

Self organized pattern formation and dynamic properties of social insect nests

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Social insects, such as ants and termites, build collectively large scale nests and complex systems of trails. These structures present a coherent global organization and sometimes appear to show near optimal properties : protection from predators, homeostasis of internal temperature, efficient internal transportation networks. In spite of the coherent global organization, the final form of the nests is the result of simple self-organized processes, and depends on the interactions that individual insects undertake with conspecifics and with the substrate. With a series of experiments on ants, we identify the mechanisms of individual behaviour that are more relevant for understanding the formation of the final nest. In parallel, we take 3D X-ray tomography images of different ant and termite nests. By analysing these images and modeling the internal system of galleries with complex networks we can measure the properties of connectivity and transportation of these structures and make hypotheses about the factors that have shaped their growth and their ecological functions.

