Jun 29, 2023 Version 2

Chronic Recoverable Neuropixels in Mice V.2

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Protocol status: Working
We use this collection and it's working

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Abstract

This protocol collection explains how to build a low-cost, lightweight system to implant 1 Neuropixels 1.0 probe or 2 Neuropixels 2.0 probes into mice, record during freely moving behavior, then recover the probes for future use.

Other chronic recoverable designs:

- single 1.0 probe in mice: Juavinett et al, 2019 (https://elifesciences.org/articles/47188)
- multiple 1.0 probes in rats: Luo & Bondy et al, 2020 (https://elifesciences.org/articles/59716)
- single 2.0 probe in mice and dual or moveable 2.0 probes in rats: van Daal, Aydin, & Michon et al, 2021 (https://www.nature.com/articles/s41596-021-00539-9)
- overview of unpublished designs: Neuropixels 2021 course lecture 3.7 by Yoh Isogai (https://www.youtube.com/watch?v=7cZqYIiGvBQ&list=PLfhWmWntvjl64ti_a-MzHIwqwEU0ZlALb&index=18)

Advantages of this design:

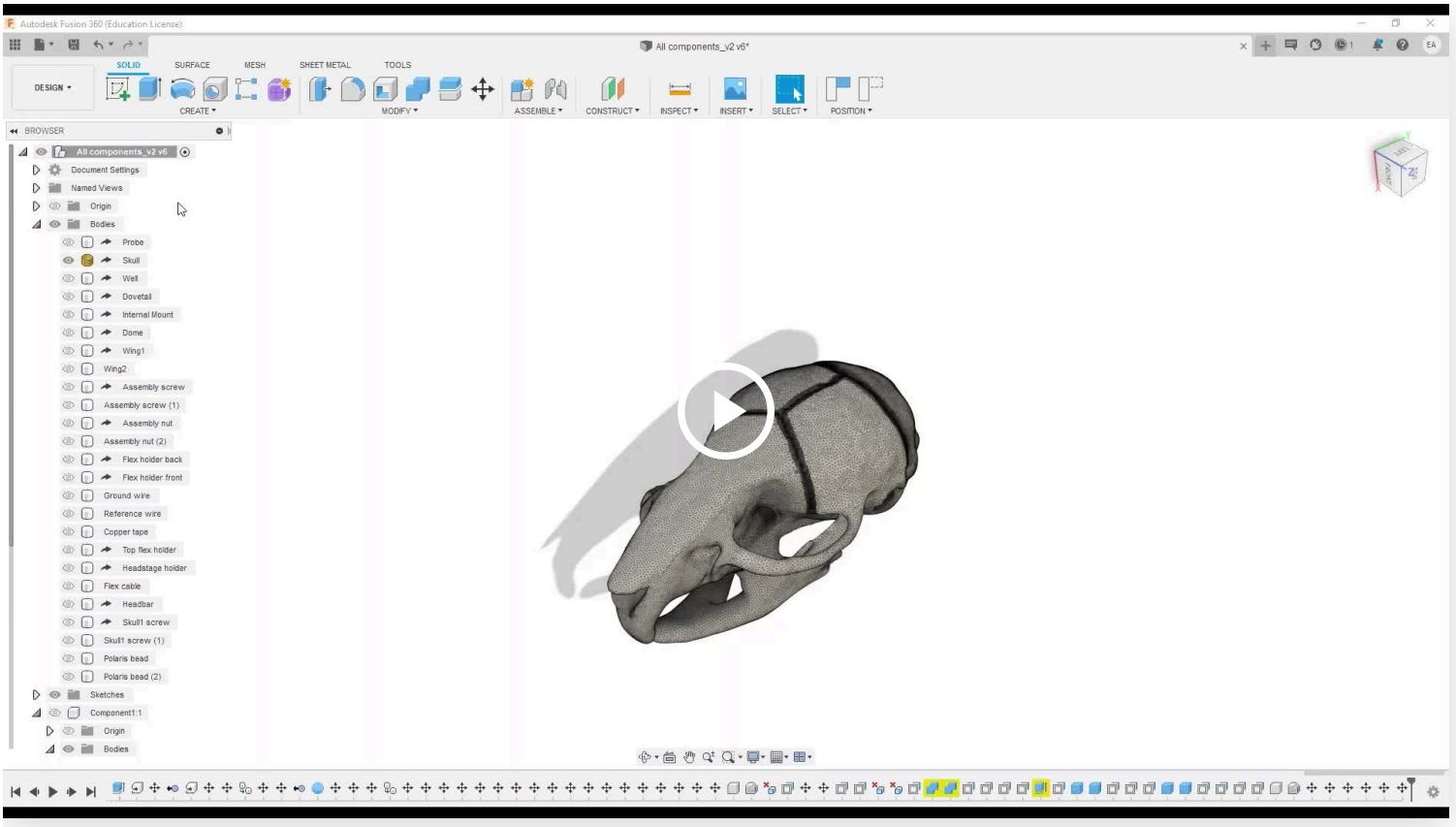
- Lightweight (entire assembly, including headbar, dental cement, and tape, weighs <3g for single 1.0 probe or <4g for dual 2.0 probes)
- Allows headfixed or freely moving recordings
- Quickly attaches to a headstage holder, which provides LEDs for tracking and a counterweight to encourage running
- Position and angle of internal mount on the probe adjustable before gluing, allowing implantation into any brain region, but custom adjustment is not required, allowing the same probe to be re-inserted into a variety of sites
- Unlike completely enclosed designs, the shank is uncovered during insertion for better visualization, yet doesn't require delicately surrounding the shank with a glue column
- Dual 2.0 probes: probes are independently insertable, so can set custom positions, depths, and angles for each

Disadvantages of this design:

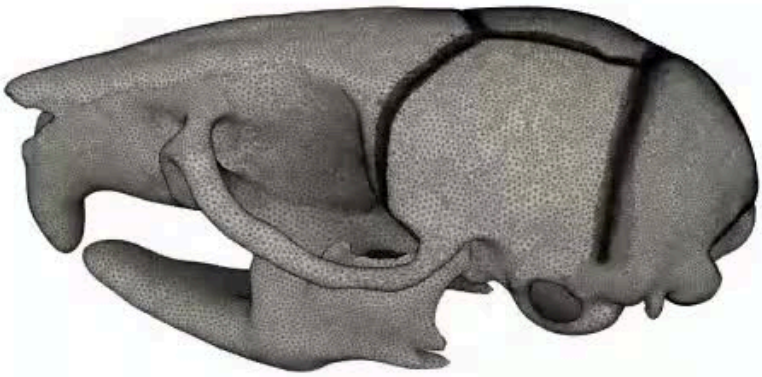
- Not suitable for larger animals (lightweight design likely can't withstand larger forces, flex cable remains exposed, moisture known to wick up shank into PCB in rats)
- External components are assembled around the probe during surgery rather than during assembly, so surgeries take slightly longer
- Less elegant than completely enclosed designs and requires a larger skull surface area for gluing
- Dual 2.0 probes: how close together the probes can get is limited by some of the components

Assembly preview:

Single 1.0 probe



Dual 2.0 beta probes



Troubleshooting

Files

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Protocol

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Assembly: Chronic recoverable Neuropixels in mice

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Building a SpikeGLX Rig with camera: Chronic recoverable Neuropixels in mice

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Freely moving recording: Chronic recoverable Neuropixels in mice

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