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## Bees' genes match their jobs

DNA switches turn workers to nursemaids.  
10 October 2003

[JOHN WHITFIELD](#)



**As bees get older they switch from hive work to outside foraging.**

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A honeybee's genes can tell you its job. Bees tending the nest have a different set of active genes in their brains to their nestmates out gathering food, researchers have found<sup>1</sup>.

There are many biological steps between DNA and deeds, says Gene Robinson of the University of Illinois in Urbana-Champaign. To find the two so closely linked is a surprise. "The genome is more heavily involved in orchestrating behaviour than one might have thought," he says.

Bees could help us map similar links in humans. "We share many components in our nervous systems with the honeybee," says bee researcher Greg Hunt of Purdue University in West Lafayette, Indiana. In fruitflies, equivalents to the honeybee job genes are involved in learning, through their control of cell communication.

Robinson's team built a computer chip bearing DNA sequences representing about 5,500 honeybee genes - about half of the bee genome. Genes that are active in a tissue sample stick to their equivalent on the chip, creating a glowing spot. The

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busier the gene, the brighter the spot.

About 40% of genes change their activity between nursemaids and foragers, the researchers found. This pattern is consistent enough to match bees to jobs on genes alone. The team tested samples from the brains of 60 insects from three hives.

Such large-scale patterns are the best guide to the complex chemistry behind animal actions, reasons entomologist Robert Page of the University of California, Davis. "We're not going to find a gene for this and a gene for that," he says.

### Growing up

Young worker bees spend their first weeks helping out around the hive. They then swap to foraging in the outside world for the final month of their lives.

So ageing influences bee employment. But the switch is not fixed - it can be accelerated, retarded or reversed. For example, old workers prevent an excess of foragers by releasing pheromones that slow younger bees' switching.

Working out how honeybees mature might help us understand similar developments in other animals, Robinson points out. Young mammals, from example, switch from play to fighting, or mate-seeking.

**We're not going to find a gene for this and a gene for that**

**Robert Page University of California, Davis**

The honeybee genome, which should be completely sequenced in the next few months, will accelerate the understanding of behaviour and genetics tremendously, says Hunt. The experiments should be repeated with a spread of genetically different bees, to show which genes are most strongly linked to behaviour, he adds.

### References

1. Whitfield, C. W., Cziko, A.-M. & Robinson, G. E. Gene expression profiles in the brain predict behavior in individual honey bees. *Science*, **302**, 296 - 299, (2003). [|Homepage|](#)

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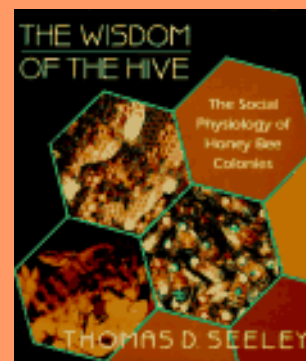
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