Characterizing predator-, prey- and self-control in complex food webs

In simple food chain models, many important ecological patterns, such as biomass and energy distributions, predator-prey cycles and extinction cascades, are largely governed by a single dimensionless metric, relating how susceptible each species is to perturbations on its own and others' dynamics. In more complex ecological networks, we expect the same ecological patterns to depend on more subtle features of the interaction matrix. This project will combine algebraic, dynamical and graph perspectives to characterize an ecosystem-wide tendency to be controlled from the top by predators, from the bottom by prey, and/or for each species by its own effective self-regulation, with the aim of being able to recognize these different types of ecosystems in Nature.