

ASU scientists' research on honey bees featured in 'Science'

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Dr. Gro Amdam

(PhysOrg.com) -- Two Arizona State University researchers, Robert Page and Gro Amdam, are the subject of a feature article in the Oct. 25 issue of the journal *Science*, which traces their collaboration, discoveries and extensive published works on the reproductive traits and social life history of honey bees.

Page is a professor and founding director of the School of Life Sciences. Amdam is an associate professor in both the School of Life Sciences and Norwegian University of Life Sciences.

As detailed in *Science*, the collaboration between Page and Amdam has led to the synthesis of the “reproductive ground plan hypothesis,” and catalyzed understanding of how genes and hormones might control social

roles and longevity. Their focus on the role of the ovary in honey bee colonies has contributed insight as to how genetically related colony members partition the labor of the colony between raising young bees, nest construction, food processing, and foraging for pollen or nectar.

In her article, journalist Elizabeth Pennisi notes that Page and Amdam's hypothesis has provided a framework and tools to study division of labor, which now "converges on two genes that may explain both ovary size and behavior."

Amdam, expanding on observations made in the *Science* article, notes that "Fundamentally, our work is about how complex [social behavior](#) evolves - which gives a history and an understanding of how behavior is regulated today.

What emerges from our hypothesis and data is that social behavior is not 'new,' it can be built from old mechanisms - behavioral mechanisms that were present before the organism developed sociality," she adds.

The ASU researchers believe that their reproductive ground plan hypothesis has fueled their research programs, a result of its accessibility for experimental testing: genetically, molecularly, physiologically and behaviorally, and that it "can serve as a looking glass for scientists that work with other social organisms."

Amdam and Page have published 16 papers together in a range of journals and captured two covers of the journal *Nature* in 2006. Their collaborative work has also been featured in and on the covers of *Naturwissenschaften* and *Bioessays* in 2007, while Amdam's team in Norway received the same honor in *Functional Ecology* in 2008 and the *Journal of Experimental Biology* in 2009. Page and Amdam's most recent publication in the journal *Genetics*, published online and featured on the cover in October, highlights their study of the genetics of ovary size.

Both researchers were also part of the Honey Bee Genome Sequencing Consortium that published the genome of the honey bee in 2006.

Page is a highly cited author with more than 200 publications centered on Africanized bees, genetics and evolution of social organization, sex determination and division of labor in insect societies. He has received numerous awards and honors, including election to the German Academy of Sciences Leopoldina, the American Academy of Art and Sciences, the Brazilian Academy of Science and the American Association for the Advancement of Science. Page, professor emeritus and former chair of the Department of Entomology at the University of California, Davis, has been intrigued by how complex social behavior evolved since he earned his doctorate there in 1980.

In 2004, he was recruited to develop the School of Life Sciences in the College of Liberal Arts and Sciences at ASU. As its founding director, he has established the school as a platform for discovery in the biomedical, genomic, and evolutionary and environmental sciences. In addition, he founded the Social Insect Research Group and ASU Honey Bee Research Facility, which has attracted top researchers in social insect studies to ASU. Page was also named a fellow of the Wissenschaftskolleg zu Berlin (Wiko) or Institute for Advanced Study, where he is leading a working group on social insect evolution.

Amdam was selected as a Pew Scholar in the Biomedical Sciences by the Pew Charitable Trusts and a Young Outstanding Researcher by the Research Council of Norway in 2007. Starting out as a theoretician who built computer simulations of social interactions, Amdam has moved on to make key discoveries in the genetic, physiological and behavioral mechanisms underlying division of labor, caste development and has advanced understanding around the evolution of social life strategies, including aging, in social insects. Her work produced the first “knockdown” adult bee where gene expression was experimentally

changed, and her research team in Norway discovered how honey bee aging can be a function of behavior, rather than age itself. She has published 46 articles since her first paper appeared in 2002.

Her work, primarily using the [honey bee](#) as a model organism, has been published in professional journals as varied as Nature, Science, Experimental Gerontology, Proceedings of the National Academy of Science (PNAS), Behavioural Brain Research, Public Library of Science (PLOS) Biology, Animal Behavior and Advances in Cancer Research. Amdam joins Page as a Fellow at the Wissenschaftskolleg zu Berlin in 2010, with her focus on the role of epigenetic mechanisms in social behavior.

Provided by Arizona State University ([news](#) : [web](#))

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