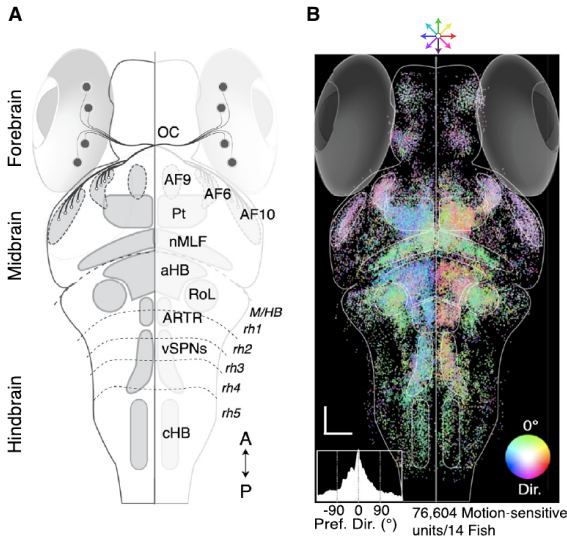


A neuronal model for visually evoked startle response(s) in fish

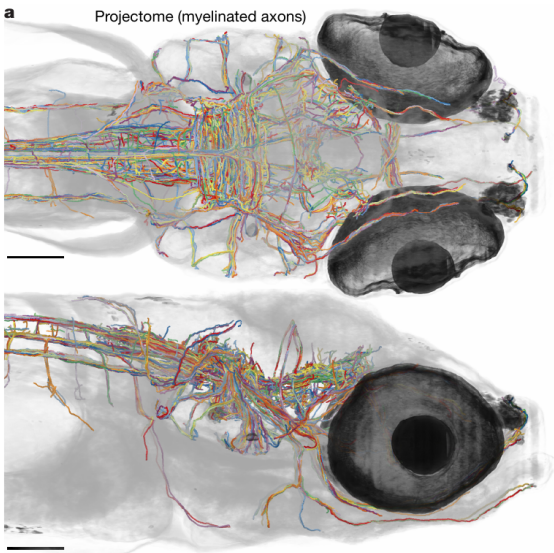
Andrej Warkentin
Computational Neuroscience Meeting
21.03.2018

```
In [2]: %%html
<style>
.example
{
    float:left;
    width: 33%;
    height: 80%;
    text-align: center;
}
.example > ul {
    text-align: left;
    list-style-position: inside;
}
.halldiv
{
    float:left;
    width: 50%;
    height: 80%;
    text-align: center;
}
.halldiv > ul {
    text-align: left;
    list-style-position: inside;
}
</style>
```

Why fish?



Naumann et al. 2016



Hildebrand et al. 2017

Discovery by Mauthner 1859

species: pike

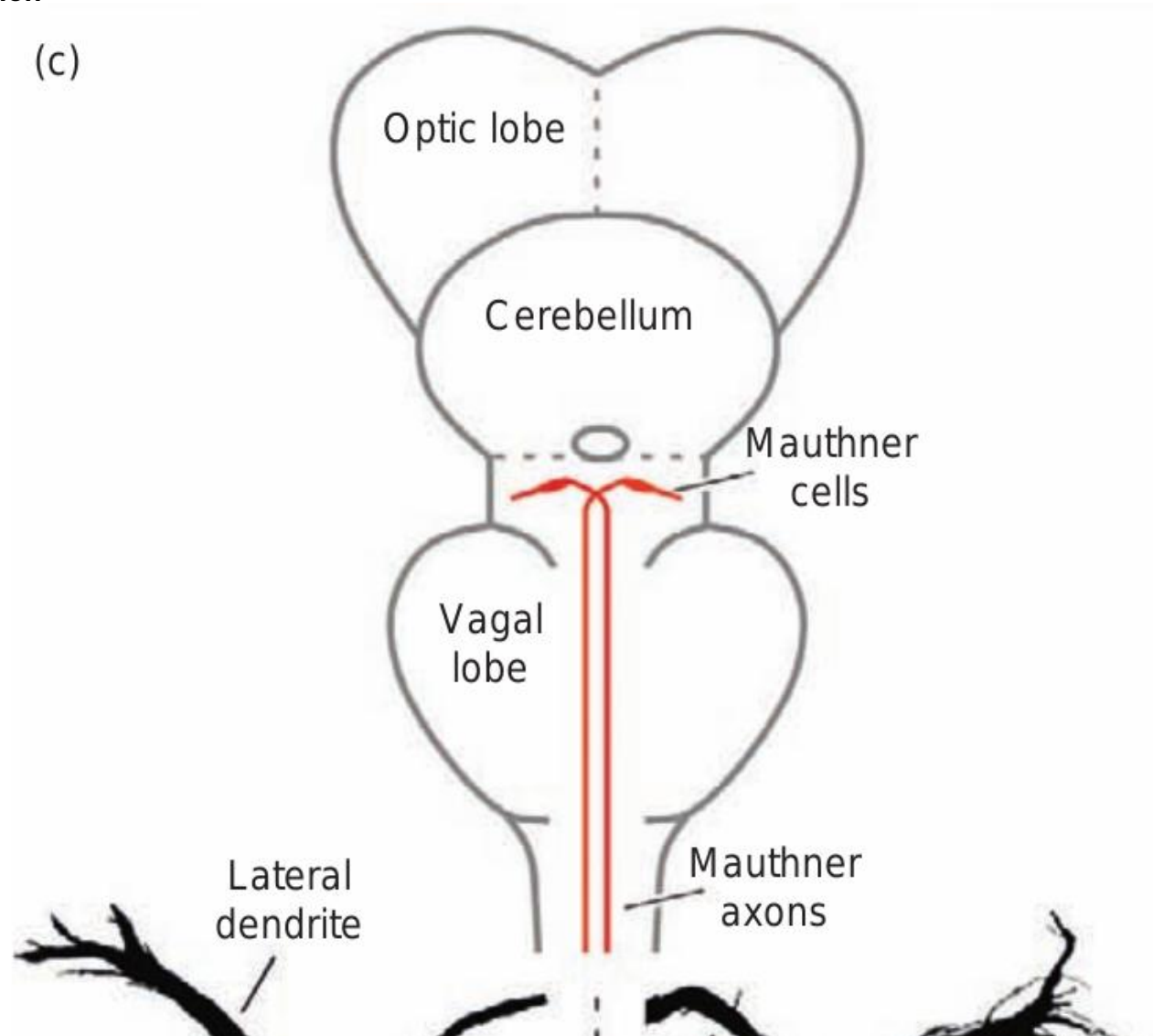
“a colossal myelinated neuronal fiber which goes throughout the whole spine”

I. In den Vordersträngen der weissen Substanz des Rückenmarks findet sich jederseits, nach vorn und aussen vom Central - Canale gelegen, eine kolossale markhaltige Nervenfasern, welche sich durch den ganzen Verlauf des Rückenmarkes erstreckt, und deren Durchmesser an ihrem breitesten Theile im Rückenmarke $\frac{1}{11}$ Millimeter beträgt²⁾).

Fun fact: Darwins “On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life” was also published in 1859.

Anatomy & Physiology

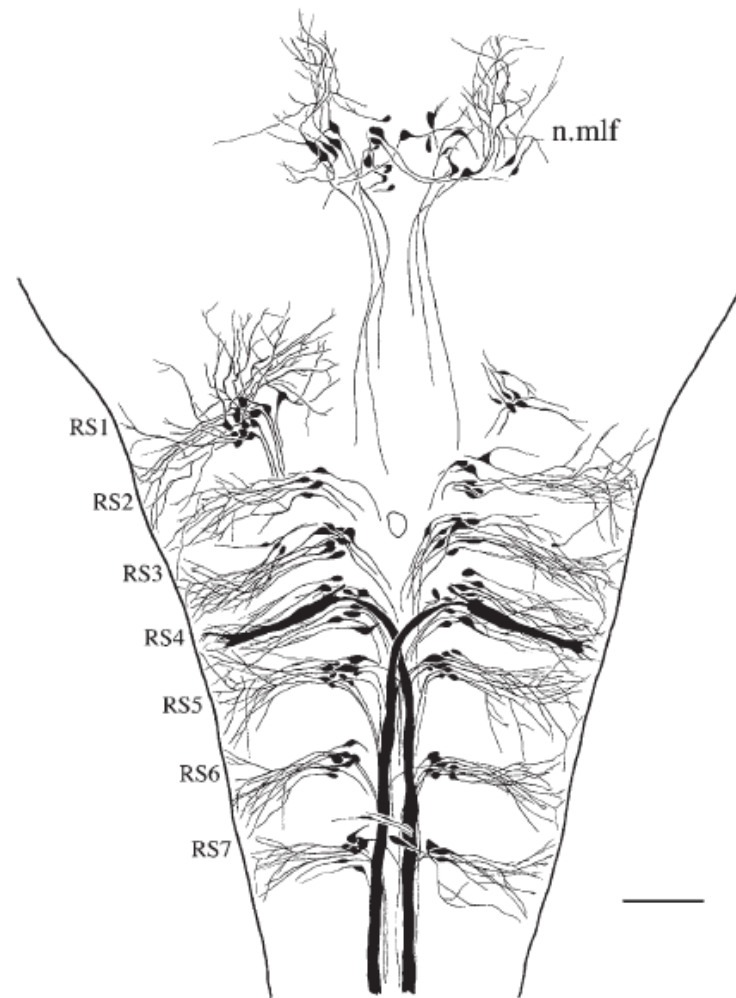
Anatomical location



Anatomy & Physiology

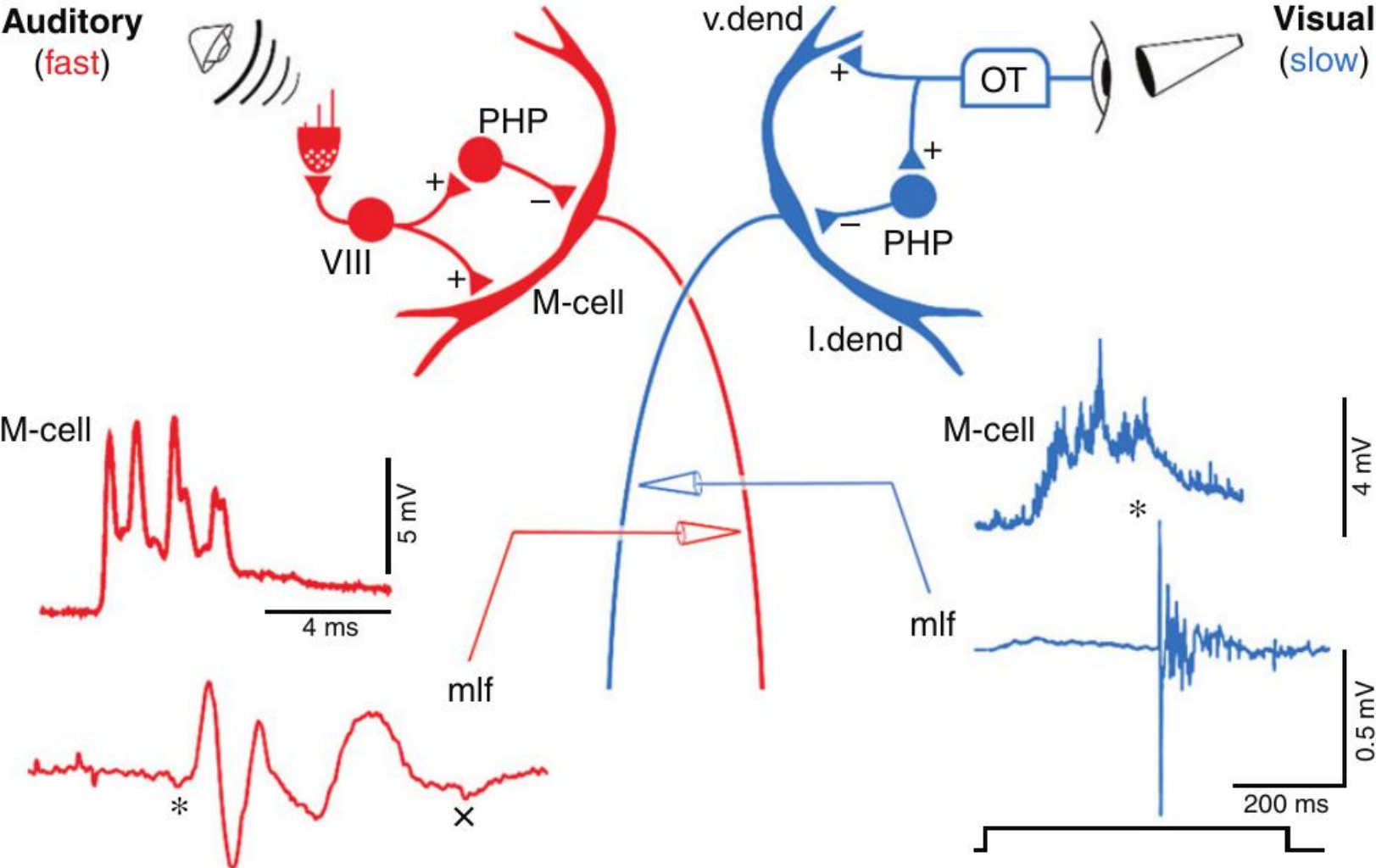
But they are not alone:

A



Anatomy & Physiology

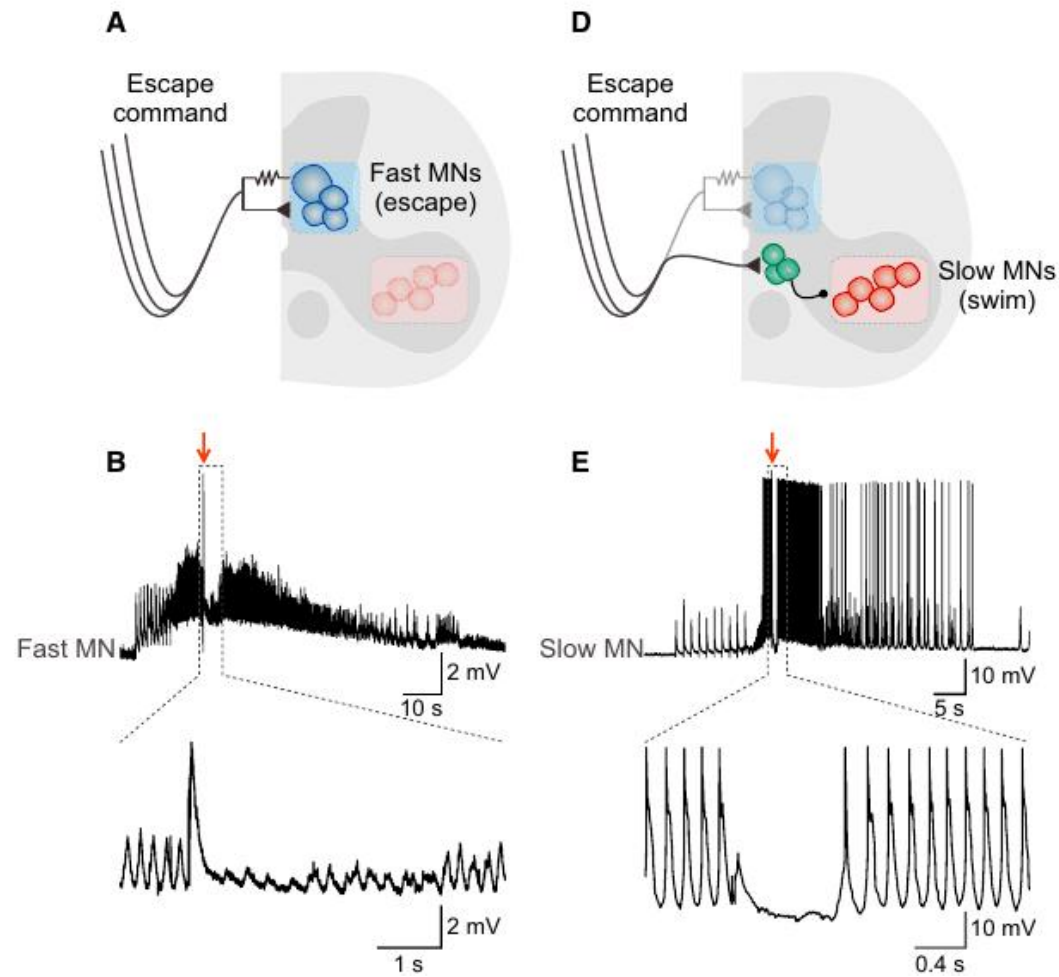
Inputs



TRENDS in Neurosciences

Anatomy & Physiology

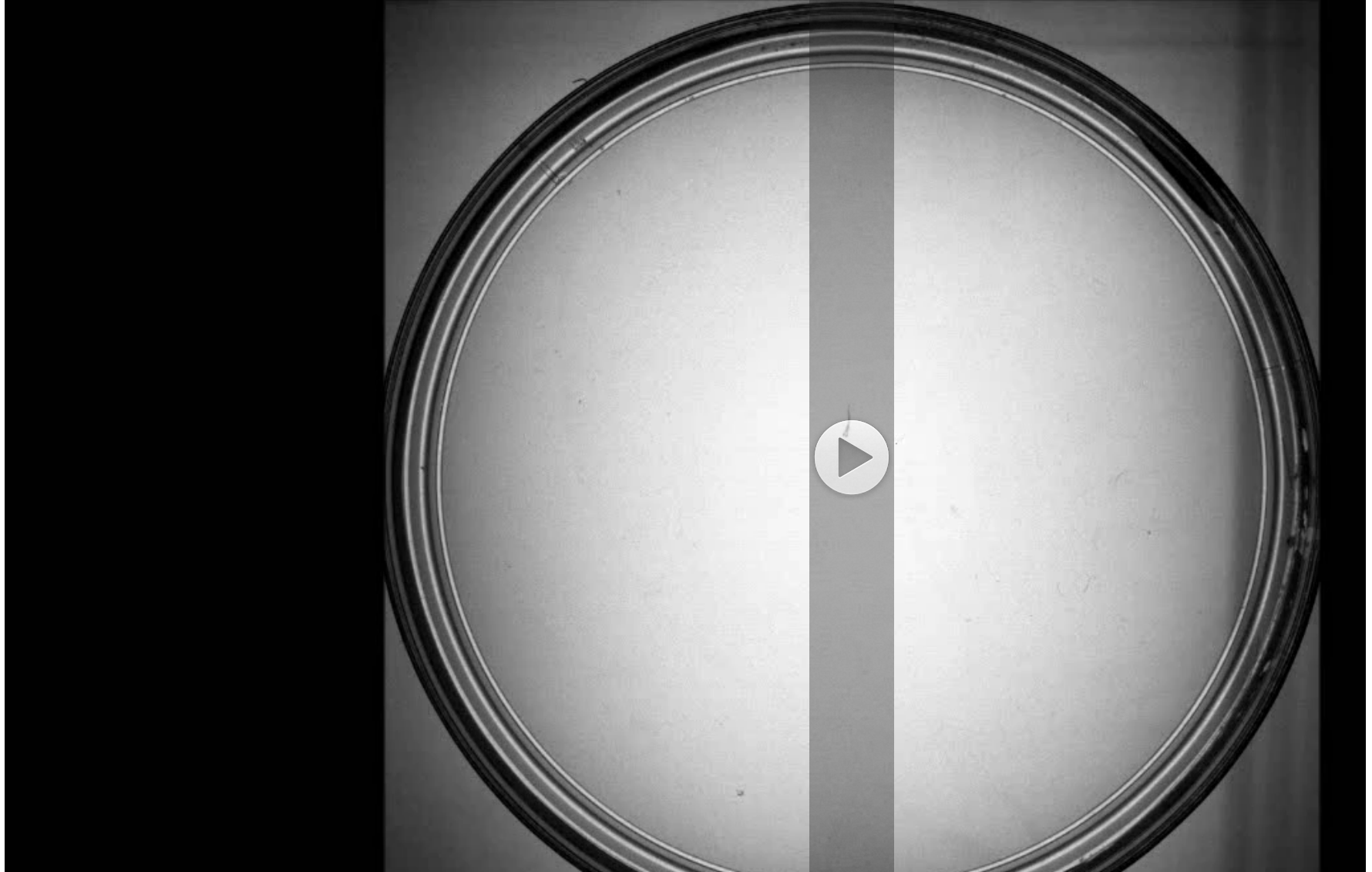
Output



Song et. al 2015

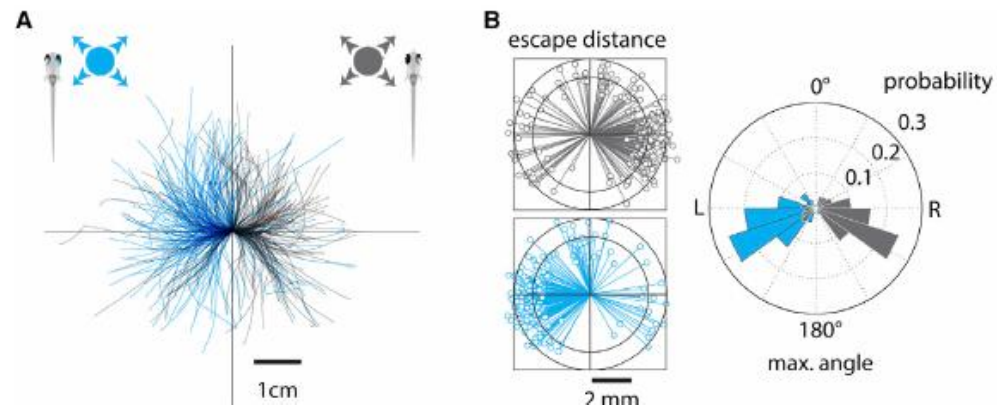
Effect of removal

of the Mauthner cell to looming stimulus experiment



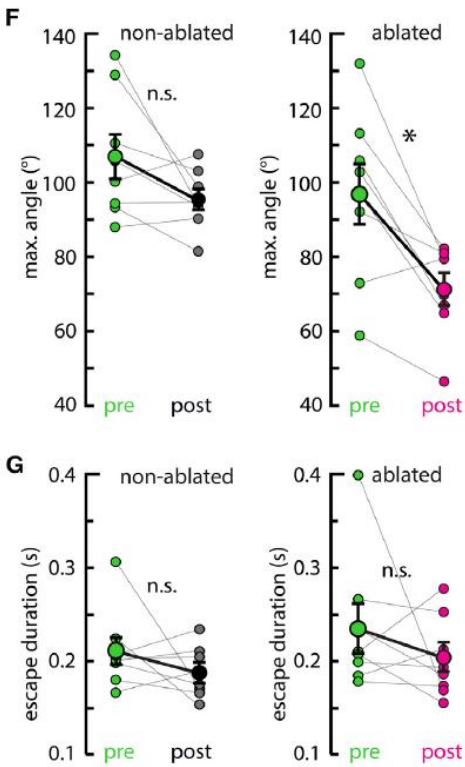
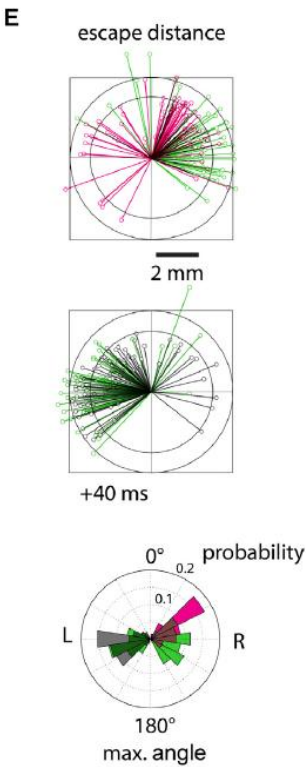
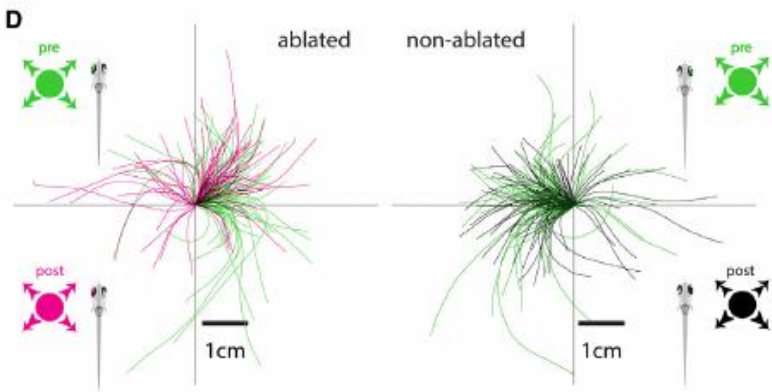
Effect of removal

of the Mauthner cell to looming stimulus experiment



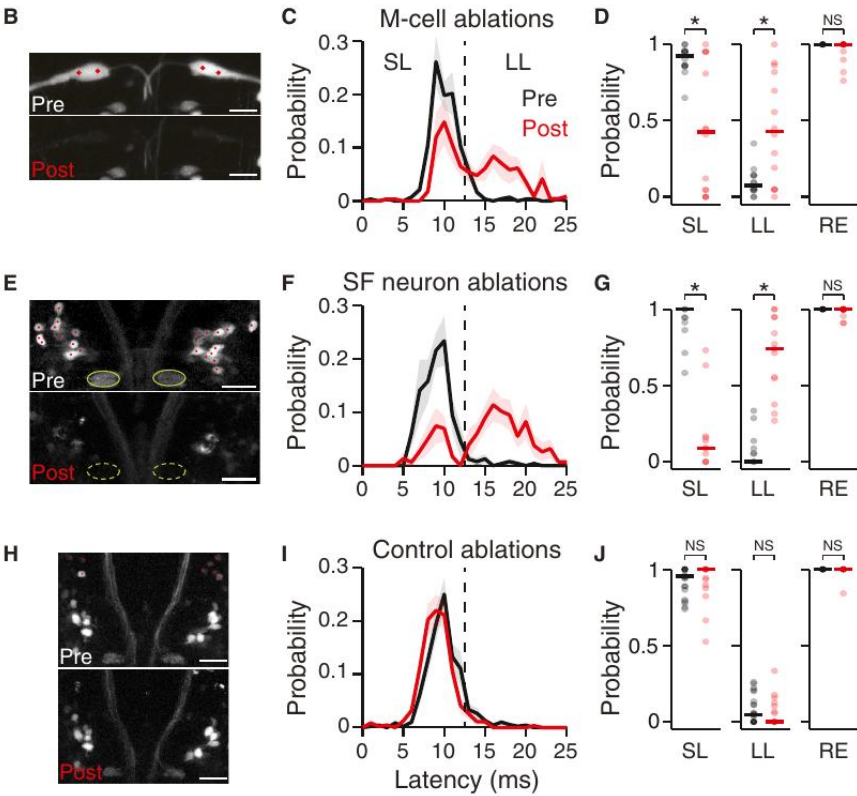
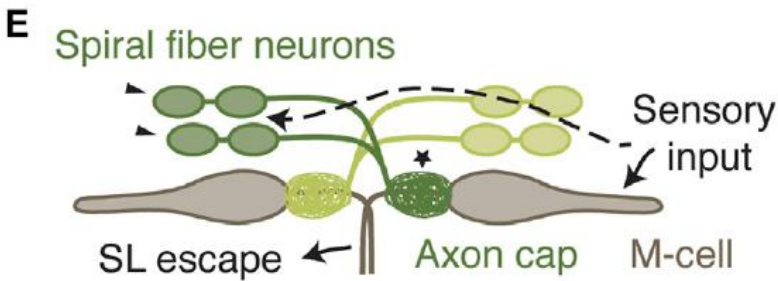
Dunn et. al 2015

Effect of removal
of the Mauthner cell to looming stimulus experiment



Dunn et. al 2015

Effect of removal
of the mauthner and spiral fiber neurons



Lacoste et. al 2015

Summary

- a pair of giant neurons with multisensory input provided via two dendritic branches
- auditory input leads to short-latency escapes of 5-15 ms
- visual input is first preprocessed and leads to long latency escapes of several hundred ms
- output goes to distinct fast motoneurons and inhibits normal swimming
- ablation of M-cells reduces angle away from stimulus and increases latency
- ablation of spiral fiber neurons increases latency as well

Thanks

Questions ?