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Plasticity and the organization of division of labour.

Sofia Ibarra, James Traniello, Marc Seid, Ehab Abouheif

According to Holldöbler and Wilson the role of plasticity in division of labour is one of the outstanding challenges of insect sociobiology. We address this fundamental question by focusing on temporal polyethism which is the overall pattern of behavioural variation through time. Temporal polyethism has been hypothesized to depend on age, physiology and experience. Our work shows that plasticity contributes significantly to the overall pattern of division of labour through by generating inter-individual variability. Inter-individual variability in both trajectories and endpoints of behavioural ontogeny appears to be the rule rather than the exception. To address the how inter-individual variability is generated, we assessed the behavioral progression of same-age individuals that share a social context. On day five of behavioural progression, we clearly identified two distinct behavioural groups: (1) 'NO GO' ants that remain inside the nest performing brood care and other tasks inside the nest; and (2) 'GO' ants that leave the nest, look for food, and eat food before returning to the nest. Surprisingly, NO GO and GO ants have similar behavioural capacities, biogenic amine titres as well as receptor expression levels, suggesting that this striking inter-individual variability must be a consequence of their social micro-environment. In order to address this hypothesis we assessed social interactions during the period between post eclosion day 2 and day 5. Our results suggest social interactions have a role in the generation of inter-individual variability. Inter-individual variability is an important mechanism that enhances robustness and resilience of the colony, fundamental features of division of labour. These results may lead us to reassess the way we have traditionally thought about division of labour in insect societies.