

## Fellows at ESO

### Marta De Simone

*"[...] I grew up in a cruel land where snow mixes with honey  
And good people wear crowns of thorns on their heads  
Since childhood, I have learned the difference between blood and wine,  
that a life can be broken for a piece of meat or bread  
And I can't get used to all this happiness [...]"*  
Brunori Sas

These words resonate with me deeply, as I grew up in a small town in Calabria (southern Italy), where the snow shines in winter, and the sky is so dark you can see the Milky Way in all its colours. I was raised in a modest family that valued culture and study, encouraging me to explore my curiosity and seek knowledge.

One evening, when I was about 12, I noticed a bright point of light in the sky, just above a mountain on the horizon. It was not a streetlight or a plane and I couldn't stop thinking about it. I was curious and seeking an explanation and my mother, who did not know what it was, encouraged me to investigate. Through my research, I slowly realised I was looking at Venus, and the discovery blew me away. Beyond that, I was always mesmerised by the night sky. On drives home from the mountains, I'd press my face against the car window, capturing every second of that amazing starry sky. Since then, I started learning the constellations and spending every chance I could looking up.

At the same time, I was always drawn to music. I started playing the flute, following in my sister's footsteps, and dreamed of attending the conservatory. But my mother encouraged me to think carefully, reminding me of the challenges my sister had faced. On the other hand, my sister tried to push me to carve my own path. In hindsight, I thank them both, because I later realised that my true passion in music was not playing an instrument but singing. That became clear when, almost by chance, I joined the church choir in my home town. At first, I was extremely shy and promised myself I would only ever sing within my room's walls. But that promise did not last long. I never left the choir, and



no matter where life took me, I always looked for one to join. Singing became my escape valve, my way to release emotions.

As high school came to an end, I had to decide what came next. In southern Italy, university was the natural step after high school, as the job market offered few alternatives. But I still had no clear direction. I considered scientific criminology (to solve homicides and mysteries), medicine (inspired by my father, who was a nurse), and, finally, something related to stars (as astrophysics). But the idea of

pursuing physics felt intimidating. I had struggled with it in high school, changing teachers every year, none of whom were particularly inspiring. However, in my final year, a new physics teacher arrived showing us physics in a new light and speaking of vast research frontiers. When I shared my interest in astrophysics, he and my maths teacher encouraged me to go for it. Their support gave me the courage to try. I moved to Florence, 800 km from home, to pursue a bachelor's in physics. The journey wasn't easy, but worth it. Over time, even my male classmates,

skeptical and envious, came to recognise my determination and the difficult path I had chosen, one they hesitated to follow.

At university, I didn't even fully understand what a doctorate was, nor the path to an academic career. That changed when I had the incredible opportunity, after meeting with Leonardo Testi at the University of Florence, to carry out my bachelor thesis project at ESO. It was my first approach to the world of research, and the opportunity to see what an international institute running the most powerful ground-based telescope looked like. I fell in love with the place, the inspiring people working there, and the atmosphere of curiosity. This sparked a desire to return for my master's thesis. Soon after, I was offered a PhD position on astrochemistry, the topic of my bachelor thesis, to work with one of the leading experts in the field, Cecilia Ceccarelli. I was overjoyed and truly grateful for this opportunity. During my PhD, I studied how molecules form in space and how the building blocks of life might have reached Earth, observing the gas in young stellar nurseries. It was a dynamic and enriching journey filled with people from diverse backgrounds, wide range of topics with unexpected and fascinating ramifications and changes of directions. It allowed me to grow into an independent scientist, ready to compete for a prestigious ESO fellowship.

Joining ESO as a fellow was a dream come true. It brought me back to the place that had captivated me and made me fall in love with research. As a fellow, I spend most of my time studying the origins of chemical diversity in regions where stars and planets form. I could also support the observatory, contributing up to 25% of my time with functional work at the ALMA Regional Center, gaining invaluable insights into how an international major observatory runs. One of the most unforgettable moments was the visit the ALMA site in Chile, where I conducted observing runs and witnessed the magnificence of the 60 antennas on the Chajnantor plateau at 5000 metres. I once again felt like that child with my face pressed against the car window, soaking in every moment of that dark, but colourful starry sky. At ESO I also met a few students who shared my passion for singing.

I then pushed them to create a small choir to have a place where people could sing, relax, and unwind after long days of work. Two years later, the choir is still going, and it is very well-received and full of the enthusiasm of the participants.

Today, I feel privileged to be an astronomer at ESO, and I hope to always retain the astonishment and curiosity I felt at the beginning of my research journey. Now, I aspire to be like those who inspired me at ESO, and to guide and encourage the future generation of astronomers.

### Julien Drevon

My name is Julien Drevon, I am 27 and I grew up in a loving home in the city of Cannes, France, right in the heart of the French Riviera. The sun, the sea, the mountains, and the clear skies provided by the nearby Alps created the ideal conditions for nurturing a passion for astronomy and the many celestial objects of the night (and day) sky.

Like most people working in the field, my passion began at a very young age. If you asked my mother, she would tell you that I hadn't even mastered the French language yet, but I was already trying to express my fascination with the Moon every time I saw it.

After a standard academic path and upon turning 17, I followed the usual trajectory of French students pursuing higher education. I completed a year of preparatory studies for the competitive entrance exams to the prestigious Grandes Écoles, which I passed. This experience taught me valuable study methods, but the pace and teaching style did not suit me. So, I decided to continue my second year directly in a physics bachelor's programme at the university. The unlimited access to knowledge, group work, and independent learning were exactly what I needed. From that point on, my academic journey followed a more traditional route.

I earned my bachelor's degree in physics with an astrophysics specialisation, followed by a master's degree and a PhD in astrophysics at Université Côte d'Azur in Nice. My area of expertise focuses on studying the molecular and dusty



environments of evolved stars in the infrared using interferometric observations.

During the second year of my PhD, I had the pleasure of being selected for the ESO Studentship programme in Santiago. At ESO, I was mentored by experienced astronomers who shared their knowledge and passion, allowing me to conduct research and gain expertise that I would not have been able to acquire without their guidance.

After completing my PhD, I was fortunate to be selected by the ESO Fellowship committee to become an integral part of the team of astronomers and researchers based in Santiago. For over a year now, I have had the privilege of wearing two hats: I am both a researcher and a night astronomer.

As an ESO researcher, I strive to understand how and under what conditions dust forms around dying stars. Dust and the heavy elements produced by stars are the fundamental building blocks of life



as we know it on Earth. By understanding how this dust forms, we are essentially trying to understand our own origins. To observe the objects and environments I study, I need telescopes over 100 meters in diameter. This is where interferometry comes into play: by combining multiple telescopes, we can achieve a resolution equivalent to that of a single 100-metre telescope. At Cerro Paranal, we do this using either the 8-metre telescopes or the smaller 1.8-metre telescopes.

Large diameters are useful when observing faint objects that require collecting large amounts of light to detect their signal. However, the objects I study are bright enough to be observed with the 1.8-metre telescopes. An additional advantage of these smaller telescopes is their mobility; they can be repositioned at different locations on the platform, allowing us to scan an object from multiple angles and achieve resolutions ranging from a few metres to the equivalent of a 200-metre telescope — five times the resolution of ESO's Extremely Large Telescope (ELT) currently under construction at Cerro Armazones.

Interferometry does not directly produce images of our environment. Instead, we observe the intensity and phase of the interference patterns between the light collected by different telescopes. My expertise involves gathering, calibrating, and analysing these data. If enough observations are available, I can reconstruct an image of the environment surrounding an evolved star.

In July 2024 I won, on behalf of ESO, the image reconstruction contest at the SPIE 2024 workshop. This competition, along with the scientific challenges presented by my data, continuously pushes me to refine my skills and improve my image reconstruction techniques. My long-term goal is to help the interferometry community reconstruct images more efficiently by making the process less tedious and more accessible so that more researchers can obtain high-quality images.

My second role at ESO, given my expertise, is to operate the VLTI instruments at Paranal for 80 nights a year. I conduct observations for astronomers worldwide whose proposals have been selected by

an ESO committee. Once a proposal is approved and the target is observable, my role is to provide the best possible data from one of the most optimal observing sites on Earth.

I see this dual role as a significant advantage, especially as someone who completed their PhD just over a year ago. On the one hand, I have the opportunity to experience full research autonomy, collaborate internationally, and work on topics I am passionate about. On the other hand, I gain hands-on expertise in interferometric data observation, learn the inner workings of an observatory, and develop my skills as a night astronomer.

This is an opportunity unlike any other, and I feel incredibly fortunate and proud to share this experience, thanks to ESO.

#### Elizabeth Artur de la Villarmois

My love for the Universe started in my childhood, when watching documentaries about the origin of the Universe, the Solar System, and Earth's formation, filled with pretty images and captivating simulations. At some point my parents bought me a set of little stars that shine during the night, and I glued them on the ceiling of my room, so every night I fell asleep 'under the stars'.

I was born in San Pedro de Jujuy, a city located in the north of Argentina, and I spent most of my childhood in Salta, two cities very close to each other and at a similar latitude as ALMA (just on the other side of the Andes). Before finishing high school, I really wanted to study astrophysics. This wasn't something temporary that faded with time and, as university application time approached, I had to get serious and started considering my possibilities. Coming from non-scientific family, I didn't know what were the steps to follow to become a scientist or what kind of future to expect. I just knew I wanted to be an astrophysicist. I still remember that my parents were a little worried about my future, but they still supported me and I will always be grateful for that.

My adventure began when I moved to the city of Córdoba, 900 km from my

hometown, to study astronomy. I think Argentina is one of the few countries that has an astronomy course that lasts five years, unlike other countries where one studies physics and then specialises in astronomy. I really enjoyed my student life and, with some ups and downs, I managed to finish my course, my thesis being about infrared jets in forming stars.

After graduating, the next step was to apply for a PhD position with funds from CONICET, the national scientific and technical research council. But, after applying for two years in a row, I didn't win the grant. That was a difficult moment and I had to sit down, reflect, and explore other paths. I began teaching maths and physics to first-year university students while applying for a master's programme in Rio de Janeiro, Brazil. I won that grant and, for the first time, I moved to a different country — and one with a different language.

During my two years in Brazil, I began working with submillimetre observations. My supervisor at that time put me in contact with an expert in the field, and I feel like that was a pivotal moment in my scientific career. At that time, ALMA was in its cycle-2, already making revolutionary



discoveries. A few months before finishing my master's, I saw a PhD position advertised in Copenhagen, Denmark, in my research area and fully focused on ALMA data. The professor offering the position was the author of several papers that guided me during my master's so, even though I had no idea at that moment about Denmark, I really wanted to work with him. Fortunately, he offered me the PhD position!

Living in Denmark was a huge change for me, in terms of culture, distance, people, weather, politics, food, and friends. I fell in love with the bicycle culture, which I still enjoy today. During my three years of PhD, I began submitting ALMA proposals, I wrote first-author papers, I became more skilled in submillimetre/millimetre data analysis, and I felt passionate about astrochemistry. After my PhD, I applied for postdoctoral positions in many countries like Sweden, Germany, Chile, and the USA. I was awarded a three-year grant in Chile, as a FONDECYT postdoc at Pontificia Catholic University (PUC), in Santiago.

My plan was to start my postdoc in April 2020, but COVID-19 hit just before. I had started my visa process to come to Chile, but the Chilean embassy in Copenhagen stopped all the processes until August, when flights partially resumed. I managed to arrive to Chile in August 2020, in the middle of the lockdown. The first months were challenging, mainly because of paperwork and bureaucracy, but I was closer to my home country, so the culture shock was not a big deal.

Living in Santiago I fell in love with the mountains and with the man who later became my husband. During these three years, I learned more about ESO and ALMA by attending workshops and conferences in Vitacura. I remember the first time I walked outside the Vitacura campus, where there are many beautiful images of the Universe and the telescopes, and I thought "I would love to work in this place." So when my FONDECYT postdoc was near its end, I applied for an ESO fellowship to work with ALMA. Honestly, I thought my chances were low, given that

Argentina is not an ESO Member State, so it was a lovely surprise when I was accepted at ESO.

I began my ESO fellowship in May 2023, and I feel I have learned a lot in this period of time, especially about the observational aspects of ALMA and how things happen behind the scenes. Visiting the antennas at 5050 metres for the first time was a dream come true, and I still enjoy it a lot every time I have a shift at the high site. But not everything is ALMA; in late 2023 I visited Paranal and the ELT, which was halfway through construction. That was breathtaking!

My current research focuses on understanding how stars and planets, like our own Solar System, form and evolve. Using ALMA observations, I study the chemical composition of these systems and their potential to harbour life in the future. Many unanswered questions remain, but the future looks bright, with upcoming new capabilities like the ALMA 2030 upgrade and the ELT's first light. Stay tuned!



Bathed in the sunset light of Chile's Atacama Desert, this image shows steady progress in the construction of ESO's Extremely Large Telescope (ELT).