

CELL SCIENTISTS TO WATCH

Cell scientist to watch – Gaia Pigo

Gaia Pigo received her master's degree in natural science followed by a PhD in evolutionary biology – focusing on zoology and ecotoxicology – in the laboratory of Fabio Bernini at the University of Siena, Italy. She then joined the electron microscopy laboratory of Pietro Lupetti for her first postdoctoral position before moving to Zürich. There, supported by an EMBO Long-Term Fellowship, she worked with Takashi Ishikawa at the Swiss Federal Institute of Technology and the Paul Scherrer Institute in Villigen. In 2012, Gaia became an independent group leader at the Max Planck Institute in Dresden. Her laboratory is interested in understanding the assembly of the cilium and mechanisms of ciliary transport in eukaryotic cells, as investigated with cryo-transmission electron microscopy.

What inspired you to become a scientist?

I grew up in the Italian countryside, and I have always been very curious about nature. I am a person who likes to observe plants, animals and other phenomena, and to understand what I'm seeing. That's a natural way for me to memorise things – that's probably also why I ended up doing science that is based on visual aspects as assessed with microscopy. When I was 5 years old, my father brought home the first volume of 'Airone', which is an Italian version of National Geographic, and although I couldn't read yet, I was able to look at all the pictures. My father kept buying this journal for me and I collected every single issue – I had to become a scientist, there was no escape!

But you didn't work with electron microscopy in the beginning?

My PhD thesis was in zoology and ecotoxicology about population dynamics in contaminated environments. I was looking at arthropods and insects in the soil, and I was investigating how these animals get rid of contaminants or pollutants from their body – how they 'detoxify'. At some point I got fascinated by electron microscopy and joined Pietro Lupetti's lab, where 3D electron microscopy projects were starting. That's how I got into cell biology. After having collaborated with Takashi Ishikawa, I moved to Zürich to work with him. Not only is Zürich a beautiful city to live in, I was also impressed by the quality of the scientific environment, the equipment and the exchange of information! It was the right place to expand my experiments from 3D electron microscopy to cryo-electron microscopy, and Takashi was already working on the topic of cilia and flagella. We worked on radial spokes, dynein motors and understanding the beating of cilia, the mechanism of cilia motility.

What questions is your lab trying to answer just now?

We're interested in how the cilium – as the large cellular machine that it is – gets assembled. Intraflagellar transport certainly is one of the most important aspects of its assembly, but we're also interested in the process of getting the building blocks of the cilia from the cell



Gaia Pigo at the MPI-CBG.

body, where they are synthesised, to the cilia tip, where the assembly happens. We want to understand how some 600 proteins find their correct space and position in the axoneme without mistakes. This is a challenging project because there are so many proteins involved and many things we still don't know, but this is what is so exciting. We know the origin of the cellular machinery, the destination and that it happens by intraflagellar transport – the rest is still not clear. Developing tools is part of the story too. We wanted to know how anterograde and retrograde 'trains' use microtubules in intraflagellar transport, moving up and down the cilia. There was practically no tool available to visualise this, so we decided to develop our own method of time-resolved correlative microscopy to describe the transport. When you're motivated by a biological question, you don't stop because you don't have the tools – you develop them.

What challenges did you face when starting your own lab that you didn't expect?

When I started my lab, I was the only person who had the knowledge of how to run things. Students in my lab grow their own cultured cells, do their biochemistry of purifying the cilia or flagella, prepare the samples for microscopy, and acquire images and analyse them. It was tough, because everyone was depending on my teaching and it takes time before people become independent. It's much easier to only focus on one method, but then it's also nice to manage many techniques to answer our questions.

Are you still doing experiments yourself?

I train and start off new PhD students up to the point when they feel confident. They need to identify with their project, so it's all about support at the beginning. I've been here 4 years and at the beginning

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Gaia enjoys painting and photography, combined in this 'post-cubistic self-portrait'.

I tried to have my own project, but it didn't really work. There are so many things a group leader has to do: meetings, grant writing and supervising – I didn't expect it to be that much. It's all great, but it simply means less or no time at the bench for me anymore. Luckily, I still manage to get on the microscope though!

“When you're motivated by a biological question, you don't stop because you don't have the tools – you develop them.”

What is the best science-related advice you ever received?

Start small. Even if you have large funds, hire a limited number of people, because it's so much better if you build a core of people in the lab. You make sure people feel that they get good interactions with one another and you, and that they can ask questions – this allows the development of a strong interactive atmosphere where they feel supported. Once this is set, you can expand. I thought this was good advice for me. It is important to define which projects to actually work on and to follow through with. One gets excited about things, but of course resources are limited. You want to select a project that has reached a certain point to avoid wasting time and energy. As for the people, it's really important to get people who are genuinely motivated – people who are excited about the work and

really want to help answer the questions of the lab – because it's very difficult to motivate people who are...not so motivated!

What elements, inside or outside the lab, have been key to your success so far?

I think a key factor for keeping the lab running and things progressing is ensuring that people are indeed happy to work in your lab. It doesn't mean everyone will be happy all the time; things sometimes don't work, and that's the way a PhD goes, right? There are moments of frustration and moments of happiness, but in general if people help each other, it works better. I also try to keep projects in the lab different. There's already a lot of competition outside of the lab and that's enough. I don't want my students and lab colleagues to fight over data or projects. So I'd say keep it simple and keep people happy. I also do sports with my lab. We try to do some kind of work out every day.

That's unusual!

I actually had a comment from one of my students once who said 'I thought we'd have cakes for our breaks'. Well, I'm an insulin-dependent diabetic, so I said 'sorry, no cake, we're going to do a work out instead'. I think she was disappointed. *Laughs*

“[...] it's really important to get people who are genuinely motivated.”

How do you achieve a work-life balance when you're trying to establish yourself as an independent investigator?

The first year, especially, was not balanced at all. There wasn't much I was doing apart from setting up the lab, teaching people and getting collaborations started. In research, you learn how to do science and then, suddenly, you're a group leader and you have to deal with a completely different dynamic. When you're a postdoc, it's mostly about you and your project, but as the head of the group, it's about the people in your team. They are all different; they need different support and attention. There is and was a lot to learn, leaving little time for other things. I have also been forced to find a balance in my life for health reasons. With my husband, we remind each other that we have to stop at a certain point and do other things. Normal things. Of course, whenever we have visits from friends, we do stuff together in and around Dresden, so that's my free time.

Could you tell us an interesting fact about yourself that people wouldn't know by looking at your CV?

When I was younger, I was a semi-professional fencer. I had to stop at the time when I started university because of my diabetes, but before that I'd been on the Italian national fencing team and I was a four-time Italian champion! I spent a huge part of my time fencing, 5 hours a day. I hope I can start again for fun at some point, because it is important to me. I also do a lot of photography, painting and pottery. I have a pottery wheel and kiln.

Gaia Pigino was interviewed by Manuel Breuer, Features & Reviews Editor at Journal of Cell Science. This piece has been edited and condensed with approval from the interviewee.