
SOE 8: Decision-making in societies (Invited Talk Iain Couzin)

Time: Tuesday 9:30–10:15

Location: H37

Invited Talk

SOE 8.1 Tue 9:30 H37

Distributed sensing and decision-making in animal and human collectives — ● IAIN COUZIN — Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ, USA

The capacity for groups to exhibit collective intelligence is an often cited advantage of group living. Previous studies have shown that social organisms often benefit from pooling imperfect individual estimates. However, collective properties can also emerge from the structure and dynamics of social interactions among individuals, rather than from enhancement of personal estimates. Using an integrated theoretical and experimental approach (employing computer vision to explicitly reconstruct sensory networks among organisms), we reveal that

emergent problem solving is the predominant mechanism by which mobile animal groups sense, and respond to, complex environmental gradients. This distributed sensing requires rudimentary cognition and is shown to be highly robust to noise. Furthermore we demonstrate the crucial role that uninformed individuals play during consensus decision-making in collectives, notably in promoting democratic consensus (despite the inability for individuals in many animal groups, such as schooling fish, to explicitly *vote*) and also enhancing the speed and accuracy of decision-making. Our results emphasize how distributed cognition can emerge from dynamical networks of social interactions among organisms, including humans, and suggest general principles by which sensing networks may be organized in biological collectives.