ICE-CSIC Communication & Outreach Office

01/12/2023

Interview with Dr. Clara Deham, ICE-CSIC PhD graduate

- First of all, congratulations on your PhD thesis! Let us start by asking you: Why did you decide to become a scientist? Tell us about yourself.

Thank you for your kind words!
I decided to become a scientist mainly because I enjoy the challenge of figuring out tough questions and feel really satisfied when I find the answers. I'm committed to solving difficult problems in science. I also like how science is always about new ideas and discoveries; every day, there's something new to learn and different challenges to face, which keeps the work interesting and not boring. Plus, I'm curious about how the world works, and that's another reason why I decided to become a scientist.

- Who have been your role models (female and male)? And your current ones?

I don't really single out specific role models. My approach is more about learning from everyone around me. I make it a point to notice what people do well and where they might fall short. It's a way for me to learn — to take the good, avoid the not-so-good, and constantly work on being a better version of myself. Recently, I had this experience with Prof. Axel Brandenburg. I met him during a scientific visit to Nordita, and his work, the way he thinks and approaches things, really made an impression on me. I also think it's important to learn from my own experiences. I try to be honest with myself, regularly reflecting on what I could do better. And I value feedback, especially from people I trust. It's all about growing, not just professionally, but as a person too.

- How would you explain your thesis to non-experts?

I would explain my thesis to non-experts as follows: Think of a neutron star as this super dense, tiny core left over from a massive star that has exploded. These stars are incredibly small, like the size of a city, but they're packed with about 1.5 times the mass of our sun. That's a lot of mass in a small space, so they're super dense. Neutron stars also have really strong magnetic fields, kind of like invisible forces reaching way out into space and affecting everything around them. And when it comes to temperature, these stars change in temperature over time. Young neutron stars start off very hot and gradually cool down.

Magneto-thermal evolution, therefore, is about how the magnetic fields and temperatures of neutron stars change over time. In my thesis, I deeply explored this concept to gain a better understanding of the behaviour of these fascinating celestial bodies. We rely on complex computer simulations to predict these changes, which helps us interpret the emissions we observe from these stars. We believe these emissions are largely driven by their strong magnetic fields. Engaging in this type of research significantly broadens our understanding of the universe and the extreme conditions within it.

- Why did you choose the Institute of Space Sciences for your PhD?

I chose the Institute of Space Sciences for a variety of compelling reasons. The primary attraction was the PhD project. Its focus on the magneto-thermal evolution of isolated neutron stars and the associated numerical simulations was a perfect match for my academic interests. Additionally, the opportunity to work with a team of researchers and advisors known for their groundbreaking research was a significant motivator for me. The institute's well-deserved reputation for high-quality research, underscored by honours like the prestigious Maria de Maetzu award, also played a crucial role in my decision. Moreover, the location of the institute in Barcelona, Spain, was an appealing factor. The city's excellent weather, rich culture, and dynamic international community made it an ideal setting for my doctoral studies.

- What kind of impact can have your research both in your field and at a social level?

My PhD project has the potential to greatly influence my field of study. It centred around developing a new 3D code for studying the magneto-thermal evolution in isolated neutron stars. What makes this code state-of-the-art is its comprehensive approach. It fully integrates three-dimensional magneto-thermal evolution, incorporates realistic, temperature-dependent microphysical ingredients, and accurately represents the structure of neutron stars. Additionally, we've employed a cubed-sphere coordinate system, which effectively resolves the axis singularity problem commonly encountered in 3D spherical coordinates. What's even more exciting is that we're planning to make this code publicly available soon. This will be a valuable resource for researchers in the high-energy astrophysics community, enabling them to explore and understand these phenomena more effectively.

At a societal level, we all play integral roles in the broader picture of society. My project became a reality thanks to the combined efforts of many people, institutions, and universities committed to pushing the boundaries of science. Every little breakthrough in science translates into a positive impact on society as a whole.

- You participated at the Magnet programme, an alliance between the ICE-CSIC and the Gabriel Castellà i Raich school, in Igualada (Barcelona), to fight school segregation. How did you value this experience?

I've been part of quite a few outreach projects, but the one that really stands out is our initiative to tackle school segregation in Catalonia. Seeing the excitement in the students at Igualada School when they learn about the universe has been amazing. This project is truly making a difference at the school. Igualada School, located in the province of Barcelona, has faced challenges in integrating its community. But now, things are beginning to improve. More and more parents in the area are choosing to send their children there, which is a big achievement for us. Witnessing the real impact of our work is incredibly rewarding

- You also participated in outreach activities, like the 2022 #HowItAllStarted event on the occasion of the International Day of Women and Girls in Science. Since you have lived in several countries, what is your take on the gender equality situation in science nowadays?

I believe that women are increasingly taking on more significant roles in science and academia. Historically, it has been a challenging journey to reach this point. However, it's crucial that we continue to push forward, ensuring that women have an even larger presence in these fields and in society at large.

- What are your plans now that you finished your PhD? Are you already somewhere else?

I'm passionate about my research work, and that's driving me to continue in this field. Right now, I'm on a scientific visit at Nordita, a great opportunity I got during my PhD through Nordita's fellowship program. After the Christmas break, I'll head back to the Institute of Space Sciences. Then, soon after I will start working with the computational research group in Alicante-Valencia. My focus there will include studying supernovae explosions and exploring the Chiral Magnetic Effect in proto-neutron star dynamo simulations. The latter work will involve close collaboration with experts at Nordita.

- Which experiences about your PhD will you treasure? How do you think they will help you in the future?

One of the experiences I value the most is developing a numerical code from scratch. It's a skill that's been incredibly rewarding for me. Learning to do this has opened up numerous opportunities in various fields, which could really expand my expertise and boost my career prospects in both the scientific and industrial sectors.

- And lastly, any tips for the current PhD students out there or undergraduate students thinking about pursuing a career in science?

If I could offer a tip to current PhD students or undergraduates considering a career in science, it would be to start early and make the most of your time. Avoid delaying your work under the assumption that you have several years ahead. Remember, learning and developing your research takes time, just like writing scientific articles and your PhD manuscript. It's crucial to start using your time efficiently right from the beginning of your PhD journey.