Quick – What's That Smell?

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Researchers at the Monell Chemical Senses Center have found that taking as little as a hundred milliseconds longer to smell an odor results in more accurate identification of that odor. This seemingly simple observation has important implications regarding how olfactory information is processed by the brain. The findings appear in the August issue of *Neuron*.

By demonstrating a clear relationship between odor sampling time and accurate odor identification, the Monell researchers solved a controversy centering on whether the brain processes olfactory information in a similar manner to how it processes visual and auditory stimuli.

"Previous published work suggested that olfaction was different from vision and audition in lacking this fundamental property," notes senior author Alan Gelperin, PhD, a computational neuroscientist. "We now can use accumulated information about these other sensory systems to help us understand olfaction."

Exactly how the many thousands of different odorants are detected and identified remains a mystery. The human nose probably contains several hundred different types of olfactory receptors, while animals with a highly developed sense of smell - such as dog, rat, or cat - may have over a thousand different receptor types.
It is thought that perception of any one odorant probably involves simultaneous stimulation of several different receptors and that an olfactory code enables identification of specific odorants by the brain. Previous experience and motivational state also interact with odorant

information to influence processing and identification. It still is not known how the brain deals with all this information to let us perceive odors.

Using an approach that has provided insight into information processing by the visual and auditory systems, the Monell researchers developed a new behavioral
paradigm using trained mice to ask whether longer exposure to an odor would result in more accurate identification of that odor. The results indicated that the mice needed extra time to accurately identify more complex odors.

“The well-trained mouse needs almost half a second to solve a difficult olfactory discrimination task,” says lead author Dmitry Rinberg, PhD. “This time window is very important as we seek to design experiments and develop models that explain what the brain is doing in the extra time it takes to identify complex odors.“

Rinberg, a physicist and computational neuroscientist, comments, “The development of color television was based on extensive studies of visual sensory processing. Modern MP3 players are built based on a deep knowledge about properties of our hearing capabilities. Similarly, increased knowledge of olfactory processing has the obvious potential to open many doors, perhaps including development of electronic olfactory systems that would have capabilities such as identification of odors for medical diagnosis or detection of land mines.”

Also contributing to the work was Alexei Koulakov, PhD, from Cold Spring Harbor Laboratory.

Source: Monell Chemical Senses Center