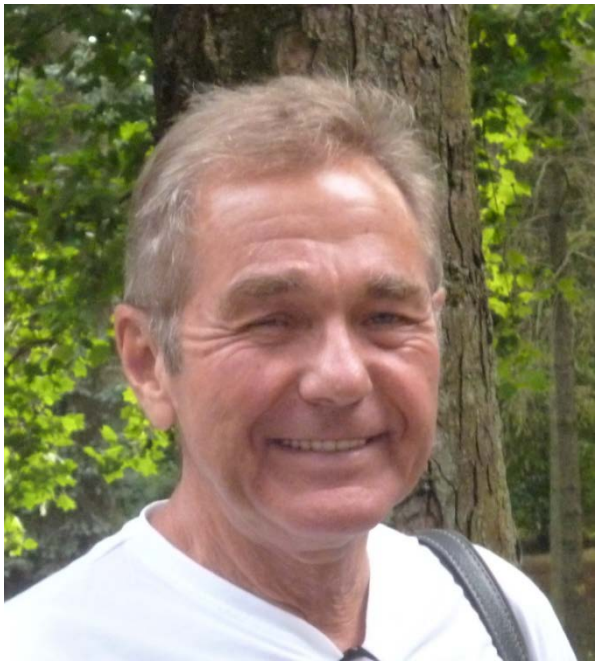
# ICUB Talks: Exact Sciences Section

## Prof. Jurij Kozicki (Maria Curie-SklodowskaUniversity, Lublin, POLAND)

## A Mathematical Theory of Self-Regulation in Infinite Populations



**Spatially structured large populations are modeled as discrete subsets of their habitats, usually consisting of single points if the shape of an entity is not important. Quite often, the evolution of such a population amounts to the appearance and disappearance of the constituents, possibly affected by the existing population. If the appearance/disappearance of an entity at a given point is affected only by the part of the population located in a neighborhood of this point, the interaction between the entities is referred to as local. Such interactions determine the local structure of the population. In the dynamics of a finite population of this kind placed in a noncompact (infinite) habitat, the dispersal to empty parts of the habitat prevails and the local interactions are not important. Thus, to reveal the role of the local structure on the global behavior of the population, it should be modeled as an infinite system of points in a noncompact habitat. In the talk, the mathematical framework for the description of such models will be outlined, and then the role of local interactions in preventing certain global effects (self-regulation) will be shown for two migration models. In the first model, the entities immigrate independently with a spatially dependent rate and emigrate (dye), also due to a local competition. For this model, we show that the local competition prevents the system from an unbounded increase in time. In the second model, the emigration is like in the first one but the immigration is subject to a local attraction by the existing population. The role of the attraction is to produce clusters of entities, which, as we show, persist or disappear depending on the presence of the local competition between the entities.**

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