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Cockroaches aren't morning people

A cockroach's ability to learn depends on what time of day you try to teach it, according to researchers at Vanderbilt University (Nashville, TN).

After demonstrating that cockroaches generally prefer the smell of vanilla over the smell of peppermint, Terry L. Page and colleagues trained them to prefer the opposite by rewarding them with sucrose when they approached the peppermint odor source and 'punishing' them with saline when they approached the vanilla (*Proc. Natl. Acad. Sci. USA* **104**, 15905–15910; 2007). When cockroaches were trained in the early subjective night of their circadian cycle, they retained the new preference and still remembered it 48 hours later. When they were trained in the early morning, however, when they are usually least active, they failed to retain the memory even 5 minutes after training. Cockroaches' ability to learn was dependent on the time of training, not the time of testing. The researchers suggest that cockroaches may not retain memories in the morning because they are unlikely to use information that applies to a time when they are usually inactive.

As olfactory systems are similar across different species, the team's findings may provide insight into the role of the circadian clock in human learning processes.

Pollution breeds malformed frogs

Outbreaks of severe limb deformities in North American amphibians have become widespread over the past decade. A study led by the University of Colorado at Boulder shows that humans may be to blame: certain types of pollution cause aquatic nutrient concentrations to rise, which can lead to increased transmission of *Ribeiroia ondatraem*, a trematode parasite that causes the deformities.

Pieter Johnson and colleagues stocked 36 artificial ponds with algae, zooplankton, snails and green frog tadpoles (*Proc. Natl. Acad. Sci. USA* **104**, 15781–15786; 2007). They added different amounts of nutrients (nitrogen and phosphorus) and parasite eggs to each pond and observed the effects over the course of three months. In ponds with high nutrient concentrations, algae growth increased. This led the snail population to grow, become infected with the parasite and shed more parasite larvae. As a result, frogs in high-nutrient ponds were up to five times more likely to contract infection than were frogs in low-nutrient ponds, though the study ended before infected frogs were developed enough to display malformed limbs.

Aquatic nutrient enrichment has been linked to diseases such as cholera and West Nile virus. This study is one of the first to experimentally establish a direct causal relationship.

Genetic association gone to the dogs

After the complete sequence of the dog genome was determined in 2005, geneticists proposed that it would be useful for finding the locations of genes associated with various inheritable traits. Domestication and breeding have made the genetic structure of the dog ideal for this application: dogs of the same breed have long stretches of identical gene sequences, making it easy to spot the few differences that can underlie inheritable traits.

Now, Kerstin Lindblad-Toh and colleagues (Broad Institute, Cambridge, MA) are fulfilling this potential, completing the first large trait-mapping studies in dogs. First, they developed a chip that analyzed ~27,000 single-nucleotide differences in the dog genome and mapped the general location of the gene region responsible for the distinctive hair ridge in Rhodesian ridgeback dogs using only ~20 dogs total (*Nat. Genet.* doi:10.1038/ng.2007.10, published online 30 September 2007). To narrow this gene region to the specific genes involved, they compared the sequence of the region in Rhodesian ridgebacks and Thai ridgebacks, a breed that has the same hair ridge as Rhodesians but is not closely related, and identified a duplication of four genes that results in the hair ridge.

This mapping method may allow geneticists to locate genes involved in diseases that affect both dogs and humans, such as diabetes.