

How many scents can a person smell? 10 to one trillion

Earlier this year, [a paper in Science](#) attempted to answer the question: how many smells can we actually smell? At least one trillion, they claimed. Recently, Markus Meister posted a paper on arxiv which made the bold claim that [we can smell at least ten smells!](#) Or at least that the data was just as consistent with ten smells as one trillion smells.

Let's start with the original claim – that humans can differentiate between at least a trillion smells. These experimenters chose 128 molecules and mixed them together in differing amounts. A little bit of molecule A here, a dash of molecule B there. These delectable treats were then presented in pairs to subjects who were tasked with answering whether they were given the *same* delight from this perfumerie or given *two different* scents. By imagining these odors as balls of different smells; push them too near each other and they get all mixed up and impossible to tell apart. By keeping them just far enough apart to discriminate each ball from the other, you can position them in a space bordered in each dimension by the number of distinct odorant molecules. Count how many of them there are and you've got your number of smells!

Markus Meister attacks this in three fundamental ways. They are each fairly interesting in their own right and worth dissecting for what they say about perception, behavior, and the differences between vision and olfaction.

His criticism concerns the *dimensionality* of the sensory data. How many ways does it vary? In vision, we know that people are trichromats (for the most part). Red, blue, green: these are the three fundamental dimensions color vision varies across. How many are dimensions are there in olfaction? There are at least 400 odorant receptor genes in humans, which suggests that there are at least 400 different odorant molecules that we could detect – though the exact number depends on the wiring of the olfactory system. This suggests that smells exist in 400 *orthogonal* directions in humans.

Read full original article: [How many smells can a smelly person smell? 1 trillion or 10?](#)