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Pellet formation, manipulation and transport by ants fire in confined environments DARIA MONAENKOVA, NICK GRAVISH, RACHEL KUTNER, Georgia Institute of Technology, School of Physics, MICHAEL A.D. GOODISMAN, Georgia Institute of Technology, School of Biology, DANIEL I. GOLDMAN, Georgia Institute of Technology, School of Physics — Red imported fire ants, Solenopsis invicta, form colonies of thousands of animals living in complex subterranean nests. Frequent nest relocations in response to flooding require that the ants be excellent excavators. In granular media, the ants excavate soil in the form of pellets composed of several grains and held together by capillary forces. We challenged groups of small and large ants (measured by head width S) to create soil pellets in granular media composed of fine and coarse glass particles mixed with water (W=0.01 and 0.1 by mass). In coarse soils (D=0.7 mm diam., comparable to S) neither S nor W affected pellet volume; pellets were composed of only one grain. Pellets larger than one grain fell apart during their formation or transport. In fine soils (D=0.24 mm diam.) the higher cohesion and smaller D allowed for greater flexibility in pellet formation; pellets were formed from 1 to 22 grains with the median pellet composed of 6 grains. Surprisingly, despite the ability to cohere more strongly, the pellet size did not change as W increased. We hypothesize that although the cohesion allows formation of large pellets in fine particles, the optimal pellet size is controlled by active manipulation and is thus dictated by traffic in the crowded nest.

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