the terrace of the Summer Apostolic Papal Palace in Castel Gandolfo on 20 July.

In August, I traveled to France in order to do my eight-day silent retreat (part of the Jesuit rule) at a Benedictine monastery near Poitiers during 05-13 August. The monks asked me to give them a presentation on the work of the Vatican Observatory, which I did. I then travelled to Lourdes in order to give a talk on faith/science (“Regardez vers les étoiles: Une astronome du Vatican réfléchit sur la création”) during the Pèlerinage National on 14 August as

requested by Br. Guy Consolmagno, S.J. at the invitation of the sanctuary. It was part of the Jubilee Year 2025 celebrations at Lourdes.

Then back in Rome, I participated in and presented a paper (“El Lenguaje científico y tapiz del libro de la naturaleza de Dios”) at the XII Congreso Latinoamericano de Ciencia y Religión conference held at the Pontifical University of Regina Apostolorum during 10-12 September. Then back at the Specola, on 27 September it was time to participate in and to give a presentation on PEPSI (“Il Survey PEPSI”) at the one-day conference “Leggere i segreti dell’universo: dalla nascita dell’Astrofisica Spettroscopia di Padre Secchi ad oggi”.

My departure from Castel Gandolfo back to Tucson came on 06 October. On the way back to Tucson, I gave another presentation to the Catholic Chaplaincy at the US Naval Academy in Annapolis on 07 October, followed by giving five presentations to high school students in the Environmental Sciences classes at the Jesuit High School in New Orleans on 22 October.

Soon after my arrival in Tucson, I gave another talk at the Newman Center for the University of Arizona, a repeat of the invitation for a talk that had been given the previous year. The final notable event of the year took place when I traveled to Omaha, Nebraska in order to give a talk on the work of the Vatican Observatory on 17 November for the Jesuit Friends and Alumni Network meeting, organized by the UMI Province of the Society of Jesus.



I have finally retired as Observatory director. Ten years is the term limit for such Vatican positions, I am told, though in fact I had already indicated more than a year ago that I was ready to pass on the baton.

Before my retirement, however, I did get to do some fun travel... a lot of it by Amtrak and other trains. Among the most notable was an invited presentation at the Los Angeles Religious Conference in February, which served as a book launch for my latest book, *A Jesuit Guide to the Stars*.

April saw the beginning of an actual around-the-world trek. I took Amtrak from Tucson to St. Louis just before Easter (speaking at Central Methodist University), flying to St. Paul, Minnesota (talk at St. Thomas More College), train to Chicago (various events), flight to London and then Edinburgh... where I had many talks (including at the Square Kilometer Array headquarters), ending up at Gordonstoun College, where King Charles studied. From the north of Scotland I took the Caledonian Sleeper train to London, the Eurostar to Paris, and the Frecciarossa to Rome. I got there just in time for the final preparations for our Vatican Observatory Summer School.

After the school, I flew to Perth, Australia for the annual meeting of the Meteoritical Society. This was my first meeting as President of that Society, and I also presented a paper on our current research into the physical properties of CI carbonaceous chondrites.

After the meeting, I flew to Adelaide and then rented a car to head north to the Jesuit retreat house (and winery) at Sevenhill in the Clare Valley, for my annual retreat there; I also got to see many wonderful southern stars and some remarkably large kangaroos.

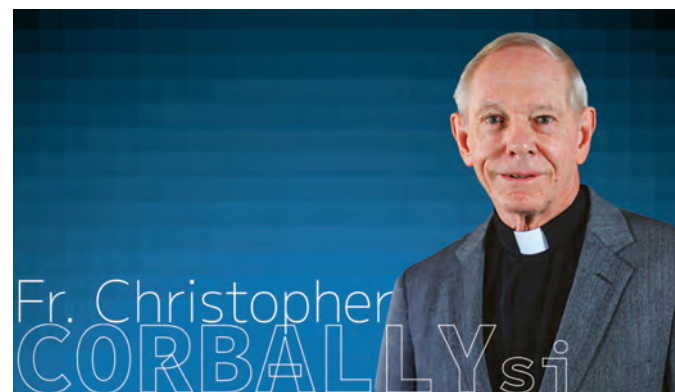
From there, it was a train to Melbourne (more talks); a flight to Auckland, New Zealand (more talks); a train to Wellington (more talks); and a ferry to the South Island (more talks). I give a special thanks to the number of different

diocesan offices who sponsored my talks and supported my travel. It was especially moving to visit Lake Tekapo again, which I had first visited in 1996 after a meteorite-hunting expedition to Antarctica. The area has become a noted Dark Sky site, and I took advantage of those skies to revisit some old celestial friends.

From Christchurch I flew to San Francisco, visiting friends and donors (and giving a talk). Then I took the train to Los Angeles (overnight with the Jesuits) and on to Tucson. I arrived back home at the end of August. Unlike a more famous traveler, my journey around the world took 126 days.

One last trip to Europe came in October. Back in Castel Gandolfo, I cleared out my room and took part in a number of Jubilee Year events during its Week of Education. At that time we inaugurated a display of Webb and Hubble space telescope images, enlarged to more than a meter across, on loan from Johns Hopkins University and the Space Telescope Science Institute. (By coincidence, that was also the week that a monumental sculpture of Our Lady Queen of the Universe by Tim Schmalz was set up at the Visitor Center.) Setting all that up was my last hurrah as Director... though much of the last minute organization actually fell on the new Director, Richard D’Souza, for which I am very grateful!

I’m now back in Tucson, which has become my base of operations. I am staying in my role as President of the Vatican Observatory Foundation, and I continue to work as an astronomer at the Observatory.



A priority for me this year was to be present at the Vatican Observatory Summer School (VOSS2025) in June. The Summer Schools are always exciting events, both for the science and for the opportunity to meet the students from so many countries, as well as the distinguished faculty. As recounted elsewhere in this Annual Report, VOSS2025 was no exception to this, but for me it was special in that I had been a catalyst in forming the topic and faculty.

Back in April 2024 there was a celebration at Steward Observatory on the University of Arizona campus for the 20th anniversary of the dedication of the Large Binocular Telescope (LBT). Since the LBT is the big neighbor to the Vatican's telescope on Mount Graham, I attended the celebration. During one of the breaks I got to talking with Dr. Eiichi Egami, who is on the Arizona faculty and chair of LBT's User Committee for Arizona. Eiichi is a VOSS1990 alumnus, and so he asked me what the topic was for VOSS2025. When I replied that none had yet been selected, he suggested four aspects of the latest science from the James Webb Space Telescope (JWST) and began listing possible faculty, several of whom were also VOSS alumni. With amazing swiftness, Eiichi's full proposal was submitted to the V.O. director, Consolmagno, and as swiftly accepted. I was delighted: you see, I had been dean of Eiichi's VOSS1990!



Photo: Eiichi Egami.

1990



2025

Eiichi Egami and Christopher Corbally at VOSS in 1990 and 2025.

On the science side, I have continued collaborating with two Professional-Amateur groups, and added a third for a particular project. Since two of the groups have produced published articles in two leading astronomy journals, and a paper from the third group is in review, I prefer “small telescope scientist” to “amateur” as a title. In the last Annual Report I explained a little about “MG1-1995959: An Eclipsing Binary Star with a Pronounced O’Connell Effect”, so this time let us look at HD 5501. It is also the brightest member of a binary star system. Its unseen secondary star eclipses it about every 7.5 days. My longtime colleague, Richard Gray, got interested in this system since it has spectral features implying there is a shell of material around it. What is more unusual is that this material changes over time and so does the “light curve” of the brightness of the star, even from cycle to cycle for the orbits.

Much nightly observing from the HD 5501 group (including some spectra from the VATT), and Gray's courageous ventures into modeling the binary system, eventually suggested a

satisfactory, while surprising scenario. The primary star that we see, the A component, has been caught in a brief phase when the transfer of material from its giant (“bloated”) surface onto the unseen secondary (B) occurs only during the part of their orbit when they are closest together. This phase lasts around 170,000 years—“brief” in the life of a star. In the next phase, the transfer from A to B will occur continuously and B will rapidly increase in mass, prematurely starting to change into a red giant star. The transfer of material is chaotic (hence the variability of many features) and it produces a torus of material shrouding the secondary. The prime source of the energized hydrogen gas, shown by emission in the red region of its spectrum, is not, as first thought, a hot spot on B's torus, but instead is the gas and material flowing out of the “back” of the primary. Rather than more words, see the cartoon of the system, as drawn by Gray. There are still puzzles about the system, so observations are ongoing. Meanwhile, at a July meeting of binary star experts, I presented on behalf of our spectroscopic group a poster about this interesting binary.

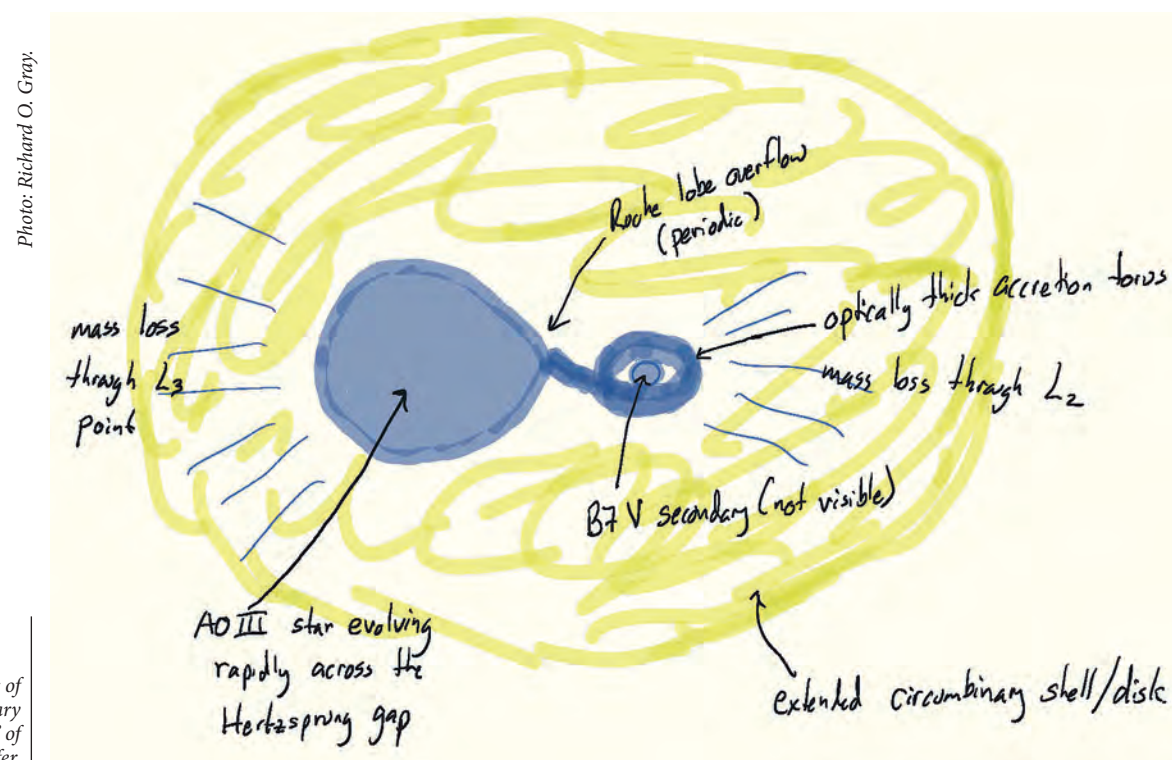


Photo: Richard O. Gray.

Schematic of HD 5501, a binary “caught in the act” of initial mass transfer.



The epistemic reading of the Two Books tells us that science and technology are fundamentally an expression of God’s willingness to share, of God’s invitation to share. God’s creation was made for us to understand and we were made to understand creation.

The Jubilee Year 2025 was devoted to hope, and for me, it was a hopeful time. For the last fifteen years, I had been focused on making the VATT’s upgrade happen. This effort reached its culmination in 2024 when we commissioned the new, PLC-based system, installed by ProjectSoft. Of course, there are still tasks that remain to be done, but I feel more free to pursue other things.

Among the lingering VATT-related tasks, we have made good progress on the telescope’s automated collimation and collimation maintenance, thanks to Robert Crawford (ably assisted by Mark Trueblood and Larry Lebofsky), a whole team of colleagues from the University of Arizona’s College of Optical Sciences, as well as our “A-team” with Christopher Johnson and Michael Franz.

Even though it gives me joy and hope, this collimation project is an example of how slow the process of science can be. In contrast, I found more immediate validation attending three meetings in 2025 on the history of astronomy and astronomical heritage. Already in late 2024, I found a meeting in Lille quite stimulating (see a note on the paper I presented there; it was published in 2025). The biennial workshop on the History of Astronomy at the University of Notre Dame was a great opportunity to meet people I have known from their work. I found the community

very supportive. Similarly, the meeting of the International Astronomical Union’s Commission C.4 on astronomical heritage in Hamburg was very useful and constructive. And finally, the annual assembly of the Alliance of Historic Observatories in Flagstaff was also very useful. As a result, I am on the Science Organizing Committees for two Focus Meetings to be held during the IAU General Assembly in Rome in 2027.

Speaking of meetings, I attended the 8th AstroRob workshop on Robotic Telescopes in Almería, Spain. It was a very good meeting, with many ideas on automation of systems and on research with automated telescopes. I gave a keynote address to the Catholic Media Conference in June. They laughed at all my jokes, and they listened attentively when I was serious. What is more, it has led to more invitations. I was invited to give a talk at the Guadalajara Book Fair, which also went very well, and I received a couple of invitations for next year.

The IAU’s Working Group Small Bodies Nomenclature, in its bulletin 5, #9, p. 22, announced that asteroid 2012 WR41 discovered by K. Černis, R. P. Boyle at the VATT on November 25, 2012 is henceforth (669448) Pavelgabor. I am very honored.



Looking back at 2025, I see a year of incredible density—a whirlwind that seamlessly blended abstract theoretical physics with the practical “apartment manager” duties of the Vatican Observatory. It was a year of transatlantic travel and profound spiritual moments that left a lasting

mark on my heart. The year began with me in my role as Vice-Director, buried in bureaucratic steps vital for our community, such as coordinating the transfers of Maura Turoli to our secretariat and Gian Luca Mansueti to manage our IT systems. Without a solid administrative and tech foundation, scientific research halts. Such “hands-on” tasks extended to working with the Governor’s technical office on extraordinary maintenance and installing two new boilers in the Specola’s oldest wing—humble but necessary work to ensure we didn’t freeze while studying the cosmos. Scientific engagement remained a priority.

Following the December 2024 FLAG meeting in Trento, I began January with a seminar on Fr. Georges Lemaître at St. Hippolytus Church, where I met Fabrizio Frezza. He later proposed an exciting project on AI. I submitted with Don Matteo Galaverni an article “Spherically Symmetric Geometrodynamics in the Jordan and Einstein Frames” for peer review. Shortly after, at Luiss University’s EMUNA program, I discussed models of divine creation before a diverse audience of Jewish, Muslim, and Christian scholars—a powerful reminder that the search for God is a universal language.

February was a month of distances. I traveled to Washington, D.C. for our Foundation’s meeting at the offices of Jones Day, followed by a reception at the Nunciature to share our staff’s research. This was followed by two intense, peaceful weeks of work at the Steward Observatory in Arizona.

By spring, I was in Namur, Belgium, for Fr. Williams Dehlonga’s thesis defense and a seminar on Jordan and Einstein “frames”. The pace accelerated as we organized our Summer School at Castel Gandolfo, focused on the JWST—a massive effort that yielded immense satisfaction.

June brought a poignant mix of joy and sorrow. I con-celebrated the wedding of my dear friend Ferdinando Fava and his wife, Janine. Ferdinando, a former Jesuit and anthropology professor, was battling brain cancer. It was a moment of heartbreaking beauty. He passed away on August 14, and I traveled to Fontevivo for his funeral

with a heavy heart, yet deeply grateful for his life. Meanwhile, the paper on “Spherically Symmetric Geometrodynamics in the Jordan and Einstein Frames” was accepted in *European Journal of Physics C*.

July was another sprint. In Teramo, I spoke on how science builds bridges for peace. This was followed by the Domoschool in Domodossola with colleagues like Don Matteo Galaverni, and a seminar on quantum gravity at La Sapienza’s School of Aerospace Engineering. Finally, in late July, I unplugged for ten days in Villasimius to recharge before the September SIGRAV meeting in Milan, where I presented my research on Regge calculus.

Autumn felt like a continuous pilgrimage. In October, I visited Santiago de Compostela, discussing the beginning of the universe and God at the university’s high-energy center. November was dedicated to a retreat for Jesuit novices and celebrating St. Stanislaus Kostka.

December provided a perfect seal on the year. I experienced the powerful Jubilee of Prisoners with the Pope, followed by an unforgettable lunch with inmates from Velletri who reminded me of the humanity behind the bars. I also visited Moncalieri to honor the 130th anniversary of our first director, Father Denza. The year closed with the blessing of the Nativity scene in our Barberini domes and the moving experience of greeting the Pope for Christmas wishes.

Now, following my spiritual exercises at the Balduina, I feel that every boiler installed and every equation written is part of a grand design holding together earth and sky. Despite the exhaustion, I am filled with gratitude for a year spent as both scientist and pastor, traveler and pilgrim, forever wondering at the beauty of creation.



Photo: Mr. Rosario Napolitano.

Seminar on Science and Faith held by Fr. Gabriele Gionti, S.J. in the main auditorium of CIRA in Capua (CE) on 03/30/2023.



This year our stellar photometry team continued working on the details of a planned publication that has undergone many successful trials as well as more challenging moments. Scientific work is not easy. It cannot truly be compared to anything else. Perhaps it can be likened to the work of a physician facing the problem of curing a disease for which there is no known remedy. Such a doctor must perform hundreds of tests and attempt entirely innovative drug application techniques on animals; yet, just when there is hope they will work on humans, it turns out they do not, and the entire process must begin anew. Similarly, in science, unlike in industry, one cannot simply set up a production line where a “success” method is almost guaranteed. Such an approach would merely be a scientific technique—a production of publications—rather than breaking through the resistance of the unknown.

We find anomalies in our photometric data, where accuracy is intended to be better than 2%. In science, contrary to medicine, an anomaly does not signify a lack of health; rather, it may represent a discovery or some unknown systematic error. We are not the only ones facing these issues. Large research teams are constantly calibrating data, as merging old measurements with new ones does not always align with the expected precision.

In particular, I am continuing to relate the Vilnius Photometric System to synthetic filters of that same system applied to Gaia data. Although the algorithms are well-known, an optimal fit between synthetic data and published results is still lacking. The primary problem lies in modeling the U, P, and X filters of the Vilnius system, as this is where the largest anomalies occur. Furthermore, data for the U filter must be modeled based on a known spectral class, since Gaia

XP does not cover the entire width of the Vilnius U filter. This work requires more attention but remains promising; not all XP data are necessary for standardizing VATT observations—theoretically, a few good filter standards would suffice to calibrate everything. Therefore, if this method proves effective, it would allow for the calibration of any VATT field of view.

A related challenge is the improvement of classification algorithms within the system itself. The larger number of classified stars made possible by CCDs, as well as their presence in other new observations, offers hope for a more precise and accurate calibration of the system, thanks to new data from OB-type stars, which are the most difficult to classify. There are also attempts to link the system with newer models for determining the age of stellar clusters, moving beyond the Padova system, used until now.

We discussed these issues during two workshops in Vilnius and at the Specola Vaticana. The session at the Specola (November 11–18) was attended by astronomers from Vilnius. Justas Zdanavičius, Saulius Raudeliūnas, Dmitrij Semionov, and Robert Janusz, S.J. led the discussions:

- 1) Justas: flatfield problem in the VATT; airmass and tie-in transformation equations, extinction coefficients (Maidanak observations).
- 2) Saulius: a paper with extensions and corrections; problem with Monte Carlo generated data for distances and age, point out of density map.
- 3) Dmitrij: two sets of data (cluster on data from Gaia CM without extinction) to match with VATT cluster members.
- 4) Robert: Maksutov (I4 run) catalog on tie in and XP-Gaia synthetic catalog (better age, smaller number of stars), python notebook (Google collab).

I have asked the Vilnius Group to prepare some remarks for the VO Staff Meeting in May 2026: how they see the future of the Vilnius System and our collaboration in future. We will respond to this after our meeting. The new director encourages us to collaborate and work together, to meet, to go to conferences, etc.

I guided several groups, mainly religious, with extended visits and science-faith connections; did some peer reviews, and consultations.



Reflecting upon our work at the Vatican Observatory and its future with a new Director, I see an important question we should always ask ourselves, which is: After we have done our research, which we need to do, and after we have published our research, which, again, we have to do, then what? It is now that I see clearly the two layers of our work. The first layer is the practical and visible part of our research which consists in conducting a research project and exposing its results to the scientific community. But the second layer, usually left untouched, consists in finding the implications of our research in other aspects of life: culture, religion, society, etc.—how research supports human society, improves it, and how in turn the One who envisions the world, God, opens new perspectives to research. This second layer, most of the time philosophical, theological, sociological, etc., accompanies the first layer from the beginning to the end.

Consider the debate back in 1935 between Bohr and Einstein on quantum mechanics, about the notion of entanglement, when Einstein came out with his famous sentence, “God does not play dice”, a sentence totally away from science, because it involved God. We need to ask ourselves the question, was it Einstein’s vision of God which guided him in his research, or was his research embedded in his vision of God?

It is clear that the debate between Einstein and Bohr was about the perception of the world which was supporting the way each of them was doing science. Einstein had a realistic vision of the world. For him, the world exists

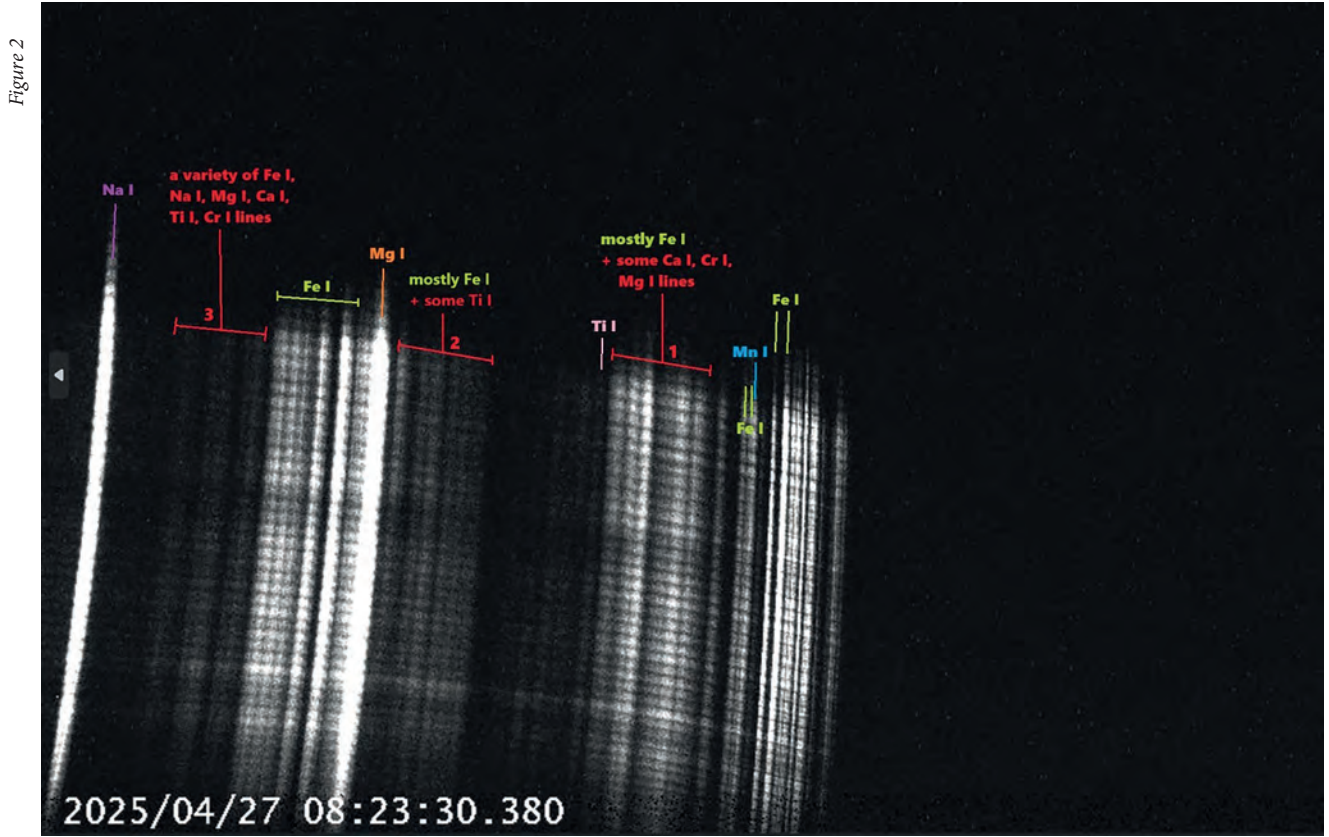
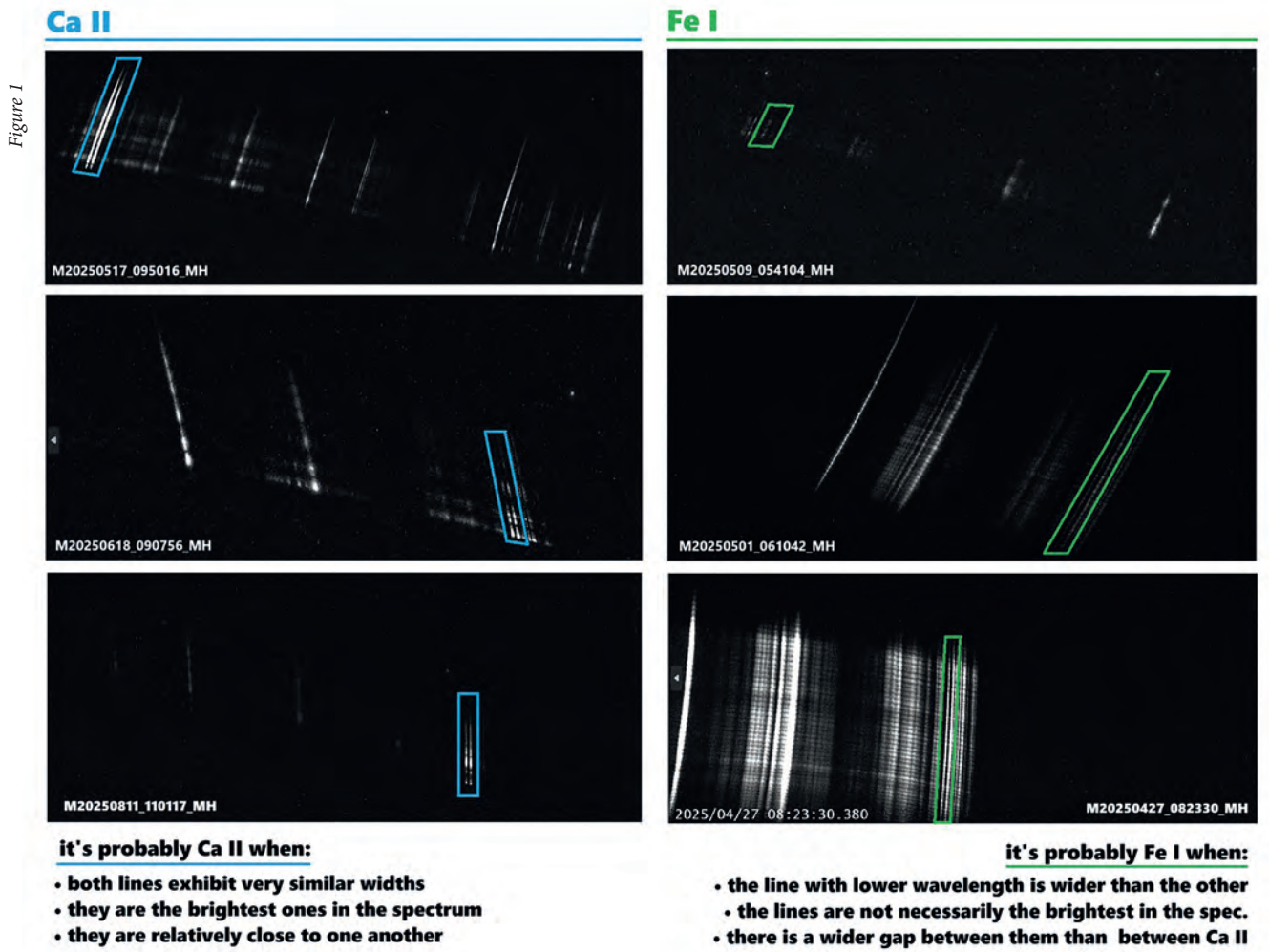
independently of our observation, meaning that it has properties, and observing it comes down to observing its properties. Bohr was convinced that we had to abandon the idea that there was a world with its properties, and that the only thing that mattered was the properties we could observe. For Einstein, if things appeared that way, it was just a provisional stage; but at the end, we would access the properties embedded in objects from the beginning.

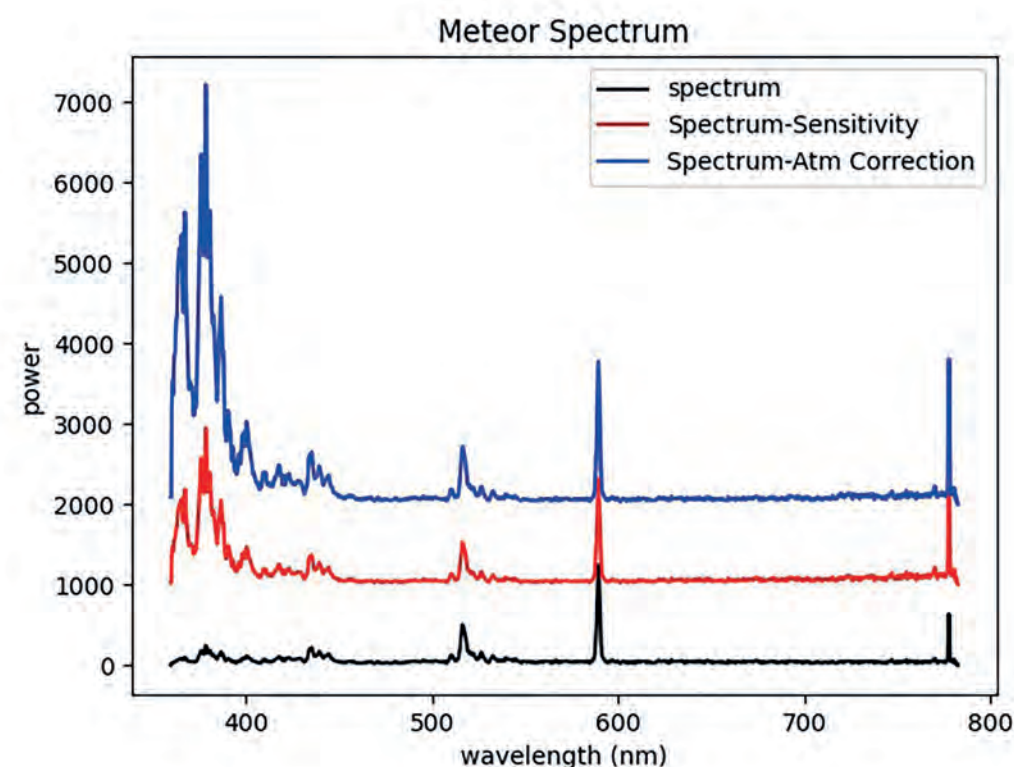
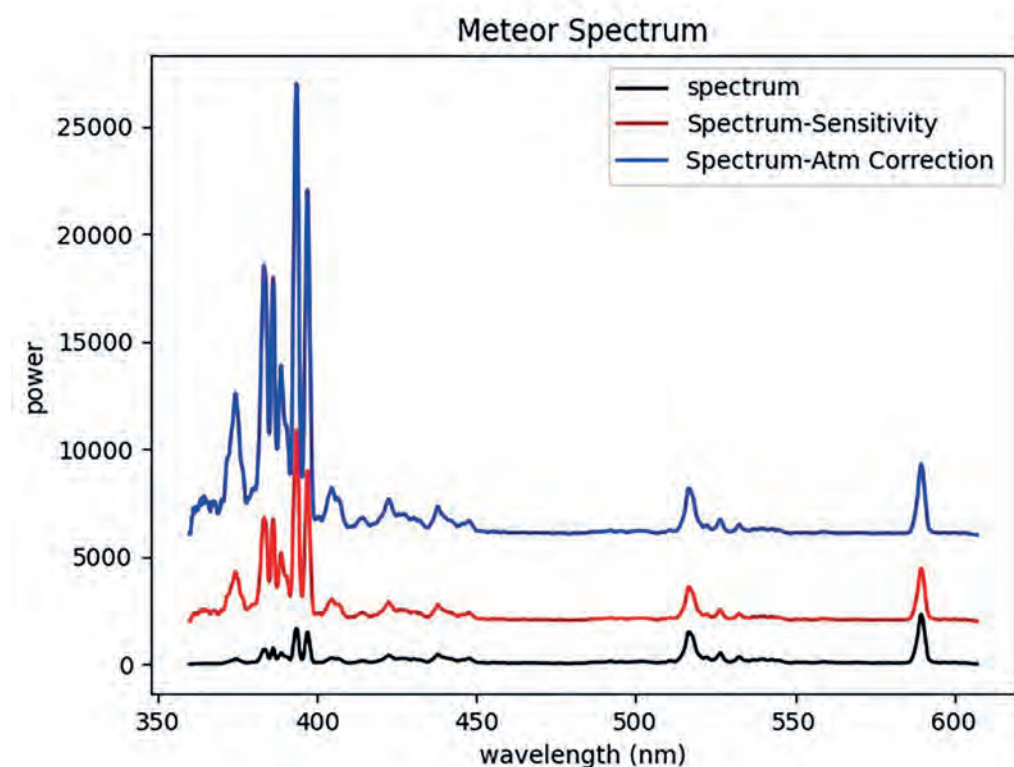
The science I do is focused on observations with the VATT and with meteor cameras. With the VATT, I participated in two collaborations with NASA. The first collaboration was with the mission DART (Double Asteroid Redirection Test), a planetary defense mission that successfully demonstrated the “kinetic impactor” technique by crashing a spacecraft into Dimorphos, a satellite of the Didymos system, and altering its orbit around Didymos. The second collaboration was with the mission Lucy. I used the VATT to observe very rapidly rotating asteroids, my main project being in collaboration with Rich Boyle and Carl Hergenrother. This year, I was able to observe around twenty asteroids, and published two papers.

My project on fireballs and meteors continues. Beside Fripon (European collaboration), Asgard (NASA collaboration), and GMN (Canadian collaboration), I started in April another collaboration with a group of researchers from Bratislava in Slovakia. The project consists of studying the spectra of meteors we collect on Mount Hopkins in Arizona. Since April, we have collected nearly twenty-five meteor spectra. Some are shown here.

In **Figure 1**, I present six meteor spectra as we collected them. In these spectra, the trained observer can see clearly the signatures of certain important chemical elements such as Calcium and Iron. We can also see the lines that are the signatures of Magnesium and Sodium.

Figure 2 shows a close up of the last meteor spectrum (bottom-right) in **Figure 1**.





This past year has been a little low-key for me. My involvement in the OSIRIS-REx mission has ramped down. (As a reminder, OSIRIS-REx was a mission to collect samples from the asteroid Bennu and return them to Earth for laboratory analysis. I am a member of the sample analysis team.) The sample analysis program of that mission has officially come to a close, though papers continue to be written.

As for the other space mission I am involved with, Lucy, the spacecraft passed by the main-belt asteroid Donaldjohanson on Easter of this year. We are still two years from arriving at the first of the real targets of this mission, the Trojan asteroids that are trapped near the L3 and L4 Lagrange points of the orbit of Jupiter around the Sun. My involvement with that mission has largely consisted of attending teleconferences. This year, I planned to attend the Lucy Science Team Meeting in person, scheduled to be held in Orlando in November. However, because of the US government's budget shutdown, the science team decided at the last minute to shift the venue to the mission headquarters in Boulder, Colorado, which would mean fewer people traveling. It was too late for me to change my ticket, so I attended the meeting via telecon from a colleague's place at the University of Central Florida in Orlando. However, that was not a fruitless visit, as I used the time to train one of the students in some laboratory work and made some other useful connections through side conversations.

I have also started a new project, and a new collaboration with Helen Grant, a postdoc formerly at INAF-IAPS and now at the University of Kent. We plan to harvest micrometeorites from the roof

of the Specola for study. The project is only just beginning. I designed and built a magnetic sweeper to comb the terraces for anything that responds to a magnet. Unfortunately, this includes many things that aren't micrometeorites, such as iron-bearing particles from the terracotta tiles that line the roof. We are still gaining the experience needed to isolate true micrometeorites from everything else.

Another new project, along with a new piece of equipment, is a 3D catalog of the Vatican meteorite collection. We acquired a structured light scanner, which uses patterns of light projected on a meteorite to recreate its shape in the computer. The device also captures photographic textures of the meteorite surface that it overlays on the shape model. The plan is to make this 3D catalog accessible to other researchers and to the public for outreach, though it may take considerable time to scan and process all 1200 specimens in the Vatican collection.

Lastly (or perhaps firstly), the model of the Church of St. Ignatius that I spent half of 2023 and all of 2024 building was installed at the start of the Jubilee year (December 2024) in the church itself, near the side altar where St. Cardinal Robert Bellarmine is entombed. The model features the observatory that Fr. Angelo Secchi, S.J. constructed atop it in the nineteenth century. We held an inauguration that included talks by Prof. Aldo Altamore, Fr. Gabriele Gionti, S.J., and myself. It has since been viewed by thousands of tourists.



The first year of my work at the Vatican Observatory in Castel Gandolfo was fruitful. I have an office in

which to work and a connection to a local server, a supercomputer, and most importantly, colleagues all over the world that I meet at least weekly over video. In 2025, I worked on five projects.

The first is the data assimilation project that I discuss in a separate article in this report.

The second is an Arabian Peninsula mesoscale convective systems (MCSs) tracking project. This project is a “leftover” from my postdoc at the University of Arizona and a collaboration with King Abdullah University of Science and Technology in Saudi Arabia. It is basically exploring the potential of tracking MCSs, that is, cumulonimbus clouds or storm clouds, over the Arabian Peninsula, and the possibility of forecasting the MCS tracks from one week to four weeks into the future. The results are promising that the characteristics (e.g., cloud top temperature, cloud shield, and life span) of MCSs over the peninsula are different from those over North America and China. The tracking algorithm seems capable of tracking up to four weeks into the future. A manuscript has been written and is currently under internal review for submission to a journal. We plan to present this work at the EGU General Assembly in early May 2026 in Vienna, Austria.

The third is the South American climate projection project. This is a community project involving around forty scientists from countries in South America, North America, and Europe. We run high resolution atmospheric models to do projection of climate over South America fifty to one hundred years into the future. One of the results shows there will be an increase in temperature, especially in some areas over the Amazon. Recently we submitted a manuscript to Climate Dynamics; it is now under review. In continuation of this work, we are running some models to look closely at the impacts on the atmosphere (including weather and climate) of land-use land-cover (LULC) changes over the Amazon. The results of this project will inform the policy and decision makers in South America of the risks of LULC changes in the Amazon.

The fourth is the Taiwan Atmospheric Land Cover project which explores AI capability. This project is a collaboration between scientists from Taiwan National University, University of West of England, and

Istanbul Technical University. We are running several simulations of typhoon Danan that hit Taiwan in the summer of 2025. We are interested in understanding the impact of the typhoon on LULC changes in northern Taiwan and in how AI may be able to inform us of the course of a typhoon.

And lastly is the AI forecasting project. We received a request in October 2025 from the University of Rome to host a PhD student of computer science as an intern. Knowing that she is working on AI in energy forecasting for her dissertation, the director of the Specola put her under my direction. I gave her the challenge of forecasting monsoon rain over Arizona using AI with data sets from my Arizona monsoon project. Her work is underway.

On August 18, I visited Institut Teknologi Bandung in Bandung, Indonesia upon the invitation of Dr. Fargiza A. M. Mulki, the dean of the Department of Astronomy, and Dr. Dudy D. Wijaya, the dean of the Department of Earth Sciences and Technology, where the meteorology program is located. To the former, I gave a short talk on the Vatican Observatory Summer School (VOSS). In the past there were students from this university joining the VOSS, but for some reason the VOSS advertisement did not reach them after 2020. Thus, my talk was to reintroduce VOSS to the students. With the latter, I shared my research on data assimilation and, to my surprise, they also did some investigation on it. We look forward to future collaboration.



In the last few years, I have been studying star formation in dwarf galaxies outside the Milky Way using stars in those galaxies that we can individually detect with our telescopes—and in

particular, studying the termination or shutdown of that star formation. As astronomers, we are very interested in understanding when dwarf satellite galaxies around large Milky Way-mass galaxies stopped forming stars. This gives us some indication of when a dwarf fell into the halo of the larger galaxy and got trapped in its gravitational well.

Observationally, it is most opportune to use the brightest stars available to us: Asymptotic giant branch (AGB) stars and red giant branch (RGB) stars are the obvious choices. A few years ago, Ben Harmsen, Eric Bell and I set out to measure the ratio of AGB to RGB stars in the stellar haloes of nearby galaxies in the GHOSTS survey to inform us about their shutdown in star formation. For this, we used an empirical calibration from nearby dwarf galaxies (where we have deeper data on their main-sequence turn-off stars) to understand what this ratio of AGB to RGB stars reveals about the shutdown in star formation. While we were able to calibrate our relation, we were unable to explain the relation using available theoretical stellar evolution models.

This year, along with Paolo Ventura and Flavia dell'Agli at the Observatory of Rome, we finished a project on the interpretation of the numbers of AGB stars found in dwarf galaxies. To our surprise, we realised that the lifetime of AGB stars depends critically on the mass loss of the star during their RGB phases. The relationship between the ratio of AGB to RGB stars and the shutdown in star formation in these stellar populations allows us to directly constrain the amount of mass lost by a star as it climbs the RGB branch. The mass loss that we derived is consistent with that derived from stars of the horizontal branch.

Armed with an empirical calibration and a theoretical model, I went on to derive the star formation shutdown of all dwarf galaxies that have been imaged by the Hubble Space Telescope. This preliminary work reveals that there is synchronous shutdown in the star formation of dwarf galaxies around Milky Way-mass galaxies, indicating that a sizeable majority of these dwarf galaxies fell together into the halo of the central

galaxy, most probably accompanying another giant progenitor. Such a scenario is entirely compatible with the accretion of smaller satellite galaxies in a hierarchical universe, where galaxies are built up by the mergers of smaller galaxies.



During most of 2025, assisted by Adriano Lolli, I coordinated the operations to maintain the historical Carte du Ciel telescope and the two Zeiss telescopes (the Visuale and the Double Astrograph) in the Papal Palace. What follows are the main activities:

At the Carte du Ciel:

A new driving system which uses a new, more powerful, AR motor was installed. This system does not require an external PC and has a new wireless remote control.

New, lighter covers for the lenses were installed.

Some modifications to the illumination of the declination circle were made.

The mechanical gears were re-lubricated. A possible insertion of ball bearings in the transmission gears has been considered, but not yet implemented. We need some more experience with the existing one before eventually proceeding to this major upgrade.

At the Visuale:

The focuser was repaired after it was damaged by being misused as a handle to move the telescope.

The eyepiece of the finder was cleaned and a new illuminator of the crosswires was installed.

At the Double Astrograph

The dome of the Double Astrograph needs replacement of the Cardanic joints. Some analysis was performed in the dome before proceeding. The work requires installation of scaffolding in the dome and will be done in 2026 when new windows will be installed.

Repair of the manual positioning in hour angle was performed by re-tensioning the spring.

Assistance During the Visits to the Specola’s Telescopes

I assisted the participants of conferences and meetings during their visits to the Specola’s telescopes: In June, during the Vatican Observatory Summer School (VOSS): “Exploring the Universe with the James Webb Space Telescope: the First Three Years”.

In September, during the Conference on Spectroscopy organized by Adriano Lolli.

Several public visits to the historical Carte du Ciel telescope and the museum (Visitors’ Center), operated in cooperation with the Vatican Museum, were held during 2025. I assisted at many of them, helping a young astrophysicist to correctly operate the Carte du Ciel telescope, which allows visitors to look at the Moon and the planets directly through the eyepiece.



It was a unique experience to carry out my research and collaboration with the Vatican Observatory in this year of the Jubilee of Hope. In particular, during the Youth Jubilee, there were many opportunities for meeting and dialogue with several groups of young pilgrims. It was also a pleasure to

collaborate with Christoforus Bayu Risanto and Robert Janusz and contribute at the meeting of the Constellations of Educational Networks promoted by the Dicastery for Culture and Education for the Jubilee of the educational world. These were just some of the many opportunities to make the Observatory’s activities known during this Jubilee year.

In the first part of the year, Gabriele Gionti and I were able to complete and publish a paper entitled “*Spherically symmetric geometrodynamics in Jordan and Einstein frames*” in the *European Physical Journal C*. We also began a new research project with Sergio Cacciatori (University of Insubria) and Federico Scali (PhD student in the same university). In the second part of the year, my collaboration with Gabriele focused on planning several events for the coming years. For 2026, we are organizing the first edition of the “*Vatican Observatory Lectures on Quantum Gravity*” and the second edition of the workshop “*Spirituality and Astronomy*” (the latter in collaboration with Robert Janusz and Sr. Irene Tranquillini, O.F.M.I.). The year 2027 will mark the centenary of Georges Lemaître’s paper in which he first derived the linear relation between the recession velocity of galaxies and their distances. We submitted a proposal for a Focus Meeting to be held during the General Assembly of the International Astronomical Union, which will take place in Rome in August 2027.

Together with Fabio Finelli and Daniela Paoletti (Astrophysics and Space Science Observatory of Bologna—INAF) we are studying the implications on the polarization of the cosmic microwave background of pseudoscalar particles acting as dark energy or dark matter. It was very important for me to be able to participate in, and present my results at, two international conferences, one in Sesto Pusteria and one in Sofia. The meeting in Bulgaria, organized as part of the international scientific research program COST Action *COSMIC WISPer*s, also gave me the opportunity for a beautiful encounter with the local Church. During the conference, I stayed in the parish house where Msgr. Angelo Roncalli, today Saint John XXIII, lived and worked during his service as Apostolic Visitor and Apostolic Delegate to Bulgaria from

1925 to 1934. Today, this house hosts the Catholic radio station *Ave Maria*. It was a pleasure, through this radio, to share the work of the Vatican Observatory and to engage in a conversation on science and faith together with the station’s director, Fr. Jaroslaw Bartkiewicz, O.F.M., and my friend and colleague Michele Cicoli (full professor of theoretical physics at the University of Bologna). This, and many other meetings, are an important part of my work at the Observatory and also an important aspect of my ministry as a priest because they allow me to meet and get to know people whom I would otherwise never have had the opportunity to meet.



Participants in the Youth Jubilee visiting the Specola headquarters.



Vatican Observatory stand at the meeting of the Educational Networks Constellations on the occasion of the Jubilee of the educational world.

Father Jaroslaw Bartkiewicz OFM, Don Matteo Galaverni and Michele Cicoli at the parish house where Monsignor Angelo Roncalli, now Saint John XXIII, lived and worked when he was Apostolic Visitor and Apostolic Delegate in Bulgaria from 1925 to 1934.



Prof. Willy Benz, President of the International Astronomical Union, Prof. Diana Mary Worrall, General Secretary of IAU, and other members of the IAU visiting the Specola.



Pilgrimage of the Vatican Observatory Staff, to the Holy Door of the Basilica of St. Paul Outside the Walls, Rome.



My work at the Vatican Observatory is mainly centered on the study of the history of astronomy, with particular regard to the region of Rome and the development of astrophysics there, from its foundation in the middle of the nineteenth century to the present time. I take part also in the general internal discussions on communicating science as part of the Vatican Observatory's projects in the field of outreach and education. I delivered a talk for the inauguration of the model, constructed by Br. Bob Macke, S.J., of the Church of St. Ignatius in Rome as it appeared in the nineteenth century, with the observatory of Fr. Angelo Secchi, S.J. atop it. The model is now displayed at St. Ignatius.

In collaboration with the Rome Astronomical Observatory, I accomplished activities related to the bicentenary of the birth of Lorenzo Respighi (1824-1889), director of Campidoglio Astronomical Observatory during the pontificate of Pius IX. Respighi was the inventor of the objective prism, which allows astronomers to collect thousands of spectra simultaneously. The objective prism technique is currently employed in many observatories. The Vatican Observatory historical collection of instruments includes some objective prisms which were used at the Vatican Schmidt Telescope. Respighi was also co-founder of Società Italiana degli Spettroscopisti (today Società Astronomica Italiana).

I worked also on a review of boreal auroras observed at low latitude from antiquity to now. The paper is in printing in the *Giornale di Astronomia* edited by Società Astronomica Italiana.

In my everyday life, in addition to family commitments, I am an active member of my parish

community of San Fulgenzio in Rome, as a lay minister of the Word and the Eucharist.



During this year, my activities differed from each other more than usual. One highlight was my participation in a conference entitled "Theology and Integral Ecology: New Approaches to our Planetary Crisis". This was held at the University of Oxford and organized by the Laudato Si' Research Institute (24-25 April). I shared my research by presenting a paper entitled "Beyond Interconnectivity: from Integral Ecology to a Theology of Complementarity". Somewhat on the same lines, I was glad to see another paper of mine, presented at the University of Cambridge the previous year, finally published in the journal *Zygon*. This paper deals with the way some of Teilhard de Chardin's views can throw light on current ecological concerns.

Another highlight was my very different activity during the summer months. I accepted an invitation to lecture for a couple of months in Vietnam, at St. Joseph Jesuit Scholasticate in Ho Chi Minh City. I offered one course on the philosophy of science and another course on philosophy of mind and artificial intelligence. It wasn't my first visit, but as in previous occasions I returned with a deep sense of joy and wonder at how Christianity is flourishing in a culture that is so different from ours in the so-called West. I enjoyed teaching their students critical thinking and doing it with reference to science. In a sense, science is cross-cultural, and critical thinking on science is greatly significant even though Vietnamese culture is considerably different from ours.

As in previous years, I had to keep up with my normal academic duties at the Philosophy Faculty

of the Gregorian University, which mainly included a graduate course on the philosophy of time and an undergraduate course on philosophy of science and nature. I was happy when a member of my research group, Joshy Joseph Nellivelil, successfully defended his doctoral thesis entitled *Pragmatic Truth and Religious Faith: William James on the Justification of Religious Claims*.

As I look ahead, I see my research next year becoming focused on the impact of AI. I am on the organizing committee of an upcoming international conference entitled “Ignatian AI”, proposed by Fordham University, the Bronx, New York. The conference, planned for October 2026, will bring together top-level scholars from Jesuit higher education institutes worldwide to pool their expertise and determine how the Ignatian tradition and the new wave of AI can mutually enrich each other. I am very much looking forward to that event.



What an extraordinary year 2025 has been for me! There would be many and many things to say, but I want to focus on the most extraordinary experience that I lived this year: a long journey to New Zealand and Australia to attend the International Congress of History and Philosophy of Science, which is held every four years.

Last year I was elected President of the Scientific Instrument Commission (SIC) and, during the Congress, I would be officially installed as President. For this reason, I felt it was my duty to attend the meeting in person. I am grateful to the Lord for the opportunity He gave me to visit this part of the world, quite unknown to me.

It was a really unforgettable experience.

The conference was held in Dunedin. Afterward, I joined a group of four colleagues that visited some other places in New Zealand. Our common thread was astronomical heritage: like “old telescope hunters”, we looked for all the most important historical telescopes in the country, and hence visited Lake Tekapo (with a nice, although a bit cloudy observation night), Mt. John Observatory, Christchurch (where we met John Hearnshaw) and Wellington, where we also visited a beautiful seismology collection. In all these places we could see the old observatories and the (few) instruments they still preserve. However, the great beauty was in the nature. Wonderful landscapes with uncontaminated lakes, glaciers, mountains ... it looked like another planet! The careful policy of the local government for the conservation of the natural heritage is absolutely successful, as well as the effort to reestablish a respectful behavior toward the local Maori cultures.

Fascinated by this world, and regretting the short time (I saw the old observatories but I missed a trip to watch the penguins!), I left New Zealand for Australia. There, my priority was to visit the three observatories that were involved in the famous Carte du Ciel project (the international enterprise aimed at photographing the whole sky that at the end of the nineteenth century gave the scientific pretext for the establishment of the Vatican Observatory). These were Sydney, Melbourne and Perth. What about their old instruments and equipment? On behalf of the SIC, how could I encourage local people to preserve this heritage? I was absolutely satisfied with the three visits. Amateur astronomers had done their best to save what could be saved. They were highly collaborative and gave me access to most of the buildings to view the extant instruments. The Sydney Observatory was under restoration, but I could see the main instruments. The Melbourne Observatory is incredibly well-preserved and old telescopes are still used for public events. I visited the laboratory where the unfortunate Great Melbourne Telescope is restored. The Perth Observatory is still in activity thanks to volunteers who work toward the maintenance of the telescopes and the library.

I have admired the passion of the people in these three places and I have much appreciated their readiness to show me whatever might be of interest to me, their availability to accompany me around, and so on. In Perth they were so kind as to make me a gift of a couple of bottles of wine! Impossible for me to bring them back home ... but I fortunately met Guy Consolmagno who attended a conference there, and I made them a gift to him in turn!

In Australia, I saw the observatories, but I missed seeing the kangaroos! Of course, in Sydney I was astonished by the impressive urban landscapes with high skyscrapers, the beautiful Opera House, and the pleasant boat trips in the bay; the beautiful gardens in Melbourne, the wonderful river in Perth ... I have many fond memories! I went back to Italy with a deep gratitude to the Lord for the people I met, the places I visited, the things I learned ... and His discrete presence, with churches that, in each place, I could easily reach to pray.



I spent the first half of 2025 on sabbatical leave, returning in August to the classroom for one last year. This part of my year-long sabbatical was most notable for the time it gave me to write, both long form (a book) and rapid responses to the news (several op-eds for the Philadelphia paper).

Last year’s kerfuffle around the publication of my book on the chemistry of tea, *Steeped*, continues to bring opportunities to talk about science and the wonders to be found cloaked in the ordinary. I particularly enjoyed giving a public lecture in the Science and Society series at the Science History Institute in Philadelphia, whose

collection I made good use of in my research for the book. I did a virtual presentation for the American Chemical Society, which brought together 1400 participants from 76 countries. I led a number of retreats on science and faith for groups ranging from students preparing for confirmation to the IHM retreat center.

I participated in two seminars organized by the Laudato Si’ Research Institute and others considering the possibilities for a new feast day celebrating the mystery of creation. The meetings were held in Assisi in December 2024 and May 2025.

I published a number of opinion pieces, including one on Pope Francis and science and another on the human impacts of the loss of health research funding in the U.S. I enjoyed doing live color commentary of the papal conclave—from what makes the smoke white to who did I think was going to be elected—for the Philadelphia Inquirer. I contributed four essays to *Nature Chemistry*, including one wrapping up the work I had done as part of a grant with colleagues at Notre Dame on intellectual humility in the sciences, and one on the winding path that led to the understanding that meteorites were extraterrestrial objects (which grew out of a visit to the Specola last year and my conversations with Bob Macke, S.J.). I continue to contribute occasional reflections on the daily readings to *Give Us This Day*. And in November I completed the manuscript for a book of Lenten reflections for Liturgical Press, due to be published this coming fall.

On the personal front there are many changes. After 40 years on the faculty, I will retire in May from Bryn Mawr College. My youngest son completed his doctorate in mathematics and got married this past spring; my oldest son moved to Edinburgh, Scotland. My husband ran for and was re-elected Judge of Elections, responsible for seeing to the integrity of elections in our local area. I am looking forward to more time to write (the next book is in progress) and travel over the next year.



The year 2025 was for me largely dedicated to exploring the philosophical and theological implications of artificial intelligence, a theme that connected my research, teaching, and public engagement throughout the period.

In June, I participated as a panelist at the VIII Latin American Lonergan Workshop at Universidad Católica de Salta, which focused on “The Challenge of Posthumanism”. The workshop provided a valuable opportunity to examine questions of human cognition and artificial intelligence through Lonergan’s philosophical framework.

In September, our interdisciplinary research team celebrated the publication of *Pensar el futuro: Una visión poliédrica* (Thinking the Future: A Polyhedral Vision), a collected volume whose title reflects Pope Francis’s metaphor of the polyhedron as a model for integrating diverse perspectives. The book marked the culmination of more than three years of collaborative work among physicists, engineers, physicians, lawyers, philosophers, and theologians.

A significant occasion was the invitation to deliver the Sarmiento-Gould lecture at the 153rd anniversary celebration of the Córdoba Astronomical Observatory in October. My lecture, titled “Memories of the Universe: Reflections on Astronomy and the Human Condition”, allowed me to reflect on the intersection of astronomical research and philosophical inquiry at the institution where I began my scientific career.

In November, the Foro Ecueménico Social honored me with the Premio Calvez for Citizen Responsibility in the “Scholar” category. This recognition acknowledged the work of our interdisciplinary research project on the future of humanity.

In December, I participated in “AI Week: AI for the Common Good” at Universidad Alberto Hurtado in Santiago, Chile. My lecture, titled “How to Deal with A Non-Human Intelligence?”, addressed the ethical and anthropological challenges posed by advanced AI systems. The event, organized by this Jesuit university, attracted significant interest from students and academics alike.

Throughout the year, in my teaching of Philosophy of Nature and Theology of Creation at Universidad Católica de Córdoba, I have increasingly incorporated themes related to artificial intelligence. Looking ahead, our research team has initiated a new project titled “The Horizon of Meaning in Large Language Models: A Hermeneutical and Theological Approach”. This investigation examines whether systems such as ChatGPT, Gemini, and Claude possess a genuine hermeneutical horizon of meaning or whether their operations remain confined to probabilistic simulation of understanding.



My work this year has centered on two things, both resulting in books. One has been history of science research, resulting in the publication this year of *A Universe of Earths: Our Planet and Other Worlds, from Copernicus to NASA* by Dennis Danielson and me (discussed in a separate article within this Annual Report). The other has been faith and science work within my local archdiocese, the Archdiocese of Louisville (Kentucky, USA).

The year 2025 was special regarding faith and science in our archdiocese. One thing that made it special was the “St. Albert Initiative” (SAI) in March. The 2025 SAI on Science and the Catholic Faith was held on March 6 at Bellarmine University in Louisville. SAIs are sponsored by the Society of Catholic Scientists (SCS) and the Science and Religion Initiative of the McGrath Institute for Church Life at the University of Notre Dame (USA) and supported by grant funding from the John Templeton Foundation. Prof. Kate Bulinski of Bellarmine made the event happen locally. The March SAI was a half-day program on science and faith for Catholic high school students, teachers, and parents as well as interested members of the general public (high school age and above). There were nearly five hundred in attendance! They heard short talks by Catholic scientists and had the opportunity to meet, eat with, and ask questions of Catholic scientists in many fields and at various stages of their careers. Two of us from the Vatican Observatory were there—Fr. David Brown, S.J. and me.

The other thing that made 2025 so special was the publication of the book *Faith and Science: A Resource Book for the Archdiocese of Louisville*. The Vatican Observatory was part of this effort.

My archdiocese has been home to the “Archdiocese of Louisville Faith and Science Dialogue Group” since it was formed in 2017 by then-Archbishop Joseph Kurtz and University of Louisville astronomer Dr. Gerard Williger (prompted in part by a total solar eclipse that passed through Kentucky). The Group has done many good things, but we continue to be perplexed by the problem of misperceptions within the local community regarding the Church and science.

Resources like the *Vatican Observatory Faith & Science Resource Center*, or the *Interdisciplinary Encyclopedia of Religion and Science*, or resources from the Society of Catholic Scientists, are good, but are overwhelming for the local parishioners, students, priests or Catholic high school teachers who hold those misperceptions. Therefore, our Dialogue Group assembled a short resource book using local resources. It might not solve the misperception problem, but the Archdiocese now has a tool to address that problem. People now can encounter a published local resource to challenge their misperceptions. This is especially true for educators (priests, teachers, parents seeking a Catholic education for their children), who have a responsibility to know about what their local church is doing.

With the support of the Director of the Office of Faith Formation, Art Turner (also a member of the Dialogue Group) and Archbishop Shelton Fabre (who approved the use of his Gold Mass for science homily in the book), the book came together in a few months. Br. Guy Consolmagno, S.J., V.O. Director at the time, wrote a foreword. The book also includes prayers, local Gold Mass homilies (including from two archbishops), and more.

It is under 100 pages with large print and abundant white space. It is not encyclopedic. It is manageable. And, it has sufficient material to address the persistent misperception problem.

The Archdiocesan Office of Faith Formation is already putting *Faith and Science: A Resource Book for the Archdiocese of Louisville* to use in their programs. And its usefulness is not limited to one archdiocese; Br. Guy ordered a batch of print copies for the V.O.’s January 2026 ACME program in Tucson.



Prof. Kate Bulinski at the SAI.

Students at the SAI with the historic telescope of Msgr. Michael Bouchet, rector of the Louisville Cathedral in the late nineteenth century. The telescope was constructed in Louisville and recently restored to usability.



First, my scientific activity: In addition to the papers I list in this Annual Report, my co-authors and I have been working intensively this year on the problem of singularities in cosmology, this time in the context of supergravity theory. We have developed a method that allows us to say more about singularities (such as those in the Big Bang or a black hole) than was previously possible. The work is now completed, but the paper (“Functorial Einstein Algebras and the Malicious Singularity” by M. Heller, T. Miller, W. Sasin, L. Pysiak) will be published in the February 2026 issue of *Reports on Mathematical Physics*.

I found much joy, but also much effort, in preparing Einstein’s well-known popular book, *On the Special and General Theory of Relativity*, for publication. This is a facsimile edition of the 1921 Polish edition of this book, translated by Maksymilian Huber, a renowned Polish scholar of the time. I wrote a lengthy introduction to this book, and it was this work that gave me much pleasure: a masterful popularization by Einstein himself, and a comparison of the theory’s state at that time with its current state! The book has already appeared in 2026.

In 2025, time worked harder for me than I did. On March 12, 2026, I will turn 90. This has kept me busy (and will continue to do so). My friends and colleagues refuse to let me rest. My close friend, Wojciech Bonowicz, conducted seven longer interviews with me, which will be published as a book by Znak. The book is titled “Seven Important Words” (it will be in Polish). These words are the titles of the individual chapters: Imagination, Language, Time, Eternity, God, Human Being,

Wisdom. The interviews have a strong personal touch. This is supposed to be a birthday gift, but I had to prepare much of it myself: give interviews, authorize, proofread.... This is how my friends keep me alive.

I afraid that in the 2026 Annual Report I will have more to write on similar topics.



My first two months in 2025 were spent in Chicago as a visiting scholar at the Lumen Christi Institute (LCI) and at the Department of Astronomy & Astrophysics at the University of Chicago. The LCI, located on the campus of the University of Chicago, provides programming in the Catholic intellectual tradition to the university community and beyond, and I was grateful that they were able to fund my sojourn in Chicago (thanks to a John Templeton Foundation grant). While visiting LCI I gave a non-credit course on “The Bible and the Big Bang”, delivered a lecture on “Faith, Belief and Knowledge” at St. Ignatius College Prep, and participated in the life of the Institute. At the same time, I was able to collaborate with my colleagues in the Dept. of Astronomy & Astrophysics, particularly Prof. Jeffrey McMahon—whom I have known since our graduate school days—who generously sponsored my visitorship. In a charming coincidence, I was given an office next to the PhD supervisor of my PhD supervisor, i.e., my academic grandfather.

While in Chicago I made lots of progress on a paper, accepted later in the year, that used observations of the Atacama Cosmology Telescope (ACT) to study two active galactic nuclei (AGN)

that we believe host supermassive black hole (SMBH) binary systems. It is now well-established that most galaxies have a SMBH—which are millions to billions of times more massive than the Sun—in their centers, but it is not clear how black holes can grow to such sizes. One likely route is via mergers, so finding and characterizing SMBH pairs, that are orbiting each other and may eventually spiral in and combine to make a bigger SMBH, is hugely exciting. These binaries also make gravitational waves that might already have been detected by pulsar timing arrays. With ACT and other millimeter and radio observatories, we can literally see their orbital period manifested as a sinusoidal change in the AGN brightness over periods of a few years. So, in addition to writing up this paper, another activity for me in Chicago was finalizing a proposal to the John Templeton Foundation to keep searching for these SMBH binary candidates, and to study AGN more broadly. The application was successful, and I have recently recruited a postdoctoral fellow to help me on this project, who will start in 2026.

I had my annual visit to the Vatican Observatory in May, but before arriving I took the opportunity of being in Italy to travel the relatively short distance to Malta for my annual, eight-day retreat. During my subsequent time at the Vatican Observatory, I hosted a day visit by a class of undergraduates from the University of Toronto who were in Rome for an intensive course entitled “The Gilson Seminar in Faith and Rome”. We almost had to reschedule the visit because of the papal election, but in the end, they got to be in St. Peter’s Square when Pope Leo XIV first appeared, and then, the next day and a bit bleary eyed, they were able to come see the new pope’s observatory! Although I did not remain for the Vatican Observatory Summer School that took place the following month, my PhD student Rebecca Dudley was fortunate to be accepted into the program and had a wonderful and enriching time at the school.

In the fall of 2025, I taught my undergraduate course entitled “The Bible and the Big Bang” and once again had a very fine group of intelligent, curious and engaged students. Additionally, I led a small seminar for astronomy graduate students in which we read selections from the works of

Galileo Galilei with some accompanying secondary sources. In the middle of the term, I traveled down south to give talks and visit with collaborators at the University of Pennsylvania and Princeton University. One of the highlights of my visit to the latter was spending some time with my former PhD supervisor, Lyman Page, and other long-standing colleagues at Princeton.



In retrospect, it is amazing how many chores astronomers have to do: teaching courses and supervising graduate and undergraduate students, giving talks, doing research and writing scientific papers and proposals, writing letters of recommendation, attending and organizing international conferences, refereeing papers and proposals, giving interviews and writing for the media. No wonder I was very busy, but I do not complain because I like my job and this was a productive year for me.

Among the highlights, my wife Joyce Pullen and I were very happy this year to be able to visit the Specola and interact with the staff during October. In March I also visited the Department of Physics of the Universidade Federal de Santa Catarina, to collaborate with Prof. Roberto Saito. This year I was recognized with the Physics of the Year 2025 Award in Chile from research.com, and also by the Top 2% Scientists Ranking released by Stanford University and Elsevier. We also submitted the report of the Galactic Plane Survey Definition Committee for the Nancy Grace Roman Space Telescope, which was finally approved. This NASA mission is expected to be launched in late 2026. Among other milestones, we published the second version of the astrometric catalog called

VIRAC2 for our ESO public survey program VISTA Variables in the Via Lactea Survey (see Smith et al. 2025 in my publications listing). I also continued as member for the steering committee of the Division H “Interstellar Matter and Local Universe” of the International Astronomical Union, and as member of the PhD Board Committee in Astronomy, Astrophysics and Space Science, in Rome, Italy.





The search for Dark Matter via the LUX-ZEPLIN experiment continues. Most of our work in 2025 was devoted to a new exploration in the lowest energy range accessible to the experiment, where the information from the detector becomes increasingly sparse and systematic effects tend to dominate our understanding of the data.

Once again, we found no evidence of Dark Matter interactions, but we did see for the first time a signal of interest: fittingly, it is an observation of solar neutrinos, which happened in the same experimental hall where Ray Davis first detected these elusive particles from our sun, more than half a century ago. Readers of the Annual Report may remember that last year I wrote about the first “hint” of coherent scattering from solar neutrinos in the experiment led by my postdoctoral advisor.

In 2024, the XENONnT and PandaX-4T collaborations reported an “indication” of solar neutrinos at the 2.64 and 2.73 sigma level (respectively). This is considered below the threshold for “evidence” or “detection” in experimental particle physics. Our new result, announced in December, improved the detection significance to 4.5 sigma, passing the “3-sigma” threshold that is considered “evidence”.

This result was especially exciting for me and my group, as it allowed us to validate several Machine Learning techniques developed by members of the “Probabilistic Detection in Cosmic Frontier” project that I lead (under the wider umbrella of the “Artificial Intelligence for High-Energy Physics” initiative of the Department of Energy). Our methods were not ultimately deployed in the new

analysis, but were leveraged for the validation of the final background model, and led to three published papers and two additional publications under review. Encouraged by these early results, we are looking forward to new opportunities to refine our methods and apply them to the ever-growing LZ dataset.



The year 2025 was significant for me in my roles as Adjunct Scholar at the Vatican Observatory and Professor of Theology at the Pontifical University of the Holy Cross in Rome. Emotionally, the most important moment was my first meeting with Pope Leo XIV on 16 June, during the audience he granted to participants of the Vatican Observatory’s “Exploring the Universe with the James Webb Space Telescope” summer school. During this meeting, I had the opportunity to present the Pope with a copy of my book, *Scientific Perspectives in Fundamental Theology: Understanding Christian Faith in the Age of Scientific Reason*, which was published by Claremont Press in California two years earlier. As a scholar who studies the relationship between scientific thought and theology, I would like to recall some words addressed by Leo XIV to the participants: “Do not hesitate to share the joy and the amazement born of your contemplation of the “seeds” that, in the words of Saint Augustine, God has sown in the harmony of the universe.”

There is also another date very important to me. In October of this year, I finished working as a full professor at the Pontifical University of the Holy Cross. I retired and

was nominated emeritus professor. To honor me, my colleagues dedicated a special issue of the journal *Annales Theologici* to me, entitled “Theology, the Sciences, and the Human Quest for Interdisciplinarity. Essays in Honour of Giuseppe Tanzella-Nitti.” Several scholars from around the world contributed to this special issue, including Paul Allen (Corpus Christi College, Vancouver); Christopher Baglow (University of Notre Dame, Indiana); Lucio Florio (Pontifical Catholic University of Argentina, Buenos Aires); and last but not least, Guy Consolmagno, the outgoing Director of the Vatican Observatory, who wrote the article “Science and Faith from the Viewpoint of the Scientist”. An event held on 9 December at my university to celebrate my transition to emeritus status was attended by Gabriele Gionti, Vice-Director of the Vatican Observatory, and Angelo Antonelli, former Director of the Astronomical Observatory of Rome. Marco Castellani, an astronomer at the Astronomical Observatory of Rome, gave a wonderful lecture entitled “The Colors of the Universe”, showing the audience some of the most beautiful photographs taken so far by the James Webb Space Telescope. It was a resounding success! Many of those present had never seen images of celestial objects of such high resolution as those that we have been

receiving for two years from the largest space telescope in operation.

Upon becoming emeritus, I stepped down as Director of the Interdisciplinary Research Center of Science and Faith and the Advanced School for Interdisciplinary Research, but continue to support their work as President of the Scientific Council. Thanks to my retirement, I now have more time available. I intend to dedicate more time to astronomy, a field in which I worked professionally for the first twelve years of my career, before moving on to theology. Alongside my role as Adjunct Scholar at the Vatican Observatory, I have started collaborating with INAF (Italian National Institute of Astrophysics), where I was appointed Associate Scholar on 18 December.

Finally, I would like to mention one particularly important and evocative event for me. On the evening of 25 February, I was invited to give a lecture inside St. Mark’s Basilica in Venice to speak about faith in God the Creator on the 1700th anniversary of the Council of Nicaea. St. Mark’s houses beautiful Byzantine mosaics depicting the six-day Genesis story. Speaking about creation beneath the golden mosaics depicting the Creator Logos at work was an unforgettable experience!



G. Tanzella-Nitti and a fellow of SISRI School, Giovanni Garofalo, during a visit to the Labs of Thales Alenia Space, in Turin, guided by Maria Antonietta Perino, program manager of Mars exploration projects.

G. Tanzella-Nitti gives to pope Leo XIV a copy of his book "Scientific Perspectives in Fundamental Theology": *Understanding Christian Faith in the Age of Scientific Reason*, during the Papal audience held on last June 16th, 2025, on occasion of the Vatican Observatory 2025 Summer School.



On January 2026, in Rio de Janeiro, G. Tanzella-Nitti gave some Lectures on Scientific Culture to a group of Brazilian Bishops.





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Chapter FIVE

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RISANTO, B.

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Technical News

Chapter SIX

NEWS OF A TECHNICAL NATURE

BROWN, D.

We have a ZWO ASI 117MM camera on loan from Rick Hill in order to produce astrophotographic images.

GABOR, P.

In the 2024 Annual Report I discussed how the VATT field derotator (some prefer “field rotator”) failed on November 18 of that year; it was a bearing failure. This year that was successfully repaired. The two Kaydon bearings were cleaned and reinstalled by Michael Franz with help from Gary Gray and others.

That was not the end of the story, however. The encoders on the two motors (in mutual tension to minimize backlash) had to be replaced. It took several engineers several trips to diagnose and resolve the matter because there was a problem with wires and connectors, but also with one of the encoders. We replaced both encoders. As a temporary solution we used Same Sky encoders with no protective housing (recommended by David Forbes who uses them at the 12-meter radio telescope on Kitt Peak). The final solution were Kuebler encoders installed by ProjectSoft during their planned service visit (below). Here is a list of those who contributed: Alyson Ford, John Ford, David Forbes, Michael Franz, Gary Gray, Khristian Jones, John Morris, George Reiland (all at Steward), and Tomas Turek (at ProjectSoft).

Finally, after the mechanical reassembly of the derotator, a new pointing model was called for. Richard D’Souza and I conducted a pointing run on March 11. Later in the year, we started pursuing a new pointing model, consulting Patrick Wallace, an authority on pointing models and author of the T-Point software, and MMT’s Tim Pickering. The MMT is famous for its excellent pointing, which is the fruit of many iterations.

Franz installed new dome bogies, six of which are of fixed height (defining the dome’s geometry) and eleven are “*sprung*” (i.e., they help support the weight of the dome evenly using springs).

Vit Talacko and Petr Langer from ProjectSoft conducted their service visit at the end of the first year after the installation of “*Don*”, the new control system

(a part of our contract) on May 13-18. A sky quality meter, a part of DarkSky’s new Southern Arizona Chapter Dark Sky Network, was installed by Emilio Falco and Al Grauer, with support from Gray and Christopher Johnson on June 18.

“*Cyclope*” by Alcor, a new seeing monitor (a small telescope pointed at Polaris) was installed on VATT’s eastern balcony by Christian Veillet (support from Gray and Johnson) in June.

MACKE, R.

The meteorite lab acquired a new instrument this year: a structured light scanner (SLS). This instrument (Einscan Scanner 3D SP V2) succeeds but does not replace the existing laser scanner. It projects a pattern of light on the meteorite, which a camera records and through triangulation creates in the computer a point cloud for reconstructing a three-dimensional model of the specimen.

The lab also acquired a new portable computer with a strong GPU processor to operate the new system and process the scans into shape models.

This new scanner, which recreates models in full color, will be used to develop a 3D catalog of the meteorite collection. This has many potential benefits for the curation of the collection, including digital exhibits, demonstrations, assisting potential borrowers in selecting samples, and documenting loaned specimens against loss or damage.

The meteorite collection itself grew by one donation this year: a 2.8-gram piece of Serra Pelada, a Eucrite (spectroscopically linked with the asteroid Vesta) that fell in Brazil in 2017. The meteorite was donated by Dr. Maria Elizabeth Zucolotto (the owner) on behalf of her research team at the Federal University of Rio de Janeiro.

In addition, we procured four other meteorites that will eventually be used in an exhibit where visitors are allowed to touch them. We obtained two specimens of the iron meteorite Gebel Kamil and two ordinary chondrites from Northwest Africa. One of each will eventually be mounted to a fixed display, and the other will be used as a pass-around specimen.

Various Topics

Chapter SEVEN

SCIENTIFIC CONGRESSES ATTENDED, INCLUDING EVENTS ATTENDED ON-LINE

BROWN, D.

Presented a poster at the Arizona Astrobiology Symposium Arizona State University in Tempe, Arizona, 21-22 March.

Presented a paper at the XII CoLaCyR (Congesos Latinoamericanos de Ciencia y Religión) conference held at the Pontifical University of Regina Apostolorum, 10-12 September.

Presentation at the Spectroscopy conference at the Specola Vaticana, “*Leggere i segreti dell’universo: dalla nascita dell’Astrofisica Spettroscopia di Padre Secchi ad oggi*”, 27 September.

CHINNICI, I.

ICHST—International Congress of History of Science and Technology—Dunedin, 29 June-5 July.

“*Giovanni Domenico Cassini, 17th-Century European Astronomer on the Fourth Centenary of His Birth*”, Bologna, 18-20 June.

LXVI Annual Conference of the Italian Astronomical Society, Florence, 3-6 June.

CONSOLMAGNO, G.

Annual Meeting, Meteoritical Society, July 13-18, Perth, Australia.

CORBALLY, C.

Arizona Space Institute Conference, April 11—oral presentation with Margaret Boone Rappaport on “*Options for Governance and Regulation of Satellite and Other Space Debris*”, followed by a poster presentation and discussion of the same topic.

Conference on Binary Stars in the Space Era, Keele University, UK, June 30-July 4—presented a poster paper on HD5501.

Attended the ADASSx Monsoon Workshop 2025, in Tucson from August 1-5.

D’SOUZA, R.

Attended the International Astronomical Union Symposium 403: “*The hidden beauty of Galactic Outskirts*”, October 6-10.

FUNES, J.

VIII Taller Latinoamericano Lonergan: El reto del posthumanismo (VIII Latin American Lonergan Workshop: The Challenge of Posthumanism), Universidad Católica de Salta, Argentina, June 5-6. Panelist on “*AI and the Future of Humanity: Anthropological, Technical, and Cognitive Considerations*.”

XXII Jornada de Investigación (XXII Research Conference), Clínica Universitaria Reina Fabiola, Córdoba, October 30. Panelist at the Central Conference: “*The AI Revolution: Opportunities and Challenges in Medicine*.”

Semana de la Inteligencia Artificial: IA para el bien común (AI Week: AI for the Common Good), Universidad Alberto Hurtado, Santiago, Chile, December 1-5. Invited lecturer and panelist. Lecture title: “*How Should We Treat a Non-Human Intelligence?*”.

GABOR, P.

Biennial History of Astronomy Workshops at the University of Notre Dame (June 11-14): took part in a panel.

Two back-to-back events in Hamburg, Germany: 1. “*Timekeeping, Navigation, Surveying - Cultural Astronomy and Instruments*”, 32nd European Society for Astronomy in Culture (SEAC) & Gesellschaft für Archäoastronomie (GfA);

2. Classical Observatories and UNESCO World Heritage Workshop of IAU C.C4 and WG, “*Windows to the Universe - Classical and Modern Observatories*”, August 25-31. Presented two papers.

Attended the 8th Workshop on Robotic Autonomous Observatories (AstroRob) in Almería, Spain, on October 6-10.

GALAUVERNI, M.

Cosmology on the Steep Rise, Haus Sexten, Sesto Pusteria, Bolzano, Italy, February 3-7. Presented seminar “*Redshift dependent cosmic birefringence*”, February 3.

VOSS 2025, Expoloring the Universe with JWST, Castel Gandolfo, June 1-27.

Domoschool 2025, Aplitools: mathematical methods for particle physics, gravitation and cosmology, Domodossola, July 14-18.

3rd General Meeting of the COST Action COSMIC WISPers (CA21106) (COSMICWISPers2025), Sofia (Bulgaria), September 9–12. Presented seminar “*Constraining ALPs with Cosmic Microwave Background Polarization Birefringence*”, September 10.

GIONTI, G.

FLAG (Field, Lagrangian and Gravity) of the INFN (Italian National Institute for Nuclear Physics) meeting, Department of Physics University of Trento, December 18-19, 2024.

International Masterclass of EMUNA Italia, Seminar VII “*Science e Religions*”, Rome (Italy), University Luiss-Viale Romania 32, Rome, January 27. Gave seminar on “*Models of Creationism and Design in Catholic Teology*”.

III International meeting “*Science for Peace*” organized by the Dioceses of Teramo, INAF-Observatory of Teramo and University of Teramo, Teramo, July 4.

“*Domoschool2025*”, Alpine International School in Physics and Mathematics, “*Amplitools: Mathematical Methods for Particle Physics, Gravitation and Cosmology*”, Domodossola (Italy), July 14-18.

26th SIGRAV Conference on General Relativity and Gravitation at the University of Milan “*Bicocca*”, September 8-12. Presented paper, “*The Quantum Measure in Regge Calculus*”, September 10.

Conference “*Under the Skies of the Vatican Observatory*”, Vatican Observatory at Castel Gandolfo, September 22. Spoke on “*The Big Bang and its Consequences for the Science and Theology Debate*”.

FLAG (INFN) meeting, Department of Physics University of Pisa, December 22-23.

GRANEY, C.

“*Deepening Communion in a Polarized World*,” St. Meinrad Archabbey, Indiana (USA) on November 4-6, 2025.

HINCKS, A.

Workshop on Cosmic Gas in the Universe’s Largest Structures, Manchester, 21–23 May.

The mm Universe 2025 Conference, Chicago, 23–27 June. Presented on “*Probing Supermassive Black Holes with Millimetre Light Curves from the Atacama Cosmology Telescope and the Simons Observatory*”, 26 June.

Simons Observatory Collaboration Face-to-Face Meeting, Manchester, 21–25 July.

KIKWAYA ELUO, J-B.

2nd symposium, African Jesuits in Science, August 3-8, Nairobi, Kenya.

MACKE, R.

Lucy Science Team Meeting, November 17-20.

MINNITI, D.

Sexten Center of Astrophysics Workshop on “*The Milky Way and Andromeda: The Odd Couple*”, in Sesto, Italy, January. Gave invited talk, “*Future Surveys of the Milky Way: Dreaming about the next generation Galactic plane survey with the Roman Space Telescope*”.

XI Encontro de Física e Astronomia da UFSC, at the Universidade Federal de Santa Catarina, Florianopolis, Brasil, April. Gave invited talk, “*Mapping the Milky Way from Earth and from Space*”.

XII Workshop of the VVV Survey on the VVVX Synergy with Next-Generation Milky Way Studies, in Florianopolis, Brasil, April. Gave invited talk, “*The Future Galactic Plane Survey with the Roman Space Telescope*”.

Wide-Field Spectroscopic Telescope Workshop, at UNAB in Santiago, Chile, December. Gave invited talk, “*Binary Free-Floating Planets with the WST*”.

Workshop of the KMOS VVVX-Gal Cen ESO Public Spectroscopic Survey, at UNAB in Santiago, Chile, December. Gave invited talk, “*Synergy with the Roman Space Telescope*”.

MONZANI, M-E.

The LUX-ZEPLIN Collaboration Meeting, hosted by the University of California Los Angeles (UCLA), California, USA 20-23 March.

15th UCLA Dark Matter Symposium, Los Angeles, California, USA. 24-27 March.

La Settimana dei Ricercatori, Liceo Scientifico Amaldi, Alzano Lombardo (BG, Italy), attended virtually, 10-15 March.

Center for Decoding the Universe Annual

Conference: Data-Driven Discovery in the Rubin Era, Stanford, California, 5-6 June. Presented “*Anomaly Detection for Ultra-Rare Event Searches*”, 5 June.

The LUX-ZEPLIN Collaboration Meeting, held virtually, 14-19 July.

RISANTO, B.

The European Geoscience Union annual assembly in Vienna, Austria, 27 April - 2 May 2025. Presented: “*Impacts of Assimilating GPS-PWV in Convective-permitting Model on Forecasting Monsoon Precipitation over Arizona Complex Terrain*”, <https://doi.org/10.5194/egusphere-egu25-100>, 2025.

TANZELLA-NITTI, G.

International Conference “*Communication and Evangelization, Contexts, Attitudes, Experiences*”, organized by the School of Social Communication of the Pontifical University of the Holy Cross, in Rome. Gave invited key-note lecture: “*The Path of Reason: Communicating the Gospel in a Scientific and Technological Culture*”, January 23.

Advanced Training School in Sociology of Religion, Luigi Sturzo Institute, Rome, May 12-16. Presented on “*The dialogue between fundamental theology and sociology of religion: reasons for interest*”, May 15.

IX° Festival dello Spazio (IX° Space Festival), Busalla-Genova. Invited Lectio Magistralis, “*Artificial Intelligence, Common Good and Human Progress. A Theological Perpsective*” July 5.

VISITS TO OTHER INSTITUTIONS FOR SCIENTIFIC PURPOSES

FUNES, J.

Universidad Alberto Hurtado, Santiago, Chile (December).

Universidad Católica de Santa Fe, Argentina (September)—Book presentations.

Universidad Católica de Salta, Argentina (June).

HINCKS, A.

Department of Astronomy & Astrophysics, University of Chicago, 8 January – 6 March.

Specola Vaticana, 3-18 May.

Department of Physics & Astronomy, University of Pennsylvania, 27-29 October.

Department of Physics, Princeton University, 30-31 October.

MACKE, R.

University of Central Florida, November 16-21.

AWARDS RECEIVED

CONSOLMAGNO, G.

Elected to an honorary fellowship at St. Edmund’s College, Cambridge, effective October 1.

FUNES, J.

Premio Calvez a la Responsabilidad Ciudadana (Calvez Prize for Citizen Responsibility), category “*Estudioso*” (Scholar), awarded by the Foro Ecuménico Social. Ceremony held at Amigos del Bellas Artes, Buenos Aires, November 5.

GABOR, P.

Asteroid (669448) Pavelgabor named.

MONZANI, M-E.

Reaching a New Energy Sciences Workforce, DOE Office of Science, High Energy Physics (HEP).

Artificial Intelligence Research in High Energy Physics, DOE Office of Science, HEP Computing Facility Operations Support to LUX-ZEPLIN, DOE Office of Science, HEP Cosmic Frontier Laboratory Directed Research and Development, SLAC National Accelerator Laboratory.

Mission Science allocation to LZ, National Energy.

Research Scientific Computing Center.

COMMITTEES OR BOARDS SERVED ON

CHINNICI, I.

Scientific Instrument Commission (SIC), President.

Società Astronomica Italiana (SAIt), Council member.

CONSOLMAGNO, G.

Science Advisory Board, SETI Institute.

Member, IAU Working Group on Planetary System nomenclature; Chair, Mars Task Group.

President, Meteoritical Society.

CORBALLY, C.

External panel member for the Hubble Cycle 33 Telescope Allocation Committee.

FRANCL-DONNAY, M.

Board, Institute for Religion and Science.

ACS, Chair of Award Committee.

FUNES, J.

Director, Cátedra Libre sobre Ciencia, Religión y Educación (Free Chair on Science, Religion, and Education), Universidad Católica de Córdoba.

Director, Research Project “*El futuro de la humanidad: implicaciones científicas, filosóficas y teológicas*”, Universidad Católica de Córdoba.

GABOR, P.

IAU WG 1 Light Pollution Standards.

SOC for IAU GA FM on the Carte-du-Ciel anniversary.

SOC for IAU GA FM on Astronomy in the Church.

AHO Board member, Chair of the membership committee.

DarkSky International, Southern Arizona Chapter Board.

GALAVERNI, M.

Member, Italian Astronomy Championship committee.

GRANEY, C.

Archdiocese of Louisville (Kentucky, USA) Faith and Science Dialogue Group (Chair).

HINCKS, A.

Governing Council, Regis College, Toronto.

Literary Trustee, Estate of Bernard Lonergan.

Membership Committee (Chair), Simons Observatory Collaboration.

Board Member, Toronto Chapter of the Society of Catholic Scientists.

Committees in the Dept. of Astronomy & Astrophysics, University of Toronto: Community Climate Committee (Chair); Graduate Programme Committee; Academic Appeals Committee.

MACKE, R.

OSIRIS-REx Sample Physical and Thermal Properties Working Group (SPTAWG) Deputy Working Group Lead.

PUBLIC PRESENTATIONS, INCLUDING ON-LINE PRESENTATIONS

BROWN, D.

Talk at the Catholic Midshipmen Club at the US Naval Academy in Annapolis, MD, 04 February.

Three presentations at the St. Albert Initiative event in Louisville, KY as part of the Faith/Science Initiative of the McGrath Institute for the University of Notre Dame. The event was held at Bellarmine University, 06 March.

Organized Star Party for young adults of the Diocese of Tucson through the parish of St. Thomas the Apostle, 07 March.

Talk at the Fidèles Amici gathering in Tucson, AZ, 08 April.

Talk at St. Joseph Parish School in Waxahachie, TX, 16 March.

Talk at VOSS2025 on PEPSI, 04 June 2025.

Talk for Benedictine monks at Fontgombault Abbey, 12 August.

Talk at Lourdes, 14 August.

Talk at the US Naval Academy in Annapolis, 07 October.

Five talks at Jesuit High in New Orleans to Environmental Sciences classes, 22 October.

Talk at the Newman Center of the University of Arizona, 24 October.

Talk at the Kiewit Luminarium in Omaha, Nebraska for Jesuit Friends and Alumni Network (JFAN) event, 17 November.

CONSOLMAGNO, G.

January 31: “*How Faith and Science Complement Each Other*”, Virginia Military Institute.

February 14-16: “*The Year in Physics*” and several other program events, Boskone Science Fiction Convention, Boston.

February 21-23: “*When Science Goes Wrong*”, invited presentation at the Los Angeles Religious Education Congress.

March 8: “*A Jesuit Guide to the Stars*”, Porticus Foundation Conference on the Catholic Intellectual Tradition, Zeist, Netherlands.

March 13: “*A Jesuit Guide to the Stars*”, Weber

Retreat & Conference Center, Adrian, Michigan.

March 24: “*Why do We Look Up*”, King University, Bristol, Virginia.

March 27-30: Retreat, Heritage Retreat Center, Crawfordville, Georgia.

April 3 - 5: Retreat, Bellarmine Jesuit Retreat House, Barrington, Illinois.

April 21: “*Genesis, Creation, and the Vatican Observatory*”, Central Methodist University, Fayette, Missouri.

April 24: “*A Jesuit Guide to the Stars*”, St. Thomas More College, St. Paul, Minnesota.

April 30: “*A Jesuit Guide to the Stars*”, University of Glasgow, Scotland.

May 3: “*A Jesuit Guide to the Stars*”. The Lauriston Jesuit Centre, Edinburgh, Scotland.

May 6: “*Discarded Images*”, Jodrell Bank Discovery Centre, Macclesfield, England and “*When Science Goes Wrong*”, University of Manchester, England.

May 9: Prince Philip Memorial Lecture, Gordonstoun College, Scotland.

June 25: (via Zoom) “*Jesuit Brothers: Sent to Collaborate in the Mission of Christ (Do and Don’t on Brother Formation)*”, Jesuit Conference of Africa and Madagascar Brother’s Gathering.

July 29: “*A Jesuit Guide to the Stars*”, Australia Catholic University, Melbourne, Australia.

July 30, “*The Pope’s Astronomer*”, Melbourne Archdiocese Catholic Schools Conference, Australia.

August 1, “*A Jesuit Guide to the Stars*”, St. Ignatius College; “*The Cult of Intelligence*”, Te Kupenga National Seminary, Auckland, New Zealand.

August 2: World Youth Day Satellite, Auckland, New Zealand.

August 3: “*From Galileo to Laudato Si*”, Auckland University/NZ Christians in Science, New Zealand.

August 5: “*The Cult of Intelligence*”, Wellington Club, and “*Catholic Cosmologies*”, St. Mary’s College, Wellington, New Zealand.

August 6: “*From Galileo to Laudato Si*”, University of Wellington / Wellington Astronomical Society, New Zealand.

August 7: “*The Cult of Intelligence*”, Kaikōura Dark Sky Initiative, Kaikōura, New Zealand.

August 8: “*What’s Surfacing About Bennu*”, University of Canterbury, Christchurch, New Zealand.

August 10: “*The Cult of Intelligence*”, Our Lady of Victories, Christchurch, New Zealand.

August 11: “*From Galileo to Laudato Si*”, Roncalli College, Timaru, New Zealand.

August 13: “*Catholic Cosmologies*”, University of Canterbury, Christchurch, New Zealand.

September 4 - 7, Retreat, Demontreville Retreat House, Lake Elmo, Minnesota.

September 9: “*The Things They Ask the Pope’s Astronomer*”, St. Ignatius Parish, New York City.

September 21: “*Jesuit Guide to the Stars*”, Fort Story Catholic Community, Virginia Beach, Virginia.

September 23: “*Jesuit Guide to the Stars*”, Vocations Canada Annual Meeting Keynote, St. John’s, Newfoundland.

September 26-27: “*Saturn*”, Astronomy at the Beach, Brighton, Michigan.

October 28: “*Why Do We Look Up?*”, Spanish Embassy Holy See, Rome.

October 30, “*And we go out to look at the stars*”, Education Jubilee 25, Constellations of Hope, Rome.

October 31: Wonder in the Heavens Panel

Discussion, St. Ignatius Church, Rome.

November 15: “*Why do We Look Up?*”, St. Albertus Magnus Conference, Angelicum, Rome.

November 20: “*A Jesuit Guide to the Stars*”, Rotary Club, Oakland, California.

CORBALLY, C.

“*The Vatican Observatory in Arizona*”, General Meeting of the Tucson Amateur Astronomy Association, January 3.

“*Weird Binary Stars Under Close Surveillance: TU Tau and HD 5501*”, Southern Arizona Society on January 4; Saddlebrooke Skygazers on December 7.

Online interview for Aarna Mistry, Reservoir High School, Fulton MD, on “*How Artificial Intelligence (AI) could benefit NASA engineers working to land humans on Mars*” for her in-depth, college-level, research project.

Seminar on “*Cosmic Expansion*” to Sabbatical Groups at the Redemptorist Renewal Center, Tucson, in April and November.

D’SOUZA, R.

MPA cosmology seminar, Garching, Munich, 25 February.

Stellar Halo Group meeting, University of Michigan, Ann Arbor, 3 March.

Flash talk, NOIRLAB, Tucson, Arizona, 21 March.

History Hour talk, Xavier Center for Historical Research, Goa, India, 21 November.

FRANCL-DONNAY, M.

“*Light from Light*”, IHM Conference Center, December.

“*Contemplative approaches to the research lab*”,

University of Pennsylvania Faculty Seminar, November.

“*Failure Monologues*”, Bryn Mawr College, November.

“*Steeped*”, Royal Society of Chemistry-US, October.

“*Topological Measures of Tightness*”, St. Joseph’s University, September.

“*Scientific poets*”, Convocation address, Bryn Mawr College September.

“*Writing with persistent poise*”, American Chemical Society National Meeting, August.

“*Steeped*”, Springfield Library, July.

“*Chemistry of Tea*”, Rotary Club of Ardmore, June.

“*Pilgrims of Hope*”, Catholic Social Services, April.

“*Chemistry of Tea*”, University of Pennsylvania Library, April.

“*Chemistry of Tea*”, New Haven Section ACS, March.

“*Chemistry of Tea*”, Swarthmore, March.

“*Chemistry of Tea*”, Quadrangle, February.

“*Chemistry of Tea*”, Hamilton College, February.

Remarks, 2025 IUPAC Global Women Breakfast (GWB) Universidad Nacional de Colombia, February.

“*Steeped: The Chemistry of Tea*”, Joseph Priestly Society, Science History Institute, December 2024.

“*Chemistry of Tea*”, Temple University, School of Pharmacy, December 2024.

“*Chemistry of Tea*”, Sciencepalooza November 2024.

FUNES, J.

Sarmiento-Gould Lecture: “*Recuerdos del Universo: reflexiones sobre la Astronomía y la condición humana*” (Memories of the Universe: Reflections

on Astronomy and the Human Condition), 153rd Anniversary of the Córdoba Astronomical Observatory, October 24.

Book launch: Pensar el futuro: Una visión poliédrica, September 11.

Book presentations at Universidad Católica de Santa Fe: El final del universo y la hermana muerte and Pensar el futuro, September 18.

Public lecture at Círculo Médico de Córdoba on artificial intelligence (with Francisco Tamarit).

Open conversation on the challenges of AI with Dr. Francisco Tamarit, within the Philosophy, Science, and Technology Seminar, Universidad Católica de Córdoba.

GABOR, P.

Keynote at the Catholic Media Conference, Phoenix, June 25.

“*Conferencia magistral*” at the 12th International Colloquium on Astronomy, Space and Society at the Guadalajara Book Fair, December 6.

Taught a tier II general education course on the history and philosophy of astronomy, ASTR 320, in the Fall 2025 semester at the University of Arizona.

GALAVERNI, M.

“*Le origini e il destino dell’universo*”, Movimento Ecclesiale impegno culturale (MEIC) Lucca, January 31.

“*La Specola Vaticana e le lune ghiacciate. Tradizione scientifica e nuove frontiere dell’esplorazione planetaria*”, (with Federico Tosi) Guastalla, March 20.

“*Alzare lo sguardo*”, Pozzo di Giacobbe, Felina, May 15.

“*Astronomia e Fede*”, Reggio Emilia Astronomia, October 6.

“*Di Dio e della Terra: Sguardi Interdisciplinari sul Cantico delle creature 800 anni dopo*”, Dipartimento di Educazione e Scienze Umane, Università di Modena e Reggio Emilia, October 17.

“*Un ponte fra Scienza e Fede: l’attività della Specola Vaticana*”, Jubilee of the World of Education - Constellations of Educational Networks”, Rome, October 31.

“*Scienza e Fede*”, Università Cattolica, Piacenza, November 12.

“*Pianeti, stelle, galassie...un viaggio nell’universo*”, Villa Minozzo, November 15.

“*Al vedere la stella provarono una gioia grandissima*”, meetings for catechists Diocese of Reggio Emilia-Guastalla, December 22.

GIONTI, G.

“*On the Jordan and Einstein Frames in the Hamiltonian Formalism*” University of Namur, Physics and Mathematics Department, April 1, Namur, Belgium.

“*A short introduction to Quantum Gravity*”, VOSS 2025 at the Vatican Observatory (Specola Vaticana), Castel Gandolfo, June 9.

“*My academic research work at the Vatican Observatory*”, School of Aerospace Engineering of the University of Rome “La Sapienza”, July 29.

“*The Quantum Measure in Regge Calculus*”, 26th SIGRAV Conference on General Relativity and Gravitation at the University of Milan “*Bicocca*”, September 10.

Seminar “*The Spiritual and Scientific Journey of Fr. George Lemaitre*”, S. Ippolito Church, January 14.

“*The Beginning of the Universe and the Question of God*”, online seminar, Master in Science and Faith, University Regina Apostolorum, Rome (Italy), April 1.

“*The Beginning of the Universe and the Question of God*”,

Casa della Cultura, X Annual meeting of CNAI, Villa De Sanctis, Rome, October 11.

“*The Beginning of the Universe between Science and Theology*” for University Students of “Colegio Jesuita de S. Augustin” in Santiago de Compostela, Spain, October 20.

“*The Research in Quantum Gravity*” at the conference “*Why do you look up the Sky*” organized by the Spanish embassy to the Holy See on October 28. At this conference Sr. Raffaella Petrini, FSE, and Br. Guy Consolmagno, S.J. were also speakers.

“*The History of the Vatican Observatory (Specola Vaticana)*”, E.U.M Jesuit Novitiate of Genoa, November 13.

“*The beginning of the Universe between Science and Theology*”, meeting on Ecology at the University “Auxilium” of the Salesian Sisters, Rome, December 10.

GRANEY, C.

“*Sun, Moon, and Ascending: Astrology from the Perspective of an Astronomer*”, University of Louisville (USA) Public Astronomy Lecture Series, December 4, 2024.

“*Sun, Moon, and Ascending: Astrology from the Perspective of an Astronomer*”, Mt. St. Francis (Franciscan Friary and Center for Spirituality), Indiana, April 4.

“*The Archdiocese of Louisville Faith and Science Dialogue Group*”, St. Stephen Baptist Church/ University of Louisville (Christina Lee Brown Envirome Institute) Faith & Science Forum, December 11, Louisville Kentucky USA.

“*On Astronomy*”, St. Rita Catholic School, Louisville, September 9.

Three presentations on the Vatican Observatory and one on the Bouchet Telescope at the St. Albert Initiative of the Faith/Science Initiative of the McGrath Institute for the University of Notre Dame, at Bellarmine University, Louisville, Kentucky, March 6.

“*A Banner Year for Faith & Science in the Archdiocese of Louisville*”, Archdiocese of Louisville Gold Mass presentation, November 15.

Various presentations as part of my science consultant work for Immaculata Classical Academy, Louisville, August-December.

HELLER, M.

29 September – 1 October: Mathematical Workshop in Kielnarowa.

HINCKS, A.

“*Knowledge, Belief and Faith*” (invited lecture), Magis Lecture, St. Ignatius College Prep, Chicago, 11 February.

“*Discovering Transients and Studying Supermassive Black Holes with Cosmology Telescopes*” (invited seminar), Jodrell Bank Centre for Astrophysics, University of Manchester, 19 May.

“*Why Does the Vatican Have an Astronomical Observatory?*” (invited lecture), Our Lady of Sorrows Parish, Toronto, 28 May.

“*Discovering Transients and Studying Supermassive Black Holes with Cosmology Telescopes*” (invited seminar), Department of Physics & Astronomy, University of Pennsylvania, 29 October.

“*Discovering Transients and Studying Supermassive Black Holes with Cosmology Telescopes*” (invited seminar), Department of Physics, Princeton University, 31 October.

“*How to Measure the Universe’s Oldest Light and What it Tells Us*” (invited lecture), Star Talk, Astronomy & Space Exploration Society, Toronto, 14 November.

JANUSZ, R.

Kontekst odkrycia w fizyce a doświadczenie religijne w ujęciu T.E. Toohig’a [Stowarzyszenie Naukowców Katolickich], April 14, <https://www.youtube.com/watch?v=ZYoqpgAxIQs>.

KIKWAYA ELUO, J-B.

Privilégier une approche scientifique dans l’analyse et la lecture des fléaux en RDC (cas de mbasu), Washington DC, June.

“*The Vatican Observatory through three significant papacies: Gregory XIII, Leo XIII, Pius XI*”, Raleigh, June.

MINNITI, D.

“*A New Galactic Plane Survey with the Roman Space Telescope*”, Center for Astrophysics and Associated Technologies CATA Area 6 Eazy Talks, Santiago, Chile, May.

Invited talk, “*The Galactic Plane Survey with the Roman Space Telescope*”, Specola Vaticana, October.

MONZANI, M-E.

“*Shining Light on Dark Matter with LUX-ZEPLIN*”, GROWTH-MSI Seminar, Cal State Stanislaus, virtual presentation, 11 February.

“*Data intensive searches for Dark Matter with LUX-ZEPLIN*”, HEPCAT Consortium, virtual presentation, 12 March.

“*A sparkle in the dark: Data intensive searches for Dark Matter with LUX-ZEPLIN*”, Visiting Scientist Talk, SETI Institute (Mountain View, CA), 24 September.

“*A sparkle in the dark: Data intensive searches for Dark Matter with LUX-ZEPLIN*”, Computational and Mathematical Engineering 300 Seminar,

Stanford University (CA, USA), 7 October.

“*La Materia Oscura Illuminata*”, La Settimana dei Ricercatori, Liceo Scientifico Amaldi, Alzano Lombardo (BG, Italy), 12 March.

TANZELLA-NITTI, G.

Opening Lecture of the new Academic Year of the Theological School “*Cardinale Celso Costantini*” of the Diocese of Pordenone-Concordia (invited talk). The title of the Lecture: “*Recent developments in the dialogue between theology and scientific thought: areas, opportunities, guidelines*”, November 22.

Round table at the Polytechnic University of Turin on the publication of the book Indagando la realtà. Tra ricerca scientifica, filosofica e teologica (Investigating Reality: Between Scientific, Philosophical, and Theological Research), edited by Alberto Piola (invited participation), May 10.

“*The Star of Bethlehem between art, science, and theology*”, Association for the Progress of the Country - Ambrosetti Forum (on-line), December 16.

Opening lecture of the series of meetings entitled “*The Beauty of Faith*,” organized by the Archdiocese of Venice in the setting of St. Mark’s Basilica, to celebrate the 1700th anniversary of the Council of Nicaea, February 25.

At the invitation of the Diocese of La Spezia, I held a training session for teachers of Catholic Religion on the use of the DISF Educational web portal (disf.org/edu), promoted by the DISF Center and the National Office for Education, Schools, and Universities of the Italian Bishop Conference, March 27.

I was invited to give several lectures as part of the program of the Theological Week “*Science and Theology: A Fruitful Challenge*,” held at the Monastery of Camaldoli (Arezzo), August 18-22.

MEDIA EXPOSURE

BROWN, D.

Article in Vatican News about the Vatican Observatory Summer School 2025: “*Specola, studenti da tutto il mondo per la scuola estiva di astronomia e astrofisica*”, 17 June, <https://www.vaticannews.va/it/vaticano/news/2025-01/specola-vaticana-scuola-estiva-astronomia-astrofisica.html>.

Article in Osservatore Romano of Pope Leo XIV’s visit to the telescopes of the Vatican Observatory in Castel Gandolfo, guided by Fr. David Brown S.J., “*Leone XIV commemora lo sbarco sulla Luna*”, 21 June, <https://www.osservatoreromano.va/it/news/2025-07/quo-167/leone-xiv-commemora-lo-sbarco-sulla-luna.html>.

CONSOLMAGNO, G.

Interview on EWTN News Nightly on “Vatican Observatory and the Intersection of Faith and Science”, February 5. <https://www.youtube.com/watch?v=l9WAFKHkAvg>

CBS Sunday Morning, “*Scanning the Heavens at the Vatican Observatory*”, June 29. The piece featured extended interviews with two of the students at the school as well as the Observatory Director, Br. Guy Consolmagno S.J., and the Curator of Meteorites, Br. Robert Macke S.J. CBS Sunday Morning typically may reach six million viewers or more, not counting those who view it later online. <https://www.cbsnews.com/video/scanning-the-heavens-at-the-vatican-observatory>

An extended interview in the 4 August issue of The New Yorker Magazine, under the segment “*Annals of Inquiry*”. This 6,000 word article covered topics ranging from the personal to the Church’s activities in promoting peace in space. The New Yorker is recognized as one of the premier publications in the United States. Its weekly circulation is over 1.3 million, not counting its significant online presence.

It has won eight Pulitzer Prizes since 2014, the first year that magazines became eligible for the prize. <https://www.newyorker.com/magazine/2025/08/04/the-vatican-observatory-looks-to-the-heavens>

CORBALLY, C.

Interviewed about the Vatican Observatory in Tucson on January 30 by Lauren Gilger, for KJZZ Phoenix’s “*The Show*”.

D’SOUZA, R.

“*Padre Richard D’Souza nominato direttore dell’Osservatorio Vaticano*”, Jesuits Global, August 19, <https://www.jesuits.global/it/2025/08/19/padre-richard-dsouza-nominato-direttore-dellosservatorio-vaticano>.

“*Intervista a Padre Richard D’Souza, nuovo Direttore della Specola Vaticana*”, Stato della Città del Vaticano, August 1, <https://www.vaticanstate.va/it/novita/2491-intervista-a-padre-richard-d-souza-nuovo-direttore-della-specola-vaticana.html>.

“*Richard Anthony D’Souza S.I. nuovo direttore dell’Osservatorio Vaticano*”, La Civiltà Cattolica, October 16, <https://www.laciviltacattolica.it/osservatorio/richard-anthony-dsouza-s-i-nuovo-direttore-dellosservatorio-vaticano>.

“*La nomina di padre D’Souza come nuovo direttore della Specola Vaticana*”, L’Osservatore Romano, July 31, <https://www.osservatoreromano.va/it/news/2025-08/quo-176/la-nomina-di-padre-d-souza-come-nuovo-direttore-della-specola-va.html>.

“*L’astronomo del Papa*”, La Repubblica, September 30, https://www.repubblica.it/venerdi/2025/09/30/news/astronomo_papa_padre_d_souza_osservatorio_vaticano_intervista-424868355.

“*Pope’s astronomer: I would baptise an alien*”, The Telegraph, October 25, <https://www.telegraph.co.uk/world-news/2025/10/25/vatican-astronomer-would-baptise-aliens>.

“*L’astronomo p. D’Souza: ‘Le stelle più lontane: la mia periferia’*”, AsiaNews (It), December 2024, <https://www.asianews.it/notizie-it/L’astronomo-p.-D’Souza:-’Le-stelle-più-lontane:-la-mia-periferia’-62199.html>.

FRANCL-DONNAY, M.

National Geographic, January, center pullout on tea.

New York Times, “*Tea Leaves Can Steep Away Lead, Study Finds*”, February 28, <https://www.nytimes.com/2025/02/28/science/tea-leaves-lead.html>.

The Guardian, February 25, “*Brewing tea removes heavy metals from water, study finds*”, <https://www.theguardian.com/science/2025/feb/25/brewing-tea-removes-heavy-metals-water-study>.

CBS3, interview with Stephanie Stahl on NIH cuts.

Proof, podcast, “*Can Science Brew a Better Cup of Tea?*”, April 25, <https://podcasts.apple.com/zm/podcast/can-science-brew-a-better-cup-of-tea/id1438546054?i=1000704677021>.

Philadelphia Inquirer, coverage of the papal conclave: <https://www.inquirer.com/opinion/commentary/live/papal-conclave-live-updates-new-pope-cardinals-voting-20250507.html> <https://www.inquirer.com/opinion/commentary/live/papal-conclave-live-updates-new-pope-cardinals-voting-20250508.html> <https://www.inquirer.com/opinion/commentary/pope-leo-xiv-robert-prevost-philly-catholics-20250513.html>.

Daily Mail, “*Revealed: What your favourite shade of TEA says about you, according to science*”, August, 17, <https://www.dailymail.co.uk/sciencetech/article-14990137/favourite-shade-TEA-says-you-according-science.html>.

Fresh Cup, “*A Scientist’s Guide to the Perfect Cup: Michelle Francl on the Chemistry of Tea*”, October 8, <https://freshcup.com/a-scientists-guide-to-the-perfect-cup-michelle-francl-on-the-chemistry-of-tea>.

Aubrey Masango Show South Africa 702, radio interview, “*Weird and Wonderful: Expert chemist explains molecular science behind brewing the perfect cup of tea*”, July 23, <https://omny.fm/shows/evening-show/weird-and-wonderful-expert-chemist-explains-molecular-science-behind-brewing-the-perfect-cup-of-tea>.

FUNES, J.

Radio Interview: Radio ADN, Santiago, Chile, December 2, <https://youtu.be/uvhA7UUDfZU?t=4361>.

Radio Interviews: Cadena 3, Argentina: “*Un sacerdote jesuita presentó un libro sobre vida extraterrestre*”, November 2024, https://www.cadena3.com/noticia/rony-en-vivo/un-sacerdote-jesuita-presento-un-libro-sobre-vida-extraterrestre_401449; “*José Funes: Science, faith and hope in dialogue about the future of humanity*”, November, <https://youtu.be/-AMudAHgMkk>.

Radio Interviews: Aire de Santa Fe: “*Dos libros para pensar la ciencia, la fe y la poesía*”, October, <https://youtu.be/kOWnKvzgfh4>; “*Ciencia y fe frente al misterio del universo: la visión del astrónomo del Vaticano en AIRE*”, September, <https://www.airedesantafe.com.ar/ciencia/el-astronomo-del-vaticano-hablo-aire-ciencia-fe-y-las-grandes-preguntas-del-universo-n630480>.

Diario Perfil Córdoba: Interview on science and society, “*Creemos más en los horóscopos y en los terraplanistas que en la ciencia y eso es preocupante*”, May 2024, <https://www.perfil.com/noticias/cordoba/creemos-mas-en-los-horoscopos-y-en-los-terraplanistas-que-en-la-ciencia-y-eso-es-preocupante.phtml>.

Conference at Universidad Alberto Hurtado, AI Week, December, <https://www.youtube.com/live/20mD5SCo22M>.

GABOR, P.

OSV News, June 26, “*Science and the stars a call to the spiritual, says Vatican astrophysicist*”,

<https://www.osvnews.com/science-and-the-stars-a-call-to-the-spiritual-says-vatican-astrophysicist>.

GALAVERNI, M.

Radio Ave Maria Sofia, “*Faith and reason*”, September.

Telereggio, “*Specola Vaticana*”, which was aired on October 7.

RAI, “*Casa Italia*”, which was aired on October 30.

TV2000, “*Terramater*”, which was aired on December 28.

GIONTI, G.

Interviewed on March 8 by Stefano Girotti Zirotti of “*RAI Vaticano*” for a documentary “*Spes*” on the beauty of creation, broadcast on RAI 3, https://www.raiplay.it/video/2025/04/Spes--Puntata-del-19042025-b57abb72-2626-496f-a459-497de692f9f5.html?wt_mc=2.www.share.raiplay_vid_Spes.

Interviewed on April 24 by Geoffrey van Hecke of the magazine Tota Pulchra <https://totapulchra.news/visite-allosservatorio-vaticano>.

Interviewed on October 29 by Mario Prignano of “*TG1 Dialogo*” on the exhibit of JWST images at the Vatican Observatory. The interview was broadcast on November 1th, <https://www.raiplay.it/video/2025/11/Tg1-Dialogo-del-01112025-5e928a90-e0eb-4975-9e27-548b8a690f17.html>.

Interviewed by Francesca Giansoldati of the newspaper Il Messaggero on September 2 (the interview appeared on the 3rd), https://www.ilmessaggero.it/vaticano/vaticano_alieni_creature_di_dio_evangelizzare_i_pianeti_padre_gabriele_gionti_leone_xiv-9046427.html.

Interviewed, with Richard D’Souza, by Gianmarco Murrone of the Vatican Radio, October 22: www.vaticannews.va/it/podcast/rvi-programmi/

[il-mondo-alla-radio/2025/10/il-mondo-alla-radio-22-10-2025.html](#) also <https://www.youtube.com/watch?v=8aQwclj44go>.

GRANEY, C.

Interviewed for “*Pope Leo XIV Inspires Young Astronomers at Vatican Observatory Summer School* | EWTN News Nightly”, broadcast June 30, https://www.youtube.com/watch?v=OfTcL_lwLG4.

Filmed at Cincinnati Observatory (USA) for German ARTE production on history and science, April 23. See https://www.youtube.com/watch?v=C_jVtql5mkw, “Is It True That... We All Believed the World Was Flat?” | ARTE.tv Documentary.

HINCKS, A.

“*Canadian built telescope captures the earliest light emitted by the Big Bang*”, The National Post, 18 March, <https://nationalpost.com/news/space/atacama-cosmology-telescope>.

“*Astronomers snap clearest ‘baby picture’ yet of the universe*”, Faculty of Arts & Science News, University of Toronto, 21 March, <https://www.artsci.utoronto.ca/news/astronomers-snap-clearest-baby-picture-yet-universe>.

Live interview about Atacama Cosmology Telescope DR6 results, Metro Morning radio show, Canadian Broadcasting Corporation, 4 April. “*Simons Observatory Special*”, The Jodcast, October, <https://www.jodcast.net/archive/202510>.

KIKWAYA ELUO, J-B.

Meteors, Fireballs, and Near Earth Objects, 2025, VOF Bulletin, p. 10-15.

Interview with Radio Maria, RCE, and RTCE, August 18, Kinshasa, RDC (Republic Democratic of Congo), <https://www.radiomaria.cd/pensee-ecrite-du-mercredi-20-aout-2025>.

African Jesuits in Science hold symposium on AI Innovation and Ecology, August 3-8, Nairobi, Kenya, <https://www.jesuits.global/2025/09/22/african-jesuits-in-science-hold-symposium-on-ai-innovation-and-ecology>. Les Jesuites Africains reflechissent sur l’IA et l’ecologie au service du developpement durable, Vatican News, August, <https://www.vaticannews.va/fr/eglise/news/2025-08/les-jesuites-africains-reflechissent-sur-l-ia-et-l-ecologie-au-s.html>.

Une planete intelligente, un avenir juste, 23 August, Paroisse Saint Joseph, France, <https://www.diocese-annecy.fr/le-diocese/les-paroisses/paroisse-saint-joseph-en-pays-de-faverges/la-feuille-paroissiale/lfp-170825-2.pdf>.

MACKE, R.

CBS Sunday Morning, “*Scanning the Heavens at the Vatican Observatory*”, June 29, <https://www.cbsnews.com/video/scanning-the-heavens-at-the-vatican-observatory>.

YouTube Video: HO Scale model Church with Secchi’s Observatory, for 2025 Public Display. Part 4. Youtube, Macke MakerSpace channel, January 21, https://www.youtube.com/watch?v=_b9FzX0y9IY.

VISITORS HOSTED AT THE SPECOLA

BROWN, D.

Gave tours of the telescopes and domes of the Papal Summer Apostolic palace to the following:

- Pope Leo XIV, 20 July.
- Alumni of St. Pius X pre-seminary (Rome), as part of their pilgrimage for the 2025 Jubilee of Youth, 30 July.
- The Swiss Guard contingent present in Castel Gandolfo (with night viewing), 8 August.

- Students from Marymount Internation School (Rome), 30 September.

Gave tours of the telescopes and domes of the Papal Summer Apostolic palace and the Papal Gardens to the following:

- VOSS students and faculty, 3 June.
- Students of Strake Jesuit High School, as part of their pilgrimage for the 2025 Jubilee of Youth, 31 July.

Gave a tour of the telescopes and domes of the Papal Summer Apostolic Palace and Garden Museums and Specola offices to Anne Miller and Meg Nelson of the Catholic Community Foundation of Minnesota, 1 October.

CORBALLY, C.

Satya Gontcho A Gontcho (Berkeley Lab), in Tucson, visit after DESI observations on Kitt Peak.

Job Kozhamthadam, S.J. (Jnana Deepa Vidyapeeth, Pune), in Tucson, visit to Corbally and Gabor.

GALAVERNI, M.

Prof. Willy Benz, President of the International Astronomical Union, Prof. Diana Mary Worrall General Secretary of IAU and other IAU members including Prof. Piero Benvenuti, Dr. Lucio Antonelli (INAF Monteporzio), Dr. Marco Feroci (IAPS Tor-Vergata) and Dr. Rosaria D’Antonio (with Fr. Gabriele Gionti), March 8.

Directorate of Telecommunications and Information Systems of the Vatican City State (with Fr. Gabriele Gionti), June 20.

Several groups of pilgrims for the Jubilee of the Youth.

Agnese Mandrino, historical archive of the Brera Astronomical Observatory (INAF), for a week of work on the historical archive of the Vatican Observatory, September 22-29.

Dr. Maurizio Giannotti (Universidad de Zaragoza), Dr. Federico Mescia (INFN Frascati), Dr. Giuseppe Lucente (SLAC National Accelerator Laboratory), September 25. A delegation of the Christian Union of entrepreneurs and managers, Diocese of Reggio Emilia-Guastalla, October 25.

High school students from Istituto Murialdo (Albano Laziale), Istituto di Istruzione superiore “*Enzo Ferrari*” (Roma), Istituto S. Anna - G. Falletti Di Barolo (Roma), Istituto Comprensivo Pavona (Albano Laziale).

Group of teachers from Salesian schools (with Fr. Jacek Olczyk).

Groups of pilgrims from Parrocchia Natività di Maria Santissima (Selvacandida, Roma), Parrocchia di “S. *Ambrogio*” (Rivalta, Reggio Emilia), Parrocchia S. Maria del Rosario (Magliana, Roma).

GIONTI, G.

Hosted visits to telescopes in the Domes of Villa Barberini and to the Apostolic palace by the following:

- Sr. Cinzia Giacinti, Apostoline Sister and the animators of the Salisean Oratory of Castel Gandolfo, December 20, 2024.
- Andrea Cottini, his wife and daughter, December 24, 2024.
- Students of the class in cosmology of the College Goodenough from London, England.
- University students and don Lorenzo Magarelli, leader of the group, from Triest belonging the group of discussion in Science and Theology of the dioceses of Triest on March 1.
- Middle school students of Albano Laziale lead by their teacher Maria Maggiore on March 6.
- Prof. Willy Benz, President of the International Astronomical Union, Prof. Diana Mary Worrall General Secretary of IAU and other IAU members including Prof. Piero Benvenuti,

Dr. Lucio Antonelli (INAF Monteporzio),
Dr. Marco Feroci (IAPS Tor-Vergata) and Dr.
Rosaria D'Antonio (IAU), March 8.

- Fr. Jim Keenan, S.J. and Dr. Bryan Fleming from Boston College on March 11.
- Visit of a group of professors of the University of Rome “La Sapienza” (Claudio Costa), May 5.
- A group of forty employee of the mail office of the Governorate of the Vatican City State lead by their director Dr. Antonino Intersimone (with Don Matteo Galaverni).
- A group of the University professors of the association “*Federico Ozanamasan*” lead by prof. Paola Podestà, September 20.
- Rectors of the catholic universities of Argentina lead by Eugenio Martin De Palma on October 30.
- Frances H. Arnold professor of Chemistry at Caltech (Nobel Prize in Chemistry 2018), November 29.
- Luca Caravella and his family from Capua, December 7.
- Prof. Raffaele Velotta from the Physics Department of the University Fredrick II in Naples (Italy), his wife and a group of friends, December 8.

HINCKS, A.

Ms. Eleonora Barbavara and Dr. Giovanni Isopi,
University of Rome “*La Sapienza*”, at Castel
Gandolfo, 16 May.

Participants of the University of Toronto’s Gilson
Seminar in Faith and Rome, at Castel Gandolfo, 9 May.

MACKE, R.

Helen Louise Grant (INAF-IAPS)

David and Lea Macke

CHANGES IN PERSONAL STATUS

D’SOUZA, R.

Final vows, 8 December.

MINNITI, D.

The very sad news this year was that my dear Mom, Nydia Del Barco de Minniti, passed away in November. May she rest in peace. She was an elementary school teacher and the kindest person, and we miss her very much.

RISANTO, B.

Final vows, 15 August.

