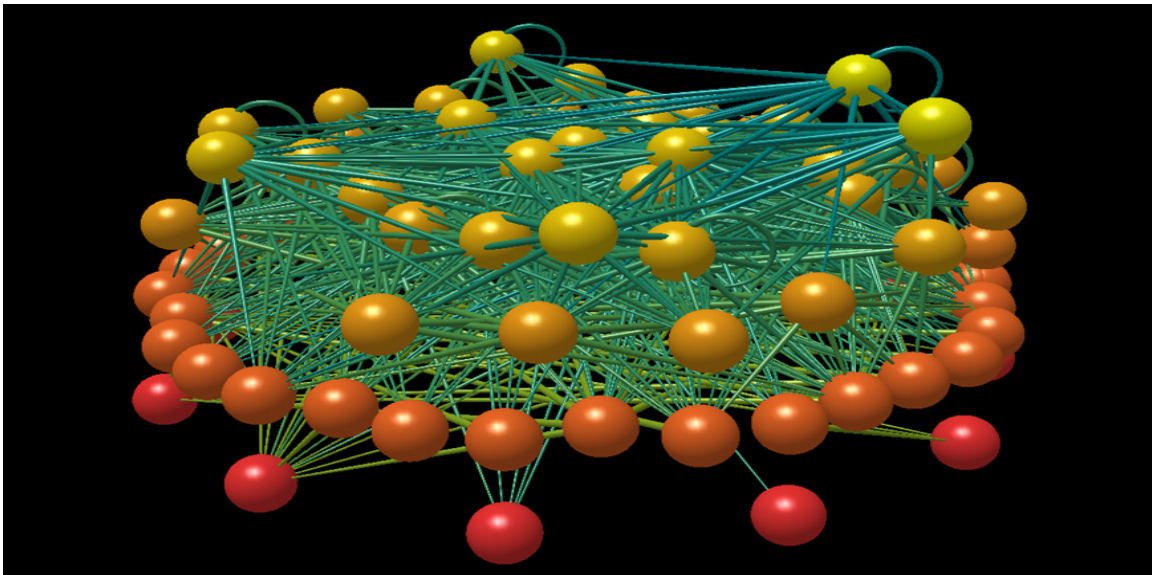


Dynamics of Interacting Species in Ecosystems

Dynamics of interacting species is a central problem to characterize ecosystems. Although its study started long ago, very few results are known in cases in which the number of species is very large. The recent advances in experiments, in particular in biology, are more and more focusing on situations where this is the case (e.g. bacteria populations).

Understanding and characterizing the dynamical behaviour of many species that interact through cooperation and competition is a theoretical challenge. Similarly to what happens in glassy systems, where frustrated interactions lead to many possible ground-states, ecosystems of a very large number of species have the potentiality of displaying a very rich behaviour: just one equilibrium, very many possible equilibria or even chaotic regimes.

The internship will focus on this kind of issues. Its aim is to study analytically the dynamics induced by Lotka-Volterra equations for many interacting species. In particular, we want to obtain the dynamical phase diagram and compare it to the numerical results obtained very recently.



Example of interacting ecosystem : Food web from Little Rock Lake, Wisconsin, USA (Martinez 1991), containing 92 trophic species and 998 feeding links between the species. The thick ends of the links attach to the predators and the thin ends attach to the prey. The vertical axis is trophic level, with plant species in red at the bottom of the image and top predators in yellow at the top of the image. Highly connected species are towards the center of the image while less connected species are placed towards the outside. Loops indicate cannibalistic species.

The internship work is for theoretically oriented students. It can possibly be continued into a PhD. The student will be involved in all Parisian events and activities of the Simons collaboration “Cracking the Glass Problem”.

Advisor: Giulio Biroli

Email: giulio.biroli@cea.fr

Lab: IPhT CEA Saclay, LPS-ENS Paris

(I spend half of the time at the IPhT-CEA Saclay and half of the time at the LPS-ENS so the student can be associated and located in one of the two)