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Navigating in the dark: chemical road signs in the nest

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The spatial distribution of ants within the nest is a key factor in a colony's organization, interaction patterns, and function. Although ants are highly mobile they form localized aggregates that remain spatially stable over long periods of time. Moreover, individual ants are known to repeatedly return to specific aggregates, which are therefore termed fidelity zones. The means by which ants find their preferred location and, generally, navigate within the dark interior of the nest are, to a large extent, unknown. Hydrocarbons are known to play a central role in ant communication. It was recently shown that the surfaces of *Lasius niger* nests are covered with cuticular hydrocarbons. It is therefore appealing to study nest floor chemical distribution as a mechanism underlying the ants' navigation and spatial arrangement. To test this hypothesis, we performed a combination of behavioral experiments and chemical analyses. Behaviorally, we used a 2D barcode identification system to automatically track all individuals of a *Camponotus fellah* colony within the nest. Our results suggest that the ants use chemical road signs laid on the nest floor in order to navigate. We show the existence of at least two such road signs which elicit distinct responses from different individuals. Next, we developed a novel technique that allows us to quantitatively measure the distribution of pheromones adsorbed to artificial nest floors. We find that these pheromones are non-homogeneously spread inside the nest, supporting the notion of chemical road signs. The high signal-to-noise ratio of this technique, together with our tracking system, allows us to compare the chemical profiles of nest chambers to those of the ants inhabiting them. Combining both approaches will allow us to decipher the mechanism by which this chemical map is formed and maintained.