



Pacific Institute *for the*  
Mathematical Sciences

# PIMS - UVic Distinguished Lecture

## Julien Arino

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Thursday, November 22, 2018  
3:30 pm

Clearihue Building  
room A202

Meet-and-Greet with refreshments prior to talk at 3 pm in DTB A514



## Population persistence in a source-sink metapopulation

The problem of source-sink dynamics in mathematical ecology originated with a 1969 paper of Levins. The idea is that a species lives in an environment that is heterogeneous: some locations are favourable to the species persistence (sources), while others are unfavourable and can only be populated if there is an inflow of individuals to these locations (sinks). This setup has been studied extensively in the case of so-called Levins-type metapopulation models, which count the number of locations (patches) in various states and couple them implicitly. The case of metapopulation models with explicit movement, where individuals move between locations, is less known.

In this talk, I will discuss the solution to a simple problem set in the latter context: is there a critical number of the number of patches that are sources such that the population persists in the entire system when the number of sources is above the threshold? An existence result is provided that relies heavily on matrix analysis, illustrating the power of linear algebra in this type of large scale problem. In a particular case, the principle of equitable partitions allows us to obtain an explicit form for the threshold. This is joint work with Nicolas Bajeux (University of Manitoba) and Steve Kirkland (University of Manitoba).