

Fellows at ESO

Hugo Messias

It was difficult to begin writing this article because I don't see myself as a conventional astronomer who was into science from a young age. So I wonder — why would you be interested? You're likely reading this because you're a curious person, and you either already know me and want to improve that knowledge, or you just wonder what induces a person to work in astronomy. We are curious beings and fiercely seek answers and patterns everywhere, and this is in fact one of the reasons why I work in astronomy.

First let me give you a bit of a background: my parents are both electrical engineers, and one of my grandparents owned a grocery shop and thus wanted to make sure his grandchildren knew maths. Being an active kid, my parents tried to keep me occupied and so I developed a lot of different interests. But in Portugal, students need to decide in high school — starting from the tenth grade — which future career to pursue. I still feel that this decision is forced on kids too soon, but I was lucky to be allowed to take a mix of arts and physics classes until I went to college. I liked drawing, especially the geometry exercises requiring 3D mental-rendering, but I ended up going into physics — likely influenced by the telescope my parents bought me, and the fact that the first two bright objects I pointed it at were Jupiter and Saturn. I still wonder if that tender present was a way for my parents to tell me that I couldn't draw. In their defence, there is some supporting evidence for this.

My physics degree, obtained in Lisbon (at the Faculdade de Ciências da Universidade de Lisboa [FCUL]), went by fast, or at least it seems like that now. At first I didn't feel like I was in the correct place — there were too many physics jokes that I didn't get, and people knew way more than I did even before we started classes. But I can't forget the history of physics class that I took. At high school, history didn't seem interesting as it involved too much memorisation and was too focussed on conquering and fighting without addressing the underlying reasons. In this class, however, the history behind the history was highlighted. I learned with Ana Simões and Henrique Leitão that the



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giants of physics, upon whom our knowledge now stands, were funnier than anyone thought. We would learn how and why technology and society kept pushing each other further and further into what we are and know today. My experimental physics class also helped me to make sense of the world around me and I realised that I was in the right place after all!

With João Yun, a very helpful and trustworthy person, I made my first contact with college-level astronomy and the research group at the Lisbon Astronomical Observatory. I met Rui Agostinho (who possesses an awesome level of physics knowledge), from whom I learned a lot about the impressive nineteenth century observatory and the people who worked there, as well as a number of fun and smart ways to approach science outreach. I started working with José Afonso, who later became my PhD supervisor together with Bahram Mobasher. The thesis has a really long title and it involves dusty galaxies. Part of my PhD work could be applied to the James Webb Space Telescope galaxy surveys, which first introduced me to the Atacama Large Millimeter/submillimeter Array (ALMA).

Right after I finished my PhD thesis, the first ALMA call for proposals went out. Thanks to Carlos De Breuck, I was fortunate enough to see the antennae being built and was able to go up to the Chajnantor plateau together with some other astronomers to see the first stages

of the array. On top of that, I was about to fly to the Universidad de Concepción (UdeC) in Chile for my first postdoctoral position under an ALMA-CONICYT (Comisión Nacional de Investigación Científica y Tecnológica) project. ALMA was everywhere! At UdeC, I got my hands on ALMA data targeting an impressive lensed major merger. It was my first contact with a large project (the Herschel-Astrophysical Terahertz Large Area Survey [H-ATLAS]), and it made me realise that astronomy is still a field that can unite clearly distinct cultures from around the world in a common goal. ALMA is probably the best example in existence, and being part of it is priceless!

I returned to Portugal to work with José Afonso at the Portuguese ALMA Centre of Expertise as its lead scientist. This project was aimed at instructing the Portuguese community — and ourselves — about ALMA and its science. During these three intense years, I learned a lot about project management and about ALMA, and I also significantly broadened my research interests. By chance, I noticed the call for ALMA Fellowships. I felt that I needed to learn more if I wanted to help the Portuguese community more, and I applied.

So here I am now, writing this in the ALMA control room while waiting for observations to finish. After one year as an ALMA Fellow, I still feel great. I'm able to visit the telescope from time to time and be involved in amazing projects such

as the ALMA Phasing Project, which once again shows what ALMA is about: a diverse group of people from different cultures and backgrounds, coming together to make a ground-breaking facility a reality. Together we're enabling a giant leap forward in knowledge in a number of areas, from solar physics to the first galaxies in the Universe. For me, astronomy is simply this: satisfying your curiosity and mixing cultures in so many ways.

Allison Man

Ever since I was young, I have been a curious person and have always liked to pose questions about the sky and everything beneath it: Why does the Moon change its shape? Why is there life on Earth and not other places? What is the definition of life? I was therefore happy to discover a profession where the entire purpose is to pose questions and seek answers in science.

This was an unusual choice of profession among fellow students in Hong Kong, a financial hub, where young people aspire to be bankers and corporate managers. I always knew I wanted to study astrophysics, but the subject was not offered at my home university so I did my bachelor studies in physics. Somehow I managed to find people who encouraged me to pursue my dreams. With the help of my mentor Kinwah Wu, I won a summer research studentship and spent a month at the Mullard Space Science Laboratory in the UK to work on my first research projects. Later that year, I was fortunate enough to be supported by my family to spend a year abroad in Denmark as an exchange student. The choice to study in Denmark was encouraged by a serendipitous encounter with Ole Strömberg, the son of Bengt Strömberg — a Danish stellar astrophysicist who played a key role in the early years of ESO.

Living in Denmark was an eye-opening experience for me. It was fascinating to learn that the life cycles of stars can be described by mathematical equations with simple assumptions. The egalitarian values of Danish society also appealed to me and I realised that I could choose to live my life differently. I decided to pursue a MSc degree in astrophysics at



Allison Man

the University of Copenhagen. This was not an easy choice, as it meant that I had to live far from my family, and I also had no means to afford the hefty tuition fees because of my status as a foreign student. Thankfully, the professors at the Dark Cosmology Centre convinced the Faculty of Science to award me a stipend and waive my tuition so I could pursue my studies. I went on to learn cosmology, galaxy evolution and astrobiology, which deepened my fascination with the Universe and how humans came to be.

While searching for a thesis project, I spoke to astrophysicists in Copenhagen about their research. I was particularly impressed when Sune Toft, a Lundbeck research group leader who had returned to Copenhagen upon completing an ESO Fellowship in Garching, described how “dead” massive galaxies puff up in size to become the largest elliptical galaxies in the Universe. I was excited to embark on an MSc project with him to measure the sizes of massive galaxies with archival Hubble Space Telescope data.

I quickly discovered that many of the galaxies were in pairs and appeared to be interacting. This was interesting because in concordance cosmology, massive galaxies are thought to assemble from merging smaller ones. However, whether massive galaxies merged more frequently in the past was a disputed topic, as observations provided contradictory evidence. I therefore changed my research

direction and measured galaxy merger rates instead of sizes, work that expanded into my PhD project.

Using deep field galaxy surveys taken with the Visible and Infrared Survey Telescope for Astronomy (VISTA) and the Hubble Space Telescope, I gathered a large sample of more than 1000 galaxy mergers and inferred that the discrepancy across observations is due to selection effects. My results implied that, to properly measure the galaxy merger rate, it is important to obtain galaxy gas mass measurements with the Atacama Large Millimeter/submillimeter Array (ALMA). As part of my PhD studies, I spent half a year visiting the Institute for Astronomy at the University of Hawaii, collaborating with Dave Sanders and Josh Barnes. It was a memorable experience for me on all fronts: learning about far-infrared astronomy and merger simulations, observing on Mauna Kea, and of course enjoying the mountains and the ocean in my free time!

After my PhD, I was happy to be awarded an ESO Fellowship to develop my research in a broader context, asking questions such as “Do galaxy mergers trigger starburst activity and active black holes?” and “How do massive galaxies shut down their star formation?” ESO and Munich in general provide a stimulating research environment, where I can bring my ideas to fruition and find experts in any field of interest. My functional work

for ALMA has enabled me to exploit my newly acquired knowledge in radio interferometry to address my science questions. Since coming to ESO I have been awarded 100 hours of observations with ALMA and the Very Large Array (VLA) to study cold gas in early galaxies. By combining radio interferometry with optical and near-infrared observations at the Very Large Telescope, I plan to investigate how star formation proceeds in the early Universe.

As much as I enjoy the intellectual stimulation of my job, I draw satisfaction from bringing people together with science. ESO is a prime example of the success and value of international collaborations. This summer, I taught at the West African International Summer School for Young Astronomers¹ held in Ghana. The students were remarkably motivated and “code-savvy”, at least compared to myself as a bachelor student! Since returning from Ghana, I have launched a mentorship programme to connect these students with astrophysi-

cists across the world, and have begun to develop a research-training programme for them with other ESO astronomers. My own mentors have been crucial to my journey to becoming a professional astrophysicist, so I hope that I can engage more colleagues to support and encourage these bright students to pursue science as a career.

Links

¹ West African International Summer School for Young Astronomers: <http://www.astrowestafrika.org>

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External Fellows at ESO

In addition to the ESO fellowships, a number of external fellows are hosted at ESO. A profile of one of these fellows is presented here.

Iván Oteo

Perhaps contrary to most astronomers, my love-hate relationship with astronomy did not start when I was a child. In fact, until I was about 16 I was really passionate about medicine and was convinced I would become a surgeon. However, everything changed when I started my last year of high school, when I had a great physics teacher whose lessons made me change my mind. The decision to pursue a degree in physics was not easy, and I still sometimes wonder what could have happened if I had studied medicine instead. I have the impression that it would have been a job that I would have enjoyed as much as being a researcher in astronomy. I studied in Sevilla, a beautiful city about 120 km away from Cádiz, the city where I was born and where I lived until I was eight years old, and Chiclana de la Frontera, the place where I spent most of my adolescence.



Iván Oteo

When I started my physics degree I was not thinking of specialising in astronomy, but rather in quantum or nuclear physics. My passion for these topics increased over the course of my five-year degree, and in my final year I even received an offer to start a PhD in quantum physics with one of my teachers beginning in 2008. I really wanted to take that career path, but in June 2008 I had the oppor-

tunity to complete a three-month summer studentship at the Instituto de Astrofísica de Canarias (IAC) in Tenerife. I could choose from a list of projects and I selected the one on solar physics, but a couple of weeks before starting I was informed that the project had been cancelled and I had to choose another one. This time, I chose one on high-redshift quasars amplified by gravitational lensing.