

CELL SCIENTISTS TO WATCH

Cell scientist to watch – Marvin Tanenbaum

Marvin Tanenbaum performed his undergraduate studies in Biomedical Sciences at the University of Amsterdam in The Netherlands. He obtained his PhD from Utrecht University in 2010 *cum laude*, having worked with René Medema on microtubule motor proteins. He won the Netherlands Association for Medical Education (NVMO) Oncology and Utrecht University Thesis awards, and moved to San Francisco with an EMBO long-term fellowship for his postdoctoral position in Ron Vale's laboratory at University of California, San Francisco (UCSF). There, Marvin shifted his focus to gene expression dynamics in living cells and developed the SunTag method to observe single-molecules in real time. He became a group leader at the Hubrecht Institute in Utrecht in 2015, supported by a European Research Council (ERC) starting grant.

What inspired you to become a scientist?

I was raised in an environment where science played an important part; my dad is a professor in computer science and my mom was actually a science journalist. So certainly I was raised to ask questions and to think about how things work; scientific research really is the epitome of all this. You're trying to figure things out yourself and that's something that is very attractive to me. I know that my dad was eager for me to go into computer science, so I don't know exactly how I ended up in biology. I could have studied physics, which I find interesting. At the age where you choose the topic that defines your studies in The Netherlands you're 18, and I guess learning about biology and how it relates to humans and how the body works is just something very appealing at that age.

What motivates you now?

The big fascination, the red line throughout my research career, has been to figure out how life works on the level of individual molecules inside of the cell. How do you get from this soup of millions of molecules that are, sort of, brain-dead zombies floating about, bumping into each other, to this beautiful cellular architecture and signalling with a robust and reproducible behaviour? This is something I certainly found very appealing about working on microtubule motor proteins – the concept of being able to study a motor in isolation, only this molecule. This idea has also been the driving force for the development of the SunTag system during my postdoc – to be able to visualise single proteins and RNA molecules inside the cell. What does it do, and how does it make sure it gets to the right place and does the right thing?

And these are also the questions your lab is trying to answer now?

Yes, the focus of the lab is to try and understand biology at the single molecule level; how you read out the genetic code and translate genes into proteins is a fundamental question in life. I think a lot of people



Portrait of Marvin Tanenbaum.

don't know why we developed SunTag in the first place, but the goal from the beginning was always to use it for the imaging of mRNA translation. At that time, there weren't any good imaging tools to label nascent polypeptides, so we went for it. It was very, very challenging and it took me several years to get it to work. Serendipitously, we also developed a second, quite different application for the SunTag – transcriptional activation using the CRISPR system – and this was based on a great collaboration we had with Luke Gilbert from Jonathan Weissman's lab who was working on different uses for the CRISPR/Cas9 system. I just ran into him in the hallway at UCSF and started chatting, and at some point we saw the potential and started pursuing it together. So we have these tools in hand, and we want to understand the dynamics of different aspects of gene expression and how it influences important decisions in a cell's life. Bringing together studying biology at the single-molecule level and the central dogma of life has been the most fun part of my career. Now, the lab is trying to understand the randomness and the real kinetics that occur at the molecular level in translation, as opposed to previous, more global approaches.

“How do you get from this soup of millions of molecules that are [...] brain-dead zombies floating about [...] to this beautiful cellular architecture and signalling?”

Are you still doing experiments yourself?

Not really, it's almost zero [*laughs*]. It's weird, I really love bench work, especially microscopy, and I thought I'd continue doing it for years to come in my own lab, but it took only a few months and I was out of the lab. But it was also an active decision, because with all the administration and management and mentoring, it was too much to manage. I preferred giving up lab work and generating more time that I can spend on the mentoring, which I really want to focus on.

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Marvin hiking with his family at Lake Tahoe, California (2014); one of the great perks of being a postdoc at UCSF.

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

The one thing I've learned from my supervisors, and which I will also apply to my lab, is that when you're struggling to get your research paper reviewed, when you're maybe at a low point, not to stress about where the work will eventually be published. Maybe there's more visibility in the big journals, but if it's good work and it's published in a journal that people read, the work will get recognised. It's such important advice to remember when you're getting rejection after rejection: people will read a paper and appreciate it if it's good science. It's helped me out of some disappointments that we all experience on a day-to-day basis.

What is the most important advice you would give to someone about to start their own lab?

On a personal note, I love the chats with my students, something I already noticed as a PhD or postdoc, where we sit together and brainstorm over a cup of coffee. For me this is rewarding and enjoyable. Also, when you start your own lab, you will have had your ideas and tools developed during your postdoc, and now you're getting grant money and hiring people. That's a fantastic opportunity to go for something really exciting. Try to ask the biggest question you can come up with and have a longer-term strategy. As a student or postdoc, you think from project to project, but when I started the lab I sat down and invested time and effort into developing a new system. Be adventurous and try to think of something new to do, rather than the safer choice, because you do really have that opportunity, at least for a couple of years.

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

It's definitely something to think about. I have two young daughters and I have to pick them up from day-care or school, and this gives me a strict deadline of course. At first, I was really stressed out about being late for pick-up because experiments go long, but planning and time schedules improve quickly. What's indeed challenging is keeping my mind in the right place, not to constantly think about experiments at home, but to shut it down when I'm not in the lab; that can be difficult. What makes it even harder is that my wife is also a scientist and works in the same institute, so that sometimes comes up at the dinner table as well! But having someone at home that understands your passion and involvement with your work can be a

really great support too. And having a family really helps with putting things in perspective too, when experiments are not going your way.

"The potential negatives are massively outweighed by the positives you get by talking openly about your work..."

What is your advice on establishing good collaborations?

Collaborations have played a really important role during all the stages of my career; I enjoy working with people that are equally excited and have different views about science. Once you've found a good partner with complementary expertise and similar interest, or the same biological questions but different approaches, you can really enjoy longstanding collaborations that are super valuable. You don't have to be best friends, but to be a good personal match is important, with smooth communication and a similar level of excitement about a project.

How do you get the most out of the meetings you attend, particularly in the early stages of your career?

Meetings are fun, but I definitely noticed a big difference between going to a meeting as a group leader and as a student/postdoc. As a postdoc, I used to go to RNA meetings and people wouldn't know the lab because we hadn't published much on the topic in recent years. I think it can be quite tough to go to a meeting as an outsider to the field and when you don't know anyone, so as a group leader this has become easier. The one big thing is to get a talk. People will then know what you do and come up to you to ask you questions, so oral presentations are really the best way to get the maximum out of a meeting. I also try to talk to students and postdocs, and certainly younger group leaders, who simply have more time than the big people in the field who can be quite inaccessible, although it's always tempting to get a few minutes with the leaders in the field. I just talk to people a lot at meetings, and I like to share my results and be open about them. Of course there's a risk that if you talk too much someone will scoop you, but I've experienced the other side way more often: you get nice feedback talking about unpublished data, ideas for the future or even a collaboration. The potential negatives are massively outweighed by the positives you get by talking openly about your work, in my opinion.

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

It's science related, but kind of a funny story that people ask me about quite often: why did I go to Ron Vale's lab to work on mRNA translation? Because as a PhD student I was already the only one in my lab working on the topic of microtubule motors for a long time, and I always thought it was too bad because I missed out on talking about the project to people. Therefore, I thought for my postdoc I'd go to THE microtubule motor lab and it would be amazing. Once in Ron's lab I had some ideas for working on motor proteins, studying mRNA transport, but then I thought why do I care so much about RNA transport? Wouldn't it be more interesting to see where the RNA actually gets translated? That's how the ball got rolling on translation and everything about motor proteins got lost in that project, and at the end I was the only one in the lab working on translation – ironically, much like what happened during my PhD!

Marvin Tanenbaum 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.