Abstract Submitted
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Congestion and communication in confined ant traffic[1] NICK GRAVISH, Harvard University, GREGORY GOLD, ANDREW ZANGWILL, Georgia Tech School of Physics, MICHAEL A.D. GOODISMAN, Georgia Tech School of Biology, DANIEL I. GOLDMAN, Georgia Tech School of Physics — Many social animals move and communicate within confined spaces. In subterranean fire ants *Solenopsis invicta*, mobility within crowded nest tunnels is important for resource and information transport. Within confined tunnels, communication and traffic flow are at odds: trafficking ants communicate through tactile interactions while stopped, yet ants that stop to communicate impose physical obstacles on the traffic. We monitor the bi-directional flow of fire ant workers in laboratory tunnels of varied diameter D. The persistence time of communicating ant aggregations, τ, increases approximately linearly with the number of participating ants, n. The sensitivity of traffic flow increases as D decreases and diverges at a minimum diameter, D_c. A cellular automata model incorporating minimal traffic features—excluded volume and communication duration—reproduces features of the experiment. From the model we identify a competition between information transfer and the need to maintain jam-free traffic flow. We show that by balancing information transfer and traffic flow demands, an optimum group strategy exists which maximizes information throughput.

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