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Never Mind Eyesight, Your Nose Knows Much More

March 20, 2014 4:18 PM ET

AUDIE CORNISH, HOST

From NPR News, this is ALL THINGS CONSIDERED. I'm Audie Cornish.

ROBERT SIEGEL, HOST:

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And I'm Robert Siegel.

The human nose can distinguish 10,000 distinct smells; at least that's been the working rule among scientists. Ten thousand smells sounds like a lot. But a new study argues that it is a vast underestimate. A new report in Science magazine concludes that the human nose can distinguish more than a trillion unique smells.

NPR's Richard Harris reports.

RICHARD HARRIS, BYLINE: When scientists say people can smell 10,000 odors, that comes from a century-old idea that's just plain wrong. Smell researcher Andreas Keller says it comes from a now laughable notion that smell has four primary scents, the way light has primary colors.

ANDREAS KELLER: And I found that so interesting and ridiculous that I thought it would be time to do an empirical experiment and test how many odors there really are.

HARRIS: So, Keller and his colleagues at The Rockefeller University and the Howard Hughes Medical Institute put together an experiment. They started with 128 chemicals with distinct smells and started mixing them together in up to 30 chemicals per bottle.

KELLER: The experiment works in the way that the subjects come in and they're given three little bottles with odors in it. Two of the bottles have the same odor in it and one has a different one. And the task is simply to tell which one is different.

HARRIS: Through this process, the scientists found that the human nose could do a remarkable job of distinguishing very small differences between smells. Once they figured out what percentage of these mixtures a person could distinguish, they called in a mathematician who figured out how many possible unique odors you can make from elaborate mixtures of these 128 chemicals.

KELLER: And that's how the number of one trillion came about.

HARRIS: Granted, 10,000 seems low. But a trillion seems so high that, I mean within a human's lifetime, clearly you couldn't encounter a trillion smells. Could you?

KELLER: That's very true. You would never encounter a trillion smells. And most of the smells we tested in our test were probably never smelled by a human being ever before.

HARRIS: So is this just fun or is there some deeper point here?

KELLER: This is just fun.

HARRIS: Really?

KELLER: It's just bothersome to see in the literature a number that's so clearly wrong.

HARRIS: The question now is whether the new number will be believable to other scientists in the field.

JOEL MAINLAND: I think it's actually a huge underestimate.

HARRIS: Joel Mainland works at the Monell Chemical Senses Center in Philadelphia, which is more or less the world capital of research on smell and taste.

MAINLAND: But this at least puts a lower limit on it and says it's much, much higher than people were thinking.

HARRIS: And that's what the research paper says: A trillion odors is a lower limit, a minimum.

Mainland wasn't involved in this project. But what intrigues him about it is not so much the huge number but the fact the scientists sometimes found mixtures of very different chemicals that ended up smelling the same. This hints that there could be a basic logic of smell. If scientists could decipher that, they could in theory reduce smells to a basic set of instructions, a universal code for smells.

MAINLAND: Somebody comes to me and they say: Look, I have this beautiful strawberry smell and I want you make this strawberry smell but you can't use any of the molecules that we have on this list. I want you to use this other set of molecules to make a strawberry. If you have a universal code, then you can use a set of ingredients that were never in the strawberry to make the same strawberry smell.

HARRIS: And if you could do that, you could send smells on the Internet. That is, you could transmit instructions to a machine that has a small number of chemicals that can be combined to make a huge variety of smells. We could have smell-o-rama. But first, you have to figure out the code. Mainland says that's a daunting challenge but the new research just might help frame that search.