

## Caesar's last breath

What are the odds that in the last five minutes), you have a breathed a molecule of the air Julius Caesar expelled in his dying breath?"

From the known mean atmospheric pressure (about 14.5 lb/sq in) and the surface area of the Earth ( $4 \pi r^2$ ) we can estimate the weight of the atmosphere at about  $5 \times 10^{18}$  kg. Caesar's last breath would have been, say, half a litre. Air at room temperature & pressure weighs about 1 g/l so assuming perfect mixing the atmosphere is about one part in  $10^{22}$  Caesar's last breath. A mole of air weighs somewhere around 30g, so a lungful of air contains about 1/60 mole or  $10^{22}$  molecules. So, every time you draw breath you would expect to breath in one molecule of Caesar's breath. In even 5 minutes the chances of not doing so are modest.

Of course this assumes that air molecules are, by and large, immutable over this time span. I'm less than confident on that one.

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Most of the carbon dioxide in Caesar's last breath is probably at the bottom of the ocean, forming limestone. The oxygen is, too (having been formed into carbon dioxide by some subsequent breather). But a fair amount of the nitrogen, might still be floating around, and nitrogen was the bulk of Caesar's breath.