

## Meet the researcher

## Marie-Alix Dalle

I have been in love with science since I was a child and was always eager to understand the world around me better. But at first, I didn't want to become a researcher after my engineering studies because I thought it would be boring, monotonous and divorced from the challenges of the real world. However, after a brief experience working as an engineer, I was so disappointed by the superficial way science was treated that I decided to give research a chance. So here I am, a PhD student in Thermodynamics at the University of Luxembourg for just over three years, and time has just flown by.

I first approached my thesis by way of water, because water is life and is poised to become an increasingly hot topic in coming years. Being part of the solution as an engineer and researcher seemed attractive to me. I'm working on a low-tech, heat-based water desalination process and studying how the temperature varies in order to optimise and improve the efficiency of the overall process. I use a non-intrusive observation method – the Schlieren technique – which is based on the optical property of light. When crossing an area of varying temperature, the light beam bends and you can relate the angle of the beam to the temperature variation in the area. I'm always amazed by how smart some observation and measurement techniques are, taking an indirect route to reach the goal. My daily work on the thesis is a mixture of experiments, set-up design, numerical simulation, sensor selection and optical observation with laser goggles. But I often also dive into very interesting discussions with colleagues, where we discuss the theory of evaporation, which is actually still rather crude given that evaporation is such a common phenomenon. And sometimes not everything goes to plan; one time, I forgot to close a valve at night and came in the next day to discover that the pink solution had leaked all over the lab floor. In short, there's enough variety in the lab to never get bored.

As I progressed in my thesis and taught my supervisor's students, I rediscovered thermodynamics. I had struggled with this subject in preparatory classes, but now it suddenly seemed incredibly useful to me. A new world opened up before me and the more I immersed myself in it, the more I realised that energy is at least as important as water. Energy is part of our daily life; we need it just to desalinate water. And that goes for everything we do, whether it's going to work, watching a movie, getting dressed or having a meal. Most energy sources are limited in and of themselves (i.e. fossil fuels), though, and the way we collect and convert energy also relies on limited resources (renewables are less dense than fossil fuels and so require more material to be collected and converted). Indeed, the best type of energy is the one we don't use. Despite my engineering studies, I had never quite grasped this; having to explain it to other people helped



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me understand it better and made me appreciate the importance of being proactive and asking questions. I also realised how little the subject of energy is understood by the general public and how often it's misrepresented in the media, despite its importance in all areas of life (economy, industry...).

Fortunately, aside from teaching, which is part of being a PhD student, we're also encouraged to learn more about best teaching practices at the university, which opened a third door for me: outreach and teaching. There are a lot of opportunities in this area, from presenting your work in the form of a comic book to doing a course on science communication. That's how I got involved in the Scienceteens Lab, a university initiative which brings high school students to the lab benches. For a whole day, the students can step into the shoes of researchers in various fields, from biology to computer science and mathematics. In the physics department we explain the concept of waves using the example of sunscreen, for example. I was excited when I got asked to help create an engineering workshop for the Scienceteens Lab. Can you guess what topic I suggested? Energy, of course! My supervisor and I are also developing an energy summer school for master's students and energy professionals. These two projects are a good way to combine my interest in energy and in learning theories.

To sum up, life as a researcher isn't always rosy; experiments rarely go as planned and teaching in the era of COVID-19 isn't ideal. But the world of research opens many doors and can contribute very directly to real-world issues, which is really satisfying for an inquisitive and engaged mind. ♦

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Marie-Alix Dalle is a PhD student in Thermodynamics at the University of Luxembourg. Passionate about science and the environment, she is also engaged in various citizen sensitisation initiatives and associations.