A Conversation with Botond Roska

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Kate Fehlhaber (KF): Hello, and welcome to this special edition of Knowing Neurons. I'm here with Botond Roska from the Friedrich Miescher Institute for Biomedical Research, and he studies the visual system all the way from the retina to the brain. So Botond, let's talk a little bit about your research. Can you tell us, what are the main questions in your lab and how are you trying to answer them?

Botond Roska (BR): Yeah, so, there are two main questions. And one question is that how certain elements in the visual system compute visual information, and the second is that how can we use this knowledge to help patients who are suffering in visual diseases when we combine them.

[0:42] KF: So, what techniques are you using to answer the first question?

BR: So, we use a variety of techniques. Conceptually we use electrophysiology and imaging to read out activity of neuronal talk, while we stimulate with light the visual system. And then for our manipulation, we use mostly optogenetics and genetic manipulation, so we use viruses and transgenic mice to bring into the specific cell types and then modulate them with a variety of genetic tools.

[1:14] KF: Wow! And how about your more translational work?

BR: In the translational work, we use gene therapy, a new form of gene therapy, this is called optogenetics gene therapy, so we use optogenetic sensors to try to target into cell types in the retina, with which then we try to rescue it or bring back visual activity to a blind retina.

[1:37] KF: That's great! How about for your Presidential Lecture that you're giving at SfN on Monday, November 17th? What are you going to speak about?

BR: First, I will talk about our circuit studies in the retina and the thalamus and the cortex to show how local circuits compute information, visual information. And then second, I will talk about the work in which we try to understand photoreceptor cell biology. What is the mechanism that keeps the light capturing apparatus of photoreceptors in good shape? And then I will show then how can we use this sort of understanding to build a retina from embryonic stem cells, which are functionalized, which are light sensitive.

[2:18] KF: So you're looking at the visual system circuitry in the retina, and then separately from the thalamus to the cortex?

BR: Yes, most of my work up to a few years ago was in the retina, and a few years ago we also started to study the thalamus, which is the region the retina sends information, and then at the entry level entry sight of the visual cortex, where the thalamus sends information.

[2:45] KF: OK. So, I'd like to ask you some questions about how you got to your current position. So, yeah, how did you get to where you are today?

BR: Mostly randomly. Well, you know, I've done a lot of things in my life. And, sort of, every turn was somewhat random, somewhat planned. So, I started my life as a cellist, as a musician, in Hungary, where I grew up, in Budapest. I was at the music academy there, and then I had an accident, and so I had to stop it. And so there I had to think what I will do, and I choose to study mathematics and medicine. And after finishing medicine, I was not sure I wanted to be a medical doctor. So, I got very interested by the work of Hodgkin and Huxley that brought me to use mathematical modeling and recordings, and that brought me to neuroscience. So, I started a Ph.D. at Berkeley, where I studied retinal circuit physiology. I enjoyed a lot my time, and I thought that I stay in research, but I also thought that the techniques or the approaches at the time were not adequate to really manipulate the system, to perturb the system. And, I was fortunate to become a Harvard Junior Fellow, where I could do a sort of freelance science around different departments. I was studying genetics and virology under the guidance of Connie Cepko, and then on the other side of the river, Markus Meister helped

me. So, putting together this knowledge at the end, I learned about viruses and genetics and physiology, and then I thought that I'd like to use all this then to understand the visual system. And, I get a position here in Basel, here in Switzerland, and this is what I started to do; I started to combine the two. And since, I'm here, and enjoying combining these different techniques to understand and to manipulate the visual system.

[4:43] KF: So you didn't always want to be a scientist, but once you started…

BR: No, not at all. Not at all. It really came at the end of medical school, where I said I might be interested and I might try out.

[4:49] KF: So, it sounds like grad school was kind of a pivotal moment for you. Was there a favorite memory during that time in Berkeley?

BR: Yeah, I really enjoyed. Of course, I, I really really enjoyed. And, I enjoyed tremendously to think, one is my conversation with my advisor, Frank Werblin, and the second one is my conversation with the retina. This is where the place is I realized that for me the way to do research, at least at that time was, that I don't read too much, I don't, you know, ask people too much, it's that I record a lot from the retina, where I stimulate them with different light measures. I did this for five years, almost every day recording, and really the retina taught me everything about itself. And I just found it remarkable, and I still think this is the best way to do research – not to ask people, but to ask the brain.

[5:54] KF: So is that the piece of advice you would give to young scientists today?

BR: Very much so. So, listen to the experiment and not your colleagues.

[6:02] KF: So how much of being a successful scientist do you think is luck and how much do you think is hard work?

BR: I think both is required, and I think hard work is very important, but also I would say that it's only worth to do it when it's really a passion, when hard work does not seem to be hard work, but it's seems to be very hard not to work. I think that's how I live my life. For me, that's what I love to do, is to work. I get very nervous when I go to vacation; after a few days, I already think that there is something missing. And luck is also needed because at one point, you know, we are searching, and luck is really important. But I would say that if somebody is working very hard and whose laboratory is where there is a lot of excitement, then there is a higher chance for luck to happen.

[6:52] KF: Do you think that having a good mentor plays a big role in your success?

BR: Yes, but I also think that there are many different ways to be good mentors, so what is a good mentor for one person might not be a good mentor for another person. I think there is really a match between two people.

[7:11] KF: All right, so let me ask you, just to switch gears a little bit, some fun questions! So, is there a neuroscientist you admire today?

BR: Yes, of course, there are many I admire. But particularly, I'd like to mention David Hubel, who passed away very recently. He studied and he discovered the course of visual, the structure of the visual cortex, and I was fortunate to sit close to him every Monday when I was a Junior Fellow at Harvard, and I learned a lot from him, and I admired not only his science, but also the way he looked at science and the way he lived his scientific life.

[7:53] KF: What do you mean by that? Because he was so passionate about it?

BR: And also, he just cared about the experiment. He went in everyday, he did experiments and went home learning something, and the next day he came back, and again there was an experiment. He lived from experiment to experiment, and I think that this is really what I like. Now, I don't do experiments myself, but I really really enjoy looking the experiment and thinking about new experiments.

[8:20] KF: Yeah, absolutely. The new data is the most fun part about science!

BR: That is exactly right.

[8:27] KF: So if you weren't a neuroscientist, what would you be doing?

BR: Well, I would likely be doing mathematics. I am fairly sure that if tomorrow they tell me that I have to stop neuroscience, I would do mathematics. I am very interested in mathematical logic, which is a little bit abstract and quite far away from neuroscience, but that's what of my passions.

[8:50] KF: Do you get to do that at all?

BR: I do. Usually every day, I do an hour of proofs in mathematical logic.

KF: Wow!

BR: This is my morning right. I have not, and also I am not working anymore with my hands in the lab, so I mostly sit and talk to people, I look at data, and think.

[9:14] KF: So now we are to the lightening round! Coffee or tea?

BR: Coffee.

KF: Go to comfort food?

BR: Well, I'm not sure I have a comfort food.

KF: What's your favorite food?

BR: My favorite food is called Asian Kitchen.

KF: What's your favorite place in the whole world and why?

BR: It's my room. That's where I usually sit and think. That's my favorite activity: to sit and think.

KF: And what dead person would you most like to meet or get advice from?

BR: Bertrand Russell. He was one of the founders of mathematical logic and an incredible person. Probably that would be my favorite meeting.

KF: Well, thank you for talking with me and answering all my questions.

BR: It was a pleasure to talk to you.

KF: You too!

BR: OK. Bye, bye.

KF: That was Botond Roska, speaking to me from Basel, Switzerland. We look forward to hearing his Presidential Lecture at SfN this year! If you have any burning questions about the brain, leave us a message or tweet us at @KnowingNeurons!