

Genetic royalty demonstrates corruption in advanced ant societies



Embargoed until 10th March 2008 at 17:00 US Eastern Time. A pre-print of the article is available to journalists from the PNAS News Office (Phone: 202-334-1310; PNASNews@nas.edu).

The maintenance of cooperation in the face of the apparent advantages of cheating is one of the major unsolved mysteries in evolutionary biology. Social insect colonies are a classic example of cooperation and have always been believed to be built on a foundation of egalitarianism, with all individuals having an equal chance of developing into reproductive queens or sterile workers. Now, however, it has been shown that royalty is genetically influenced in leaf-cutting ants, with certain genetic types cheating their nestmates by biasing their development into queens. Two distinct mechanisms are involved and, just as with human societies, the threat of suppression keeps cheats rare. The results demonstrate that corruption haunts even the most advanced of societies.

A leaf-cutting ant larva faces a stark decision during her development. On the one hand she may become a queen, going on to mate and produce hundreds of thousands of offspring in a colony of her own. On the other, she may become a sterile worker, selflessly carrying out the variety of critical tasks that ensure the success of her natal colony. Which caste a larva becomes was long believed to be determined solely by nurture, i.e. the quantity and quality of food she is fed by her sister workers. In a research article published this week in the prestigious journal *Proceedings of the National Academy of Sciences of the USA*, researchers at the Universities of Leeds and Copenhagen show that nature also plays a role. A colony of leaf-cutting ants contains a mixture of genetic lineages because the ants within it are the offspring of a single mother who mated with many different males. The researchers have now found that the offspring of some fathers are predisposed to develop into queens. Ants that inherit royal genes from their father are able to bias their caste destiny and thus cheat many of their altruistic sisters out of their fair chance to become a queen themselves. However, it seems that such blue-blooded cheats don't have it all their own way, because royal lineages tend to be rare within their colonies. This fits with evolutionary theory which predicts that being more common will cause cheats to be detected and punished by cooperative individuals. The rarity of genetic royalty thus appears to be an evolutionary strategy by cheats to escape suppression by the altruistic masses that they exploit.

The fungus-farming leafcutter ants have often been regarded as being among the most harmonious of societies. The present results show that even these advanced ant societies suffer from subtle forms of corruption, just as evolutionary theory would predict. The research was carried out by William Hughes, a lecturer in evolutionary biology at the University of Leeds, and Jacobus Boomsma, the Director of the Centre for Social Evolution at the University of Copenhagen.

Reference: Hughes, W.O.H. and Boomsma, J.J. (2008) Genetic royal cheats in leaf-cutting ant societies. *Proceedings of the National Academy of Sciences of the U.S.A.*

Contact: Professor Jacobus Boomsma: Institute of Biology, University of Copenhagen, Universitetsparken 15, Copenhagen 2100, Denmark; phone: +45 35321250; email: jjboomsma@bi.ku.dk



The three female castes of Acromyrmex leaf-cutting ants, queen, large worker and small worker, pictured on their fungus garden. Photo copyright D.R.Nash.



An Acromyrmex leaf-cutting ant queen and a small worker pictured within their fungus garden. Photo copyright D.R.Nash.