Bridging the Gap: from Brain Mechanics to Brain Dynamics

26 - 30 September 2022 Lorentz Center@Oort

Scientific

Description and aims: The human brain is one of the most fascinating objects in the living world. Besides keeping us alive by regulating all vital functions, such as our heartbeat, respiration, and sleep rhythms, it is involved in all our feelings, thoughts, decisions, and sustains our learning processes and creativity. Interactions between mechanical processes, both fluid and solid, and the dynamics of large neural networks are key to shaping brain's form and function and are involved in transitions between health and disease. Yet, these interactions are poorly understood. This workshop aimed at promoting cross-disciplinary research on this topic by bringing together experts in experimental, theoretical and numerical aspects of brain mechanics and brain dynamics and experts from fundamental and clinical neurosciences.

Tangible outcome: Most participants have been willing to get out of their comfort zone to engage in discussions spanning out of their own field. This led to interesting novel ideas at the interface between brain mechanics and dynamics, even if at the same time pointing out to tremendous difficulties due to the limitations of current experimental investigation tools. A perspective paper summarizing the ideas discussed during the workshop, is in preparation by the organizers and co-chairs, with a unique template for the three selected sections (Genesis, Zoe, Ptosis). A sub-group of participants has volunteered to organize a follow-up meeting in two years.

Scientific breakthrough: there is not one specific scientific breakthrough, but we believe we planted seeds for the breakthroughs to come.

"Aha" moments: When the audience realized the ambiguity of "brain dynamics", which can both relate to dynamical processes in the sense of mechanical sciences or in relationship with neuronal processes apprehended with the concepts of dynamical systems.

Organization

Format of the workshop: our workshop was organized in a fully "in person" format, with only a few speakers with last minute impediments (e.g. covid positive) giving their talks remotely through the Zoom interface. Scientific sessions were planned to be transdisciplinary, with no announcement of the talk titles in advance, so as to maximize attendance to all talks. As recommended by the Lorentz team, we scheduled ample time for organized discussions, some in sub-groups, some plenary, with ECR participants selected as co-chairs by the organizers to present syntheses of previous discussions. These discussions helped to structure the writing of a perspective paper (see above), which is currently in progress.

Other comments: A large majority of participants, if not all, deeply thanked the organizers and Lorentz team for gathering this eclectic group of researchers, interested in many aspects of brain mechanics and brain dynamics, and with previous record of trans-disciplinary work. The relaxed and friendly atmosphere, that the Lorentz center settings helps to foster, has also been highly appreciated, as well as the beautiful beach location of the workshop dinner, that became quite wild due to heavy rain and winds.

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