Interview with Hervé Rouault (CPT – INMED, Marseille, France)

- Could you briefly describe your academic background and experience?

I was trained in physics at the École Normale Supérieure in Paris. Following my master thesis, I did my Ph.D. in the Laboratoire de Physique Statistique at the École Normale Supérieure with Vincent Hakim. The project consisted in understanding the specification of animal cell fates among assemblies of cells from a theoretical point of view. I studied the dynamics in space and time of protein concentrations that determined cell destiny for the development of organisms.

I collaborated with an experimental team led by François Schweisguth from the Pasteur Institute in Paris. I applied the theoretical concepts I developed to the formation and spatial arrangement of the peripheral nervous system of the fruit fly, Drosophila melanogaster. Shortly after my Ph.D.

I pursued research with François Schweisguth and looked at the patterns of cell fate specification under the microscope. I then decided to continue looking at the spatio-temporal dynamics in biological systems and continue to leverage the genetic power of the fly system. I moved to the United States and did a postdoctoral internship at the Janelia Research Campus in Virginia. I deciphered the nature of the neural activity of an internal compass that the fly is using to orient itself while navigating. This system bears a striking resemblance with other neural circuits present in the brain of mammals.

- What led you to interdisciplinary research?

I remember being fascinated when I was still a teenager by the range of applications of non-linear physics, from the description of the stripe patterns in zebras to the laws governing the regularity of droplet formation in a tap.

It was one of the reasons why I decided to work on the development of organisms during my PhD. I also tremendously liked the experience of collaborating with experimentalists on a joint project.

I changed my research subject for my postdoc in the US, but continued to conduct interdisciplinary approaches. It is an effective way to generate new successful ideas in the different fields of research it emanates from.

- What led you to CENTURI?

The CENTURI initiative was a perfect match for my background. Research in neuroscience, of premier importance, is led at the Inmed, in Luminy and in the Aix-Marseille University. I am thrilled to be part of the emerging theoretical efforts in neuroscience. I expect to help foster new collaborations between the Center of Theoretical Physics, which is my main affiliation, and the Inmed.

Moreover, the research conditions offered by CenTuri are excellent. I will be able to quickly develop a research team, even before applying to other funding grants.

- Could you describe us your research projects and perspectives within CENTURI?

I propose to study how the different spatial environments an animal experiences are internally represented in the brain. I intend to leverage recent advances in the theory of recurrent neural networks and machine learning to decipher the neural networks that support our persistent representations of space. I plan to explore first how animals orient themselves in 3D spaces.

- What are your first impressions about CENTURI?

I am very excited to take part in the early stages of the Turing Centre. I was able to quickly communicate with many groups I intend to work with, in the future. The research on the campus is very active, and I was glad to witness how eager the researchers are to develop interdisciplinary approaches and collaborate with theoreticians.