Seewiesen-Andechs Colloquia

Max Planck Institut für Ornithologie

Speaker invited by: Behavioural Ecology & Evolutionary Genetics Group

Thursday – 22 March 2007 (tea & coffee 15:30, talk 16:00)

Olfactory Evolution in Arthropods

BILL S HANSSON

Dept of Evolutionary Neuroethology, Max Planck Institute for Chemical Ecology, Jena

Sensory systems are constantly under selective pressure to be optimized and adapted according to the lifestyle of the organisms possessing them. In most arthropods the olfactory system plays a vital role in survival and reproduction. Here I will visit three systems where we have studied changes over evolutionary time, changes brought about by new habits in food choice, mating or habitat choice. In the melanogaster species group of fruit flies our early investigations revealed a very pronounced conservation of peripheral olfactory functions, despite the speciation events that have occurred. When going more into detail of our material we could, however, identify changes in certain types of receptor neurons. In the specific case of the fruit fly species confined to the Seychell Islands a preference for a new food source was paralleled by change in both peripheral and central nervous olfactory function and morphology. In the European corn borer two partly isolated strains have evolved based on their pheromone blend preferences. One type prefers a 97:3 mixture of the two pheromone components, while the other prefers a 1:99 mixture. The two types do partly interbreed and produce hybrids of intermediate preference. In the peripheral olfactory system we found a marker for the male type, and could show that a single gene determines the male receptor neuron setup. In recent experiments we could show that the two strains display a reversed innervation pattern in the male-specific, pheromone information processing part of the brain. The separation into two strains might thus have occurred as a simple switch of receptors between two pheromone component-detecting neurons. Christmas Island giant land crabs entered the terrestrial habitat about 5 million years ago. In early experiments we observed that these crabs are strongly olfactory guided, and do thus depend on an olfactory system functioning in air. In our ongoing experiments we have shown that the peripheral olfactory system of the robber crab has undergone a strong modification, adapting it to detection of airborne molecules.

Who is Bill S Hansson?

PhD, Lund University 1988
Professor, Lund University 2000
Director, Max Planck Institute for Chemical Ecology, 2006

Selected publications:

Stensmyr MC, Dekker T, Hansson BS. 2003. Evolution of the olfactory code in the Drosophila melanogaster subgroup. Proc R Soc Lond B 270:2333-2340.

Stensmyr MC, Erland S, Greenaway P, Wallén R, Hallberg E, Hansson BS. 2005. Insect-like olfactory adaptation in the terrestrial giant robber crab. Current Biology 15:1-20.

Dekker T, Ibba I, Siju KP, Stensmyr MC, Hansson BS. 2006. Olfactory shifts parallel superspecialism for toxic fruit in Drosophila melanogaster sibling, D. sechellia. Current Biology 16:101-109.