

# MAKING DO WITH LESS: THE MATHEMATICS OF COMPRESSED SENSING

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Location: BHG- 215

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## Abstract

Suppose a bag contains 100 marbles, each with mass 10 grams, except for one defective off-mass marble. Given an accurate electronic balance that can accommodate anywhere from one to 100 marbles at a time, how would you find the defective marble with the fewest number of weighings?

You've probably thought about this kind of problem and know the answer. But what if there are two bad marbles, each of unknown mass? Or three or more? An efficient scheme isn't so easy to figure out now, is it? Is there a strategy that's both efficient and generalizable?

The answer is "yes," at least if the number of defective marbles is sufficiently small. Surprisingly, the procedure involves a strong dose of randomness. It's a nice example of a new and very active topic called "compressed sensing" (CS), that spans mathematics, signal processing, statistics, and computer science. In this talk I'll explain the central ideas, which require nothing more than simple matrix algebra and elementary probability. I'll then show some applications, including how one can use this to build a high-resolution one-pixel camera.

*Cookies, Juice, and Coffee*

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