Flowers help bees cope with uncertainty: signal detection and the function of floral complexity. AS Leonard, A Dornhaus, DR Papaj J Exp Biol 2011 Jan 1 214 Pt 1:113-21

Must Read [8]

Sections:
Plant-Biotic Interactions,Evolutionary Ecology,Cognitive Neuroscience,Sensory Systems,Behavioural Neuroscience

Comments:
How do animals make decisions in complex environments? How do we reliably recognise 'target' stimuli when there are multiple similar distractors that need to be avoided? This new study tackles these fascinating questions by considering the 'relatively' simple decision-making processes in bumble bees seeking to find rewarding 'flowers'. The study provides clear evidence that bees derive a benefit from processing more complex signals, as these serve to reduce pollinator uncertainty in identifying rewarding flowers using a given modality. The finding has important implications for understanding multimodal perception in brains, and indeed how selective attention may be deployed to disentangle ambiguous signals. The authors use a very cleverly designed experiment with six test groups of bees, exposed to flowers to allow discrimination learning adapted from classic psychophysical 'peak shift' experiments. Whilst some test groups are only exposed to target (S+) and distractor (S-) colour stimuli during a learning phase, other test groups learnt this visual problem in the context of scents. Whilst the presence of scent did not provide a direct cue to solving the discrimination task, since the scents are associated with both target and distractor stimuli, bees from the scent groups are significantly more reliable in tests at recognising S+ from similar distractor stimuli: these bees do not demonstrate a peak shift whilst control groups without scent do. This study therefore provides the first evidence that scent can improve the perceived reliability of visual stimuli in complex environments. It thus helps answer important questions about why flowers evolved multiple cues, and what might be a minimum level of processing ability in an animals' brain to manage such complex multimodal signals. Future work could seek to understand how the availability of multiple cues enhances mechanistic features of visual processing, like selective attention, or other mechanisms like context learning.