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Latest News

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CHEMICAL SENSES

RADICAL THEORY OF SMELL CHALLENGED

Human study fails to support controversial theory's predictions

[AMANDA YARNELL](#)

Researchers at Rockefeller University have tested [a controversial theory](#) of the mechanism of smell and found no evidence to support it.

Scientists remain puzzled about how a given molecule is perceived as having a particular odor. Most think that a molecule's shape is what determines its smell. But a recent book about biophysicist and perfume expert Luca Turin has popularized a controversial alternative. According to Turin, smell receptors in the nose act like spectrometers to detect the intramolecular vibrations of odor molecules. Vibration had been implicated in smell as early as the 1930s, but the proposal had fallen out of favor with scent researchers. Thanks to Chandler Burr's 2002 book "The Emperor of Scent," Turin's vibrational theory has gained widespread attention in the popular press.

However, most scent researchers remain skeptical. Now, assistant professor [Leslie B. Vosshall](#) and postdoc Andreas Keller of Rockefeller's Laboratory of Neurogenetics & Behavior have put Turin's theory to a test [*Nat. Neurosci.*, published online March 21, <http://dx.doi.org/10.1038/nn1215>]. "We gleaned three predictions of Turin's theory from his published work and designed experiments to test them," Vosshall says.

In the first, several dozen human subjects were asked to rate the vanilla character of a 1:1 mixture of guaiacol and benzaldehyde. Turin's theory predicts that the combined molecular vibrations of guaiacol and benzaldehyde should approximate the vibrations of vanillin, Vosshall says. None of the subjects reported that the mixture smelled like vanilla.



SMELL SEEKERS Vosshall (left) and Keller tested the controversial vibrational theory of smell in humans.

The second experiment tested

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whether aldehydes containing an even number of carbons smell different than odd-numbered ones. "Contrary to Turin's prediction, subjects did not find that aldehydes smelled more similar if they had an even number of carbons versus an odd number," Vosshall says. **COURTESY OF ROCKEFELLER UNIVERSITY**

Turin also has predicted that deuterated and nondeuterated acetophenone, which have the same shape but different vibrational spectra, should have distinct scents. None of the subjects tested could tell the difference between the two, even at a range of concentrations. "Our results don't prove the shape theory, but they do show that molecular vibrations alone cannot explain the perceived smell of a chemical," Vosshall says.

When asked to comment on the new study, Turin was dismissive of Vosshall's conclusions. While acknowledging that "isotope experiments are the true test of the vibrational theory," he questioned the team's experimental design. "The jury's still out on vibration theory," he added.

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