

**Interview with Misha B. Ahrens, Ph.D.
Awardee of the Eric Kandel Young Neuroscientists Prize 2019**



**Eric
Kandel** Young
Neuroscientists
Prize

What motivates you for your research?

Working with talented and inspiring lab members, and seeing them grow as scientists, is a huge daily motivating force. On a different level, the search for deeper and more complete knowledge is a major part of what has driven humanity forward. The fact that it's a creative and exciting process is a bonus. Although our focus is on reaching a fundamental understanding of the brain, we think our research can help people in the long run. This could happen through mental health treatments; furthermore, understanding our brains better will hopefully create a better understanding between humans on a personal level to create more tolerant societies. A deep understanding of neural circuits may also impact computer science, for example by uncovering the dependencies of nervous system function on physical processes on many spatial scales (from large circuits to molecules), something that is currently not actively being utilized in machine learning.

What qualities should a researcher have in your field?

Curiosity and an eagerness to learn new things. Our research depends on combining multiple approaches to answer questions, from mathematical tools to molecular biology. It is rare that someone enters the lab with all this knowledge, and we rely on teaching each other every day. It is also important to have a desire to get to know zebrafish behaviour, even try to imagine being a zebrafish ourselves, imagine what types of problems their nervous system needs to solve, and how this might coincide with problems we as humans need to solve.

How did you come to your research field?

Following my undergraduate in mathematics and theoretical physics at Cambridge University, I was about to start a PhD in string theory, when I changed my mind and switched to computational neuroscience. This decision was partly inspired by summer research I had done with Juan Delius, a neuroscientist, in Germany - and the idea of applying mathematics to understanding the nervous system had been in the back of my mind ever since. During my PhD, with Maneesh Sahani at the Gatsby Unit, I was creating statistical methods for understanding information processing in the auditory cortex and I felt the urge to get a first-hand look at brain activity myself. Clever animals with small brains seemed the most tractable way to understand brain function, so I picked the larval zebrafish and went to the Engert lab at Harvard for a postdoc. Following this, I started a lab at Janelia and established light-sheet functional imaging of entire zebrafish brains with Philipp Keller. That allowed us to record activity across the entire brains of behaving animals, and we were ready to study how cells work together to provide animals with the building blocks of intelligence.

Why are you doing research in the USA?

Things just turned out this way - Janelia provides a unique research environment that I wanted to be part of; it just happens to be in the United States. I also like to live in a society that is international and open to people from anywhere in the world. This is still a great component of the States, and something that we should value, improve, and maintain.

How do you recharge energy during strenuous phases in the lab?

Scientifically, strenuous times can be some of the most productive and supportive times in the lab. It can be uncomfortable when questions are wide open or risky decisions need to be made, but those are also the times when people come together and maximize collective creativity. On a personal level, it's important to maintain a healthy routine of spending time with others, exercising, eating and sleeping well, and perhaps meditating.

Do you have a motto for your work?

Be prepared to be surprised. We may not be able to fully imagine how the brain works, so it is important to keep an open mind, let the data speak for itself, and embrace the unexpected.

Who should the results of your research work help in the long term?

Humanity and society. A better understanding of the world around us and of ourselves is important for its own sake, but an important aspect of studying the brain is to contribute knowledge that will one day improve mental health and improve the lives of people in general. Exactly in what manner this will happen may not yet be predictable, but many applications of neuroscience to health care already exist. I also hope that understanding how our brains and minds work will make people more understanding of each other and eventually help create better and kinder societies worldwide.

Who would you like to meet for a coffee?

If I could have coffee with any historical figures, I would like to meet Ada Lovelace and Nikola Tesla. Ada Lovelace is considered one of the first computer scientists and creators of algorithms, which play a huge role in the world two centuries later. She also wanted to create a computational model of the brain. Tesla was a pioneer of using electricity in applications that must have seemed like magic a century ago (and still do, in some sense). The way in which their fields were wide open at the time may be similar to how neuroscience is wide open in the current time. I would like to know more about how they used their imagination and logical thinking to solve the problems they worked on and create new inventions. It would also be nice to tell them about the world as it is now.

Why is zebrafish particularly suitable for your research?

Zebrafish combine the best of many worlds. They are quite sophisticated animals when they are just one week old - they hunt, learn, explore, and so on. Their brains are small enough that a full understanding of them may be achievable; moreover, their small size makes it possible to image brain activity in almost all neurons at the same time with light microscopes, even as they are behaving. Zebrafish and mammals including humans share many brain areas, which means that discoveries in one animal can easily inspire studies in others. We may study other organisms in the future, but the advantages of zebrafish will be hard to beat, so I think they will remain a component of the lab for quite some time.

Thank you very much for your time!

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