



## CREATING AN ODOR PRESENTING DEVICE TO MAP THE OLFACTORY BULB

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Little is known about the neuronal systems that operate the senses, and the exact mechanisms that convert sensory inputs into neuronal signals are not fully understood. To understand more about our senses and how they work, studies of structures like the Olfactory Bulb (OB) and appropriate tools, such as an olfactory response compendium are necessary.

The OB is an ideal model to learn more about neural plasticity, the ability of neuronal structures to adapt, change, and learn. [1] It is also a good model to study active sensing through. [2] A variety of tools are utilized to study OB signal integration and OB function in general. These tools range from biological markers to computational computer programs. However, the OB researcher's toolset conspicuously lacks a comprehensive odor response map compendium. The lack of this compendium means that researchers do not have a valuable resource they can analyze or compare their own results against.

To remedy this deficit, the Wachowiak Lab is aiding in the creation of an OB odor response compendium which will be released to the Neuroscience community. This compendium will be created by presenting multiple odors to mice and taking images characterizing the response of their OBs. Due to the large quantity of smells that must be presented for the creation of the compendium, a device capable of presenting a large quantity of odorants in a short amount of time is needed. This device must: 1) deliver enough odor sufficient to generate an OB response for at least 95% of the presentations, 2) require no more than 3 minutes to set up for each set of odors, 3) all for automated presentation of at least 8 odorants per trial, 4) require minimal cleaning and maintenance, and 5) deliver enough odor at each position to elicit a consistent OB response.

Development on the device is ongoing and is currently on the 5<sup>th</sup> iteration. In this iteration, puffs of air from pneumatic valves are used to push odorants out of 12 mixer bayonets into a central airstream that carries them to the mouse. This version fulfills all the aforementioned requirements and is currently being tested to determine its efficacy.

Thus far, tests have been conducted to determine how distance from the target, dilution ratio, evacuation fan speed, and bayonet position affect the amount of odor delivered with a photoionization detector (PID). As the distance from the target increases, the amount of odor delivered and its variance decompose exponentially, because the odor has more time to disperse. Less dilute (more concentrated) odor solutions also deliver more odor with more variance, due to the increased concentration of molecules. There were no significant differences in amount of odor delivered with varying evacuation fan speeds or bayonet positions.

### References:

[1] Mori et al. "The Olfactory Bulb: Coding and Processing of Odor Molecule Information," *Science*, vol. 286, no. 5440, pp. 711-715, Oct. 1999.

[2] M. Wachowiak, "All in a Sniff: Olfaction as a Model for Active Sensing," *Neuron*, vol. 71, no. 6, pp. 962-973, Sept. 2011.