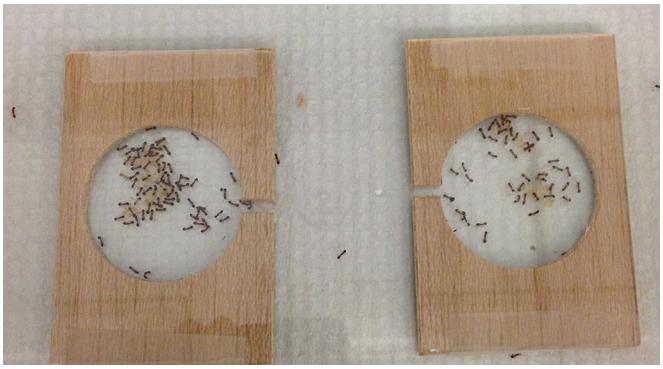
INSIDE JEB

Divided ants always pull together



A single ant colony that has been divided between two equally uncomfortable queenless nests in the process of reunification. Photo credit: Grant Doering.

Separation is never easy and when some ant colonies grow too large, or their home is devastated unexpectedly, division can be the only short-term practical solution. However, Grant Doering from McMaster University, Canada, explains that in the long term, going it alone isn't always the best option. The ants may be spread too thinly for both colonies to pull through, with the portion that is left tending the queen having to work twice as hard to meet her needs. Under these circumstances, reunification is essential for the survival of the queen and her colony. Having already discovered that colonies that are torn asunder are happy to reunite, selecting the most desirable of the two residences as their new home (doi:10.1007/s00040-016-0503-1), Doering and PI Stephen Pratt were keen to find out how *Temnothorax rugatulus* queenless ants go about reuniting when neither abode is particularly inspiring.

'*Temnothorax* colonies in the wild may occupy three or more nests at one time', says Doering, explaining how colonies are often left without a queen when they separate. So, he and Pratt headed out to the Pinal Mountains, west of Phoenix, AZ, USA, where they collected 22 colonies of *T. rugatulus* to test out the insects' reunification strategies. After making each colony comfortable in a tiny bespoke nest, constructed from balsa wood and microscope slides, Doering then divided the colony in two by carefully transporting the ants and their brood to one of two arenas. There, the ants quickly occupied the new nests provided for them. However, some of the new homes were more desirable than others. In some experimental setups, Doering relieved half of the divided colony of their queen and provided them with an uncomfortably bright nest (very undesirable), while the queen was placed with the remaining colony in a cosy dark nest (extremely desirable). Then, he allowed the ants to choose which property they would reunite in. After ∼15 h, most of the colony had abandoned the undesirable nest in favour of the darker residence that was home to the queen.

But then, Doering made the decision more difficult. He gave the divided colonies the choice between two less-comfortable dim nests and allowed one half to keep the queen, making it marginally more attractive. And, in the worst-case scenario, he divided individual colonies between two equally uncomfortable bright and queenless nests, to find out whether the ants could get it together and reunite even when there was no particular advantage to either abode. Yet, even then, the ants managed to cooperate and reunite, so how did they pull off the feat?

This time, Doering painstakingly painted minute dots on each member of the ∼100-strong colony before splitting them in two and filming the protracted reunification process. 'Individually marking every ant was probably the most time-consuming part', he says, adding with a smile, 'It takes a while to anaesthetize each one with CO_2 and apply the dots'. Amazingly, after reviewing the footage, only three or four ants on average were responsible for the entire reunification and these transporter ants usually originated from the more salubrious nest; they were essentially picking up lost nest mates and returning them home.

However, when the two halves of the colony were divided between equally uncomfortable accommodation, equal numbers of pioneering transporter ants set out from each nest, but eventually the transporters seemed less committed. 'In symmetric reunifications … ants will suddenly stop working, even if there are more nestmates to transport', says Doering. He suspects that this strategy might allow one nest to fall out of favour and avoids nestmates being transported to and fro unnecessarily.

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Doering, G. N. and Pratt, S. C. (2019). Symmetry breaking and pivotal individuals during the reunification of ant colonies. *J. Exp. Biol.* **222**, jeb194019.

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