



Cranes (here *Grus japonensis*) form long-term pair bonds that may last the birds' lifetime.

Monogamy May Be Written in Our Genes

In animal studies, a set of 42 genes involved in neural development, learning and memory, and cognition seems to be associated with monogamy

By Karen Hopkin

What makes one species pair off, and members of a closely related species play the field? The answer may lie in their genes.

Researchers at the University of Texas at Austin were interested in how complex characteristics—such as monogamy—arise during evolution. “We chose to investigate this question using monogamous mating systems because animals with monogamous mating systems are available in all the different vertebrate clades,” says Rebecca Young, a research associate and evolutionary biologist, who led the study. “And we were able to find species that had independently evolved monogamy in each of these lineages.” This sampler of species provided the researchers with the evolutionary equivalent of a bird’s-eye view of the behavior.

“We decided early on that we didn’t just want to study a particular group of animals, like mice or fish, for example, or a particular group of birds, and compare between monogamy or nonmonogamy there,” says Young’s colleague Hans Hofmann, professor of integrative biology. “Instead we took a very broad look across vertebrates—across 450 million years of evolution—when these fish and birds and frogs and us shared the last common ancestor.”

The researchers chose five pairs of species, and they looked to see if they could spot a signature pattern of gene activity that was shared only by animals that were monogamous. And they discovered a set of 42 genes whose activity in the brain is strongly associated with monogamy—including genes involved in neural development, learning and memory, and cognition. The results appear in the January 22, 2019, issue of the *Proceedings of the National Academy of Sciences USA*.

“This is surprising because these species have evolved monog-

amy independently,” Young says. “And they’ve diverged for hundreds of millions of years from one another. So we might expect that because of this evolutionary distance, gene expression in the brain would be quite different. But in fact, we find this shared signature that seems to be related to the mating system of the organism.”

Now, those genes may not be setting up entirely new patterns of behavior. They may just be building on underlying mechanisms that all species share, such as pair bonding. “To form a pair bond, one has to tolerate another individual for a long period,” Young says.

Yet even members of the most intolerant species have to put up with one another—at least for as long as it takes to mate. Take, for example, shrews. “Shrews tolerate one another for about one day a year,” Young says. “So those mechanisms already exist in very aggressive species. But they just happen for short periods.” What may happen in monogamous animals is that these conserved pathways, which exist in many different kinds of mating systems, get modified or become more elaborate.

In principle, Young and Hofmann and their collaborators could have extended the study to humans—perhaps by comparing our neural gene expression patterns with those of chimpanzees. But that evaluation might be unfair, given that so much of our courtship behavior is just bananas. ■

Karen Hopkin is a freelance science writer in Somerville, Mass. She holds a doctorate in biochemistry and is a contributor to *Scientific American’s* 60-Second Science podcasts. This article is adapted from one of her recent podcasts.

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