Could individuals with rigid behaviour make intelligent collective decisions? On the one hand, social evolution is expected to promote individual intelligence to facilitate reciprocation (Hamilton 1987). On the other, bigger societies are supposed to need less intelligent individuals and computer swarm intelligence emphasises the simplicity of agents. In social insects, many characteristics of pattern and process at the colony level are indeed captured by models based on simple rules of individual behaviour. It may appear such rules presuppose rigid behaviour. However, flexibility and sophistication may be required to follow them. Furthermore, studies of individual bees and ants demonstrate their cognitive abilities. Social insects are the key to understanding the relationship between collective and individual intelligence plus their relative advantages and disadvantages for adaptive problem solving.

170 - THE INFLUENCE OF A PRIMER PHEROMONE ON BIOGENIC AMINES AND NESTMATE RECOGNITION IN THE FIRE ANT, SOLENOPSIS INVICTA

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Monogyne fire ant, Solenopsis invicta, colony workers are territorial and are aggressive toward members of other fire ant colonies. In contrast polygyne colony workers are not aggressive toward non-nestmates, presumably due to broader exposure to heritable and environmentally derived nestmate recognition cues (broad template). Workers from both monogyne and polygyne fire ant colonies execute newly mated queens after mating flights. We discovered that after removal of their colony queen, monogyne worker aggression toward non-nestmate conspecifics quickly drops to investigative levels; however, heterospecific recognition/aggression remains high. Queenless monogyne or polygyne worker groups were also not aggressive toward newly mated queens. Queenless worker groups of both forms that adopted a monogyne-derived newly mated queen became aggressive toward non-nestmate workers and newly mated queens. We suggested that this powerful effect of queens on conspecific nestmate recognition is caused by a queen produced recognition primer pheromone that increases the sensitivity of workers to subtle quantitative differences in nestmate recognition cues. Biogenic amines have been reported to modulate the sensitivity of insects to stimuli. We used this information to probe the primer pheromone/endocrine basis of nestmate recognition in fire ants. Queenright colonies were divided into three components: queenright, queenless, and queenless fed the biogenic amine, octopamine (OA). Queenright colonies maintained high aggression levels. In contrast, queenless workers fed only crickets and aqueous sucrose had low aggression levels. Workers that were fed octopamine had aggression levels that were not significantly different from queenright workers. Feeding OA to fire ant workers was adequate to simulate the presence of the queen, in terms of nestmate recognition. Thus, we have strong evidence that the queen recognition primer pheromone acts on workers to maintain high levels of OA that up - modulates worker sensitivity to the subtle changes in intraspecific nestmate recognition cues.

171 - THE MULTIFACETED ROLE OF CUTICULAR HYDROCARBONS IN SOCIAL INSECTS

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Cuticular hydrocarbons have been thought to evolve as a protective barrier against desiccation. However, being externalized they were opted in many insects, in particular social insects, as communicative signals. Their high complexity as well as species specificity is consistent with their communicative role. In many ants species they function as the label responsible for nestmate recognition. Specific experiments in several species have indeed shown that the hydrocarbons, but not the non-hydrocarbon lipid fraction indeed provide the necessary label for discriminating nestmates from alien individuals. Uniform colony odor is generally achieved through cue exchange between nestmates, and the postpharyngeal gland was singled out as the exocrine glands in which cues are admixed and further applied on the individual body surface. Recent studies have revealed another possible function for cuticular hydrocarbons, as fertility signals. Fertile individuals (queens or egg laying workers) project specific hydrocarbon blends that are different from that of infertile nestmates. They therefore provide nestmates with the information necessary for achieving reproductive decisions. In some species, a single hydrocarbon or a subset of cuticular hydrocarbons is implied, while in other species the more complete blend seems to be necessary for full activity. There seems to be a contradiction between the above two functions. Nestmate recognition, in

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