**Traffic in argentine ant trail networks**

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Argentine ants build networks that connect their multiple nests to each other and to food sources. In 2011, we found that these networks approximate solutions to shortest path problems (minimal spanning trees and steiner minimal trees). This behaviour is an example of swarm intelligence, where relatively simple individuals (an ants brain is smaller than the period at the end of this sentence), work together to solve complex problems.

We are now interested in understanding how traffic is regulated within these optimal networks. For example, what happens when traffic suddenly increases? Do the ants reshape their networks? Do they build extra trails, and are these trails in optimal locations? We are also interested in learning how individual ants move through the network as this has a major impact on overall network efficiency. There are three potential projects: one will investigate the movement of individual ants through the trail network, with the goal of determining how network topology influences the efficiency of food delivery. The second project will investigate the response of trail network topology to an increase in traffic caused by the introduction of a food source. Both projects will require lab experiments on argentine ants; data will be analysed using techniques from graph theory. Students with a strong background in individual based modelling have the option of a computer based project that aims to model the influence of network topology on the efficiency of food spread through ant trail networks.

**Suitable for** students who are comfortable working with live ants in a laboratory setting. Some knowledge of graph theory is useful, but not necessary. Students interested in the third project do not need to do laboratory work, but must have a strong background in computer modelling, and an ability to work independently.