Visions, needs and requirements for (future) research environments: An exploration with ERC Grantee Nicolas Schuck

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Researchers are at the very heart of the EOSC: So what do researchers really need to do cutting-edge research? How do they think the EOSC could support them in their endeavours? Let's see what Dr. Nicolas Schuck, Leader of the Max Planck Research Group NeuroCode - Neural and Computational Basis of Learning, Memory and Decision Making, has to say.

"Establishing an on-going dialogue on the research system and researchers' needs"

TU Wien: What does your research currently focus on?

NS: My work focuses on the neural basis of decision-making and memory. One particular process that we are investigating right now is called "replay". During this process the hippocampus — a brain area located deep inside the temporal lobe — rapidly reactivates memories. Research has shown that the sequential reactivation looks like the brain is recapitulating, or replaying, past experience. That is why it has been called replay. It is not entirely clear what role this process has in decision-making, and one particular challenge has been to investigate the process in humans, where we can measure brain activity only very indirectly. So part of our work is not only to understand what replay is good for, but also finding tools that will allow us to measure it in humans, rather than animals.

TU Wien: What data sets are you working with to answer your research questions?

NS: We mostly use functional magnetic resonance imaging (fMRI) and computational models, and we often analyse the human brain imaging data using "custom made" statistical tools. One particular interest is of mine is to combine more traditional research methods with insights from machine learning.

> "Science is often a process that is filled with failures. Failures cost time, but they have a very useful function and we learn a lot from them"

TU Wien: What would you need to increase your research capacity?

NS: Generally, I appreciate and enjoy the excellent computational imaging facilities at the Max Planck Institute. What could make my team/lab more efficient is more "technical" exchange between researchers. For instance, we often find solutions to different aspects of data acquisition or statistical analysis, such as how can we get the most signal in a particular brain area. I think there could be a more streamlined process, which would make it easier to access solutions that other researchers worldwide have already found. Sharing these

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insights, which are often technical rather than scientific issues would be great.

TU Wien: What else would you need for your preferred future research environment or for your preferred actual research environment?

NS: I would like to dedicate more time to deep theoretical work and that would require me to focus on a single project for a longer time. I have many responsibilities, such as running the lab, which often result in chasing from one task to the next. Additionally, there is publication pressure and very frequent career changes. These responsibilities and pressures sometimes hinder working on long-term projects.

TU Wien: OK. So what needs to happen to change that?

NS: I think that careers in science are very focused on the achievements of individuals, and these achievements have to be evaluated in relatively short time frames. This has led to a structure in which we often try to create projects that can be spearheaded by a single person. That can reduce the complexity of the projects that we work on. These kind of projects need to be finished within a certain amount of time because we know in so and so many years this one person will have to be evaluated. And people will be looking for one piece of finished work where it is very clear that the responsibility and the credit for this work is assigned to this one person. I think that finding different ways of assigning credits in science could be very helpful and that would allow us to work in larger teams and increase the timeframes in which we are evaluated. Giving us more time would also be helpful, because science is often a process that is filled with failures. Failures cost time, but they have a very useful function and we learn a lot from them. In other words: we need time to get stuff wrong. Of course, there needs to be accountability and people need to make sure from the outside that experiments are not doomed from the start. Right now, however, you often cannot afford do really cutting-edge research, because you have to show frequent success.

> “I hope that in the long-term science is going to be as thriving and international as it is today”

TU Wien: So these needs are needs that actually concern the immediate future. On a more macro level, where do you think science is heading?

NS: I hope that in the long-term science is going to be as thriving and international as it is today. Right now, I am afraid that the rise of nationalism will make it a lot harder for us to keep that international exchange within science going. As I mentioned before, I really hope that the future will bring more team science, in which you can work in larger teams to solve problems in a more thorough manner, with more time. It would be important to prevent teams from getting too big. It would not be helpful if we had huge centralized institutions with thousands of researchers working on the same topic, because then diversity of ideas and creativity would be lost. However, for the purpose of publishing papers, I would like to see groups going beyond the typical team size, which is now between two and five people. I do hope to see slightly larger teams in the future.

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TU Wien: What is your personal worst-case scenario for future research environments?

> "I do not want to see an ever-increasing need to publish papers at a faster rate. Publishing good papers should be the priority"

NS: I do not want to see an ever-increasing need to publish papers at a faster rate. Publishing good papers should be the priority. I also think that we are sending more and more people into the scientific system, without really thinking about what will become of these people. Right now, I think that the university system is not sustainable, because we keep opening graduate schools and have very talented young people that become early career scientists. However, all of these scientists eventually want to have post doc positions, then they want to have PI positions, and then they want to have tenured professorships. Rightfully so. But unfortunately, these positions do not exist. This increases the pressure on young graduates, which is not only harmful for people but harmful for science, because people focus on maximizing the reward system that is focused on individual papers and citation counts. That cannot be the best way forward.

TU Wien: Having said all this, what do you want from the European Open Science Cloud?

NS: It is a great idea to connect researchers on a European level and listen to what is on their minds. It would be good to establish an on-going dialogue on their needs, and on the system. It is a very competitive system, which causes many researchers' continuous worry about their careers. I think that listening to that reality and trying to think about how we can make the system overall functional would be useful. I would like to see a focus on both maximizing scientific outcomes and on the way the system works for the researchers.

Nicolas Schuck studied Psychology at Humboldt University in Berlin (2004-10) and was trained in Machine-Learning during an Exchange at University of Toronto (2007-08). He then completed his PhD in Psychology at the MPI for Human Development between 2010 and 2013 and continued to a Postdoc position at the Princeton Neuroscience Institute (2013-17). He was selected as a Max Planck Research Group leader in 2017 and received a prestigious ERC Starting Grant of the European Research Council in 2019. His lab is based at the MPI for Human Development in Berlin.

His work focusses on how the brain allows humans to learn and make decisions, and how we can lift these secrets using brain imaging techniques. His lab studies topics related to representation learning and replay in the human brain, and the role of these processes in memory and decision making.

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