## The costs of preference

**Supervisors:**
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**Hosting institution:** University of Exeter

**Project description:** Sexual selection is responsible for some of the most spectacular and exaggerated behaviours and morphologies in the natural world, and female mate choice is a key mechanism of this form of selection. In spite of its fundamental role in sexual selection however, female preference for mates remains under explored and even basic questions like the costs of preference remain unknown. This is unfortunate because potential costs of preference are critical to our understanding of how sexual selection operates. For example, the most general model of evolution through sexual selection assumes that there are no costs to preferences (Lande (1981) *PNAS* 78:3721-3725), but is easily able to generate runaway (Fisherian) exaggeration of traits, thus providing an explanation for the exuberance of sexual characters seen in nature. Nonetheless, this model was heavily criticised because preference was assumed to carry no cost, and subsequent models found that the inclusion of costs of preference caused instability in the Fisher process and stable trait exaggeration could not occur unless mate preference maximised female fitness (Pomiankowski et al. (1991) *Evolution* 45:1422-1430). Thus whether we live in a Fisherian or good genes world can largely hinge upon whether preferences are costly or not, but as explained, we have next to no information on preference costs.

This PhD will assess the costs of female preference in *Drosophila simulans* using two approaches: 1) isofemale lines – these represent fixed genotypes and by quantifying preference functions for different genotypes, we can subsequently explore fitness costs of having different preferences. 2) experimental evolution – we can select for females that prefer to mate with different males and then after allowing populations to diverge in their preferences, test for potential costs of different preferences. This is possible as we have now identified male traits on which females base their preferences. This proposal builds on previous work we have conducted on mate choice and sexual selection in *D. simulans* (e.g. *Journal of Evolutionary Biology* (2013) 26:311-24; *Journal of Evolutionary Biology* (2013) 26:94-107; *Evolution* (2012) 66:665-677; *Current Biology* (2011) 21:R62-65; *Current Biology* (2008) 18:R553-54; *Current Biology* (2007) 17:R959-60).

**Training opportunities:** Hosken will train the student in experimental evolution and insect husbandry and they will have the opportunity to learn a range of physiological techniques including flow-through respirometry. There will also be training GCMS (the sexual trait mentioned above is measured with this method) and experimental design. Hunt will provide expertise in quantitative genetic analysis and the analysis of female mate choice decisions and CHC analysis. Student's will be part of the insect research team that includes multiple PIs and a post-doc/student population in the lab of 14. They will gain the strong statistical training all Exeter Cornwall students gain via our postgraduate R training programme and will obtain a range of transferable skills via Exeter's PDP programme.