"From mathematical modelling by structured cell population dynamics for cancer plasticity to philosophy of cancer: role of the atavistic theory"

A plenary conference by **Jean Clairambault**, INRIA & Laboratoire Jacques-Louis Lions, France

Wednesday, the 8th of June 2022, 16h-17h

at Laboratoire TIMC, pavillon Taillefer, room R31, Domaine de la Merci, La Tronche, France

and via Zoom (link below)

Jean Clairambault is emeritus senior scientist (directeur de recherche DR1) at INRIA Paris, MAMBA team. His research interests mainly focus on mathematical models for biology and medicine. He is particularly interested in the following subjects:

- evolution of phenotypes in cancer cell populations ("cell Darwinism") towards drug resistance,

- physiologically structured partial differential equation models for cell population dynamics,

- pharmacotherapeutic optimisation in oncology w.r.t. toxic side effects and drug resistance.

Abstract. I will firstly show how continuous mathematical models of cell populations, taking into account relevant biological variability by so-called continuous structured variables are valuable tools to study cell population evolution. Such structure variables may be of various physiological or pathophysiological nature, either biologically accessible by measures, such as quantitative expression of genes of resistance to a given drug, or more hidden, representing, *e.g.* fecundity, viability, plasticity with respect to functional phenotypes in cancer cells. An application to theoretical optimal control of cancer growth in an organism comprising healthy and cancer cells populations, coping with both toxic side effects of drugs in healthy cell populations and evolution towards drug resistance in cancer cell populations will be presented.

Then I will show how working toward understanding and controlling drug resistance in cancer makes us naturally and recurrently ponder on the question of what is disrupted in cancer, that is normally functioning in multicellular organisms (as cancer is a disease of only multicellular organisms). Toward this goal, philosophers of biology, focusing on cancer, have made proposals that should be integrated in a billion-year evolutionary perspective, which the unifying atavistic theory of cancer provides with reasonably convincing arguments. I will present a viewpoint on cancer interpreting plasticity as a loss of control on cell differentiation, that allows uncontrolled cancer cells to efficiently replicate under stress by mobilising normally unused genes, that have been silenced in the course of coherent development of multicellularity, a view which is enlightened by the atavistic theory of cancer.

Link for the visio-conference :

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