Posted: December 23, 2007

New method enables scientists to see smells

Animals and insects communicate through an invisible world of scents. By exploiting infrared technology, researchers at Rockefeller University just made that world visible. With the ability to see smells, these scientists now show that when fly larvae detect smells with both olfactory organs they find their way toward a scented target more accurately than when they detect them with one.

"Having two eyes allows us to have depth perception and two ears allows us to pinpoint a noise precisely," says Leslie Vosshall, head of the Laboratory of Neurogenetics and Behavior. "Sensing odors in stereo is equally important."

In research to be published in the December 23 online issue of *Nature Neuroscience*, Vosshall and her colleagues show that odor information is easier to perceive when it is smelled with both olfactory organs. By genetically manipulating flies to express odorant receptors in one olfactory organ or both, they show that the brains of *Drosophila melanogaster* larvae not only make use of stereo cues to locate odors but also to navigate toward them — a behavior called chemotaxis.

To study this behavior, Vosshall and her colleagues had to figure out which direction the larvae move with respect to the source of the odor. But since odors are invisible, the researchers could neither predict how the flies would move in relation to these scents nor guess whether the odors were concentrated in patches or along a gradient. To complicate matters, odors whisk to and fro at the mercy of the slightest stir, making it impossible to determine their concentrations at particular locations.

"We needed to create an environment in which we knew something about the spatial arrangement of the odors," says Vosshall. "We needed to see the smells."

In collaboration with colleagues in Thomas P. Sakmar's Laboratory of Molecular Biology and Biochemistry, the researchers used a novel spectroscopic technique that exploited infrared light to create environments where they could see, control and precisely quantify the distribution of these smells.

When Vosshall and her colleagues observed the animals' behavior, they found that although animals with one functional nose or two were both able to sense odors, only the ones with both olfactory organs working accurately navigated toward the odor source. "A left-right comparison isn't necessary for flies to smell," says Vosshall, "but it is necessary for them to do it well."

Nature Neuroscience online: December 23, 2007

Contact: Thania Benios 212-327-7146
newswire@rockefeller.edu