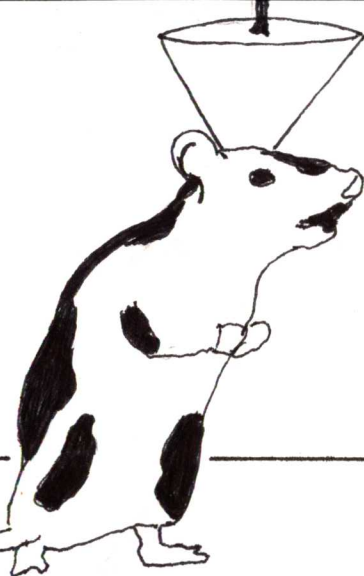


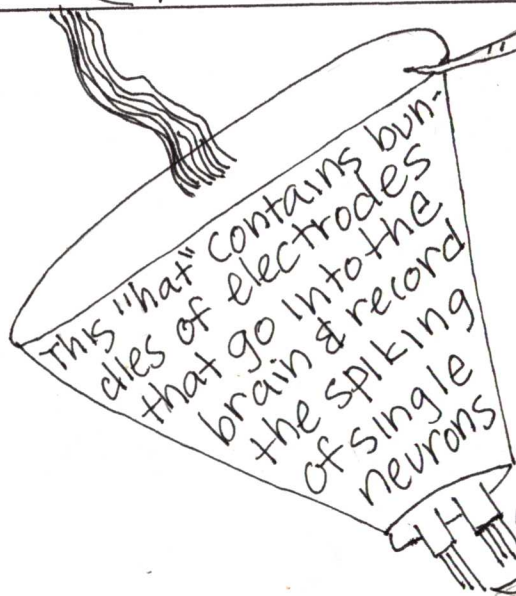
LOCOMOTOR AND HIPPOCAMPAL
PROCESSING CONVERGE IN
THE

Lateral Septum

by Hannah Wirtshafter, PhD



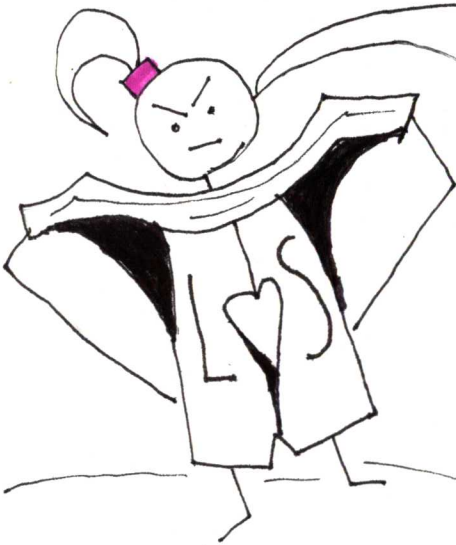
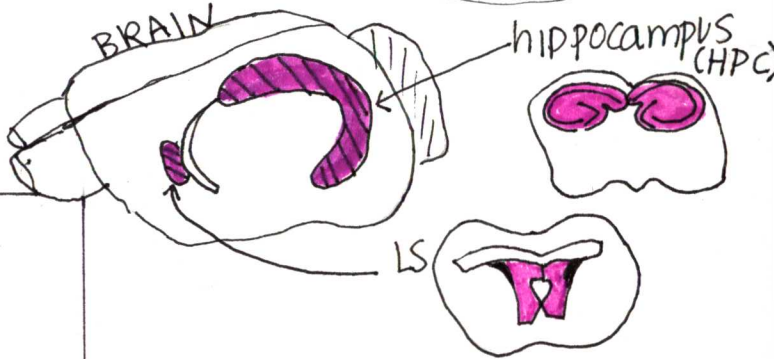
COOL hat,
bro



This "hat" contains bundles of electrodes that go into the brain & record the spiking of single neurons

I go into the hippocampus, used in memory and navigation

I go into the lateral septum (LS). The hippocampus sends info to the LS and it is known to play a role in feeding and in anxiety



Don't sell me short! I also play a role in locomotion and fear and addiction and **AGGRESSION**

Such drama



Comic by Hannah S Wirtshafter

Manuscript in Current Biology, 2019

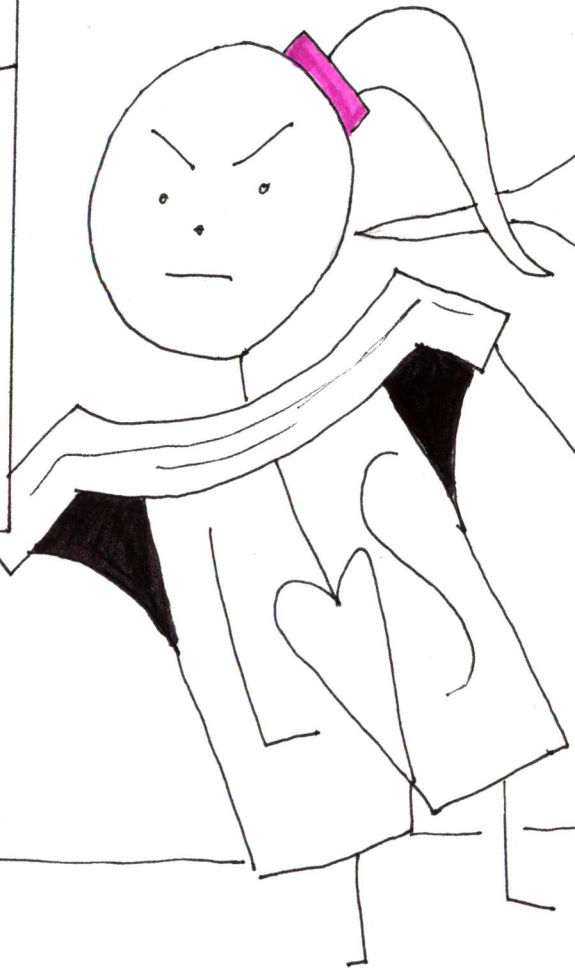
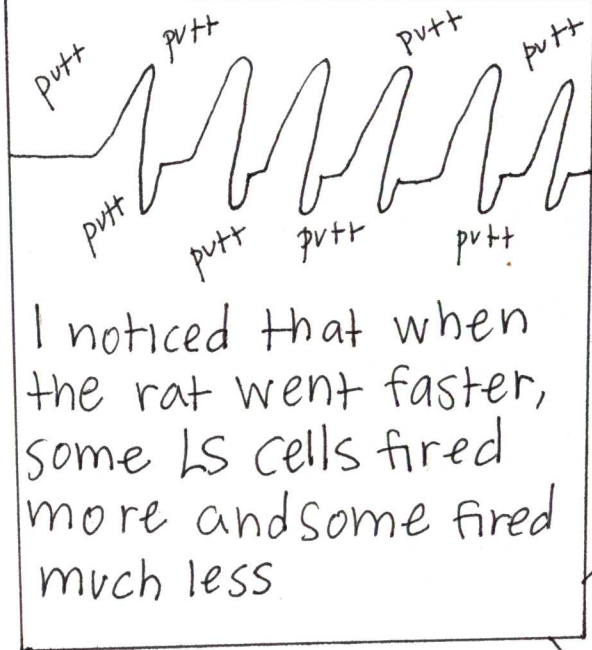
by HS Wirtshafter + MA Wilson, M.I.T.



when the rat runs, I can hear his neurons fire



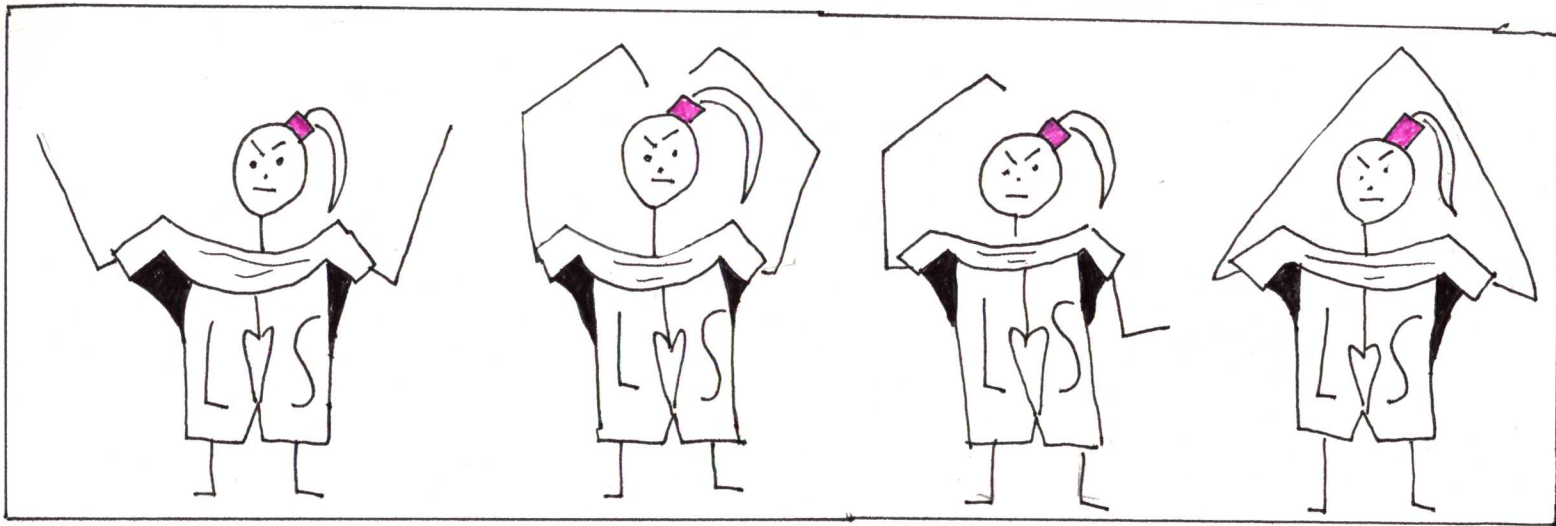
and they pay in chocolate



I keep track of BOTH speed and acceleration by changing my firing rate

SPEED LIMIT $20 \frac{cm}{s}$

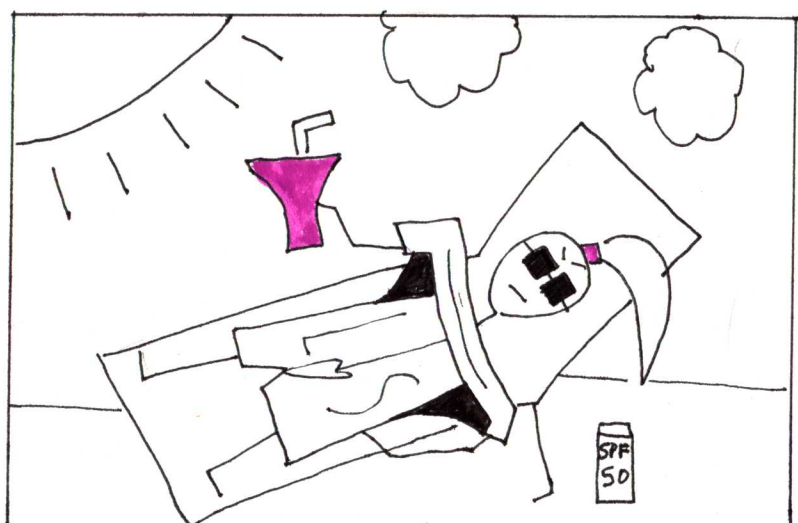
ACC. LIMIT $\pm 50 \frac{cm}{s^2}$



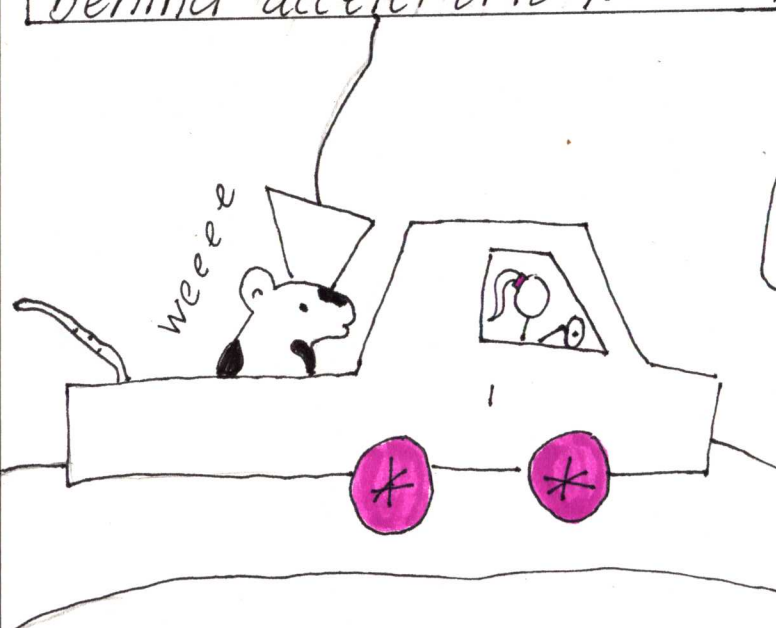
LS cells can increase or decrease their firing rate to increases and decreases in speed and acceleration. It appears that cells change firing rate linearly, in proportion with speed and acceleration changes.

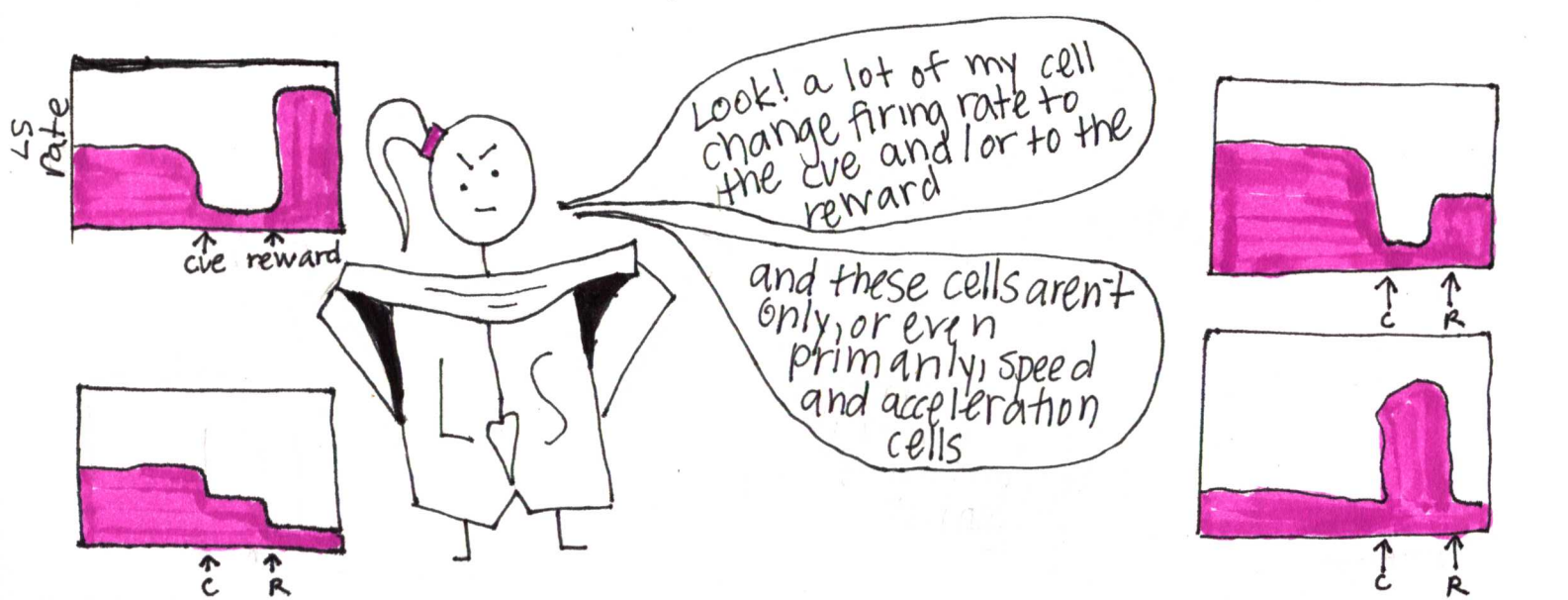
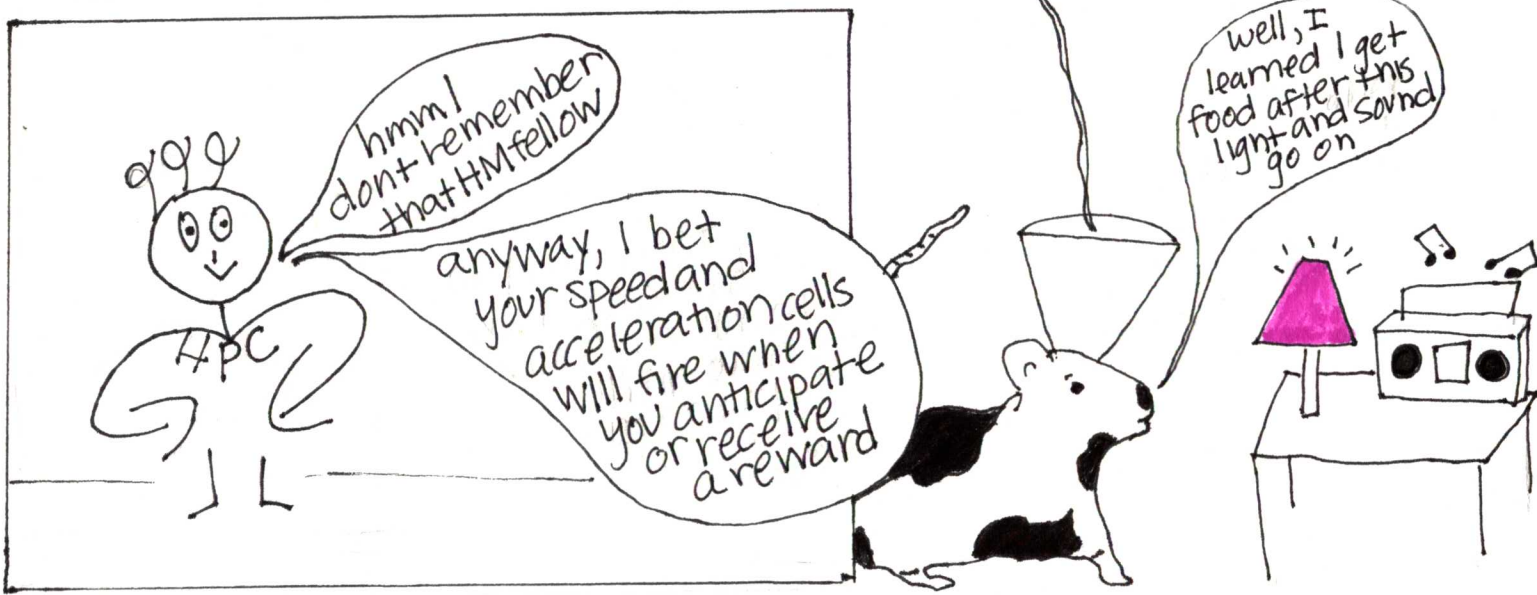
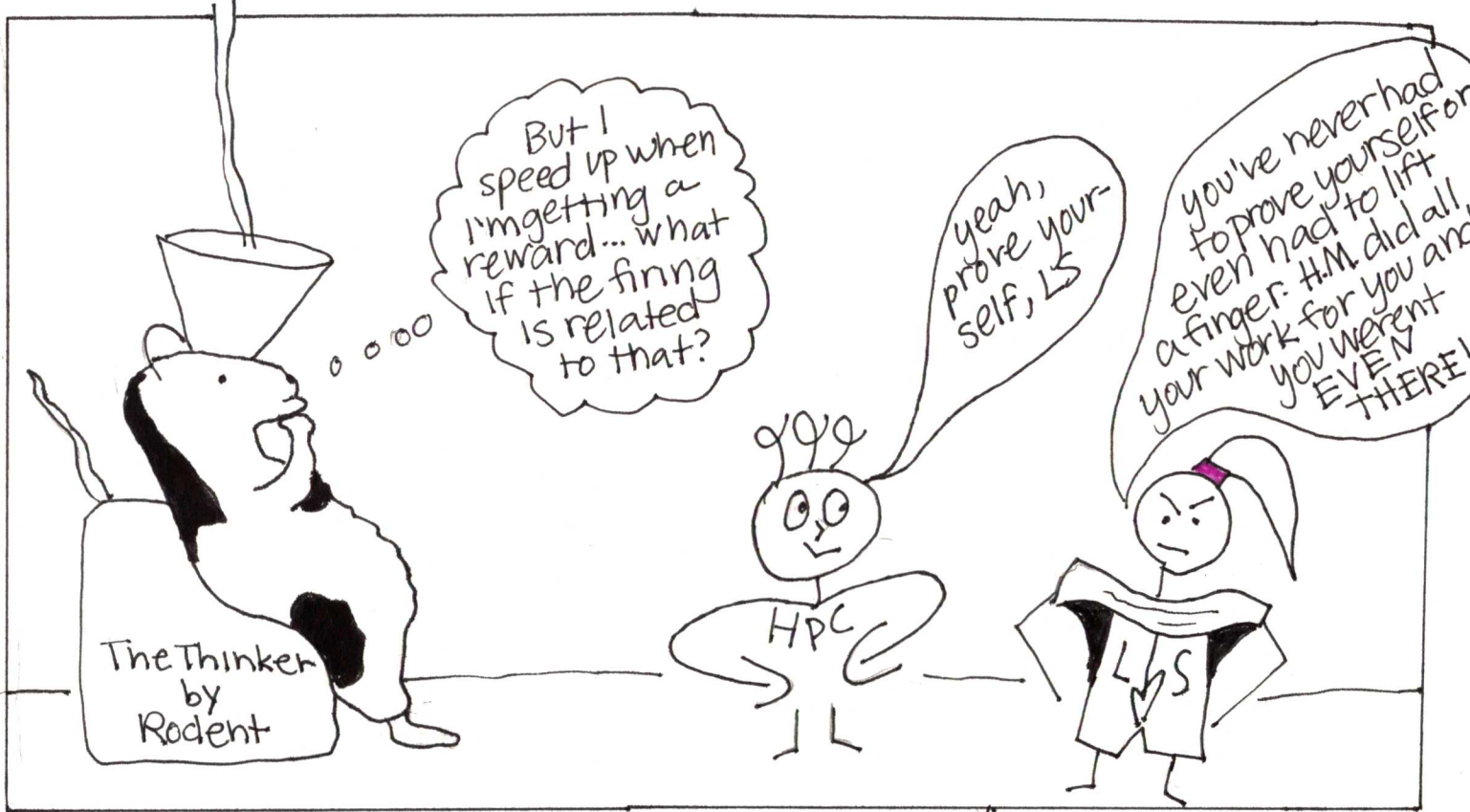


But always running a little behind acceleration...



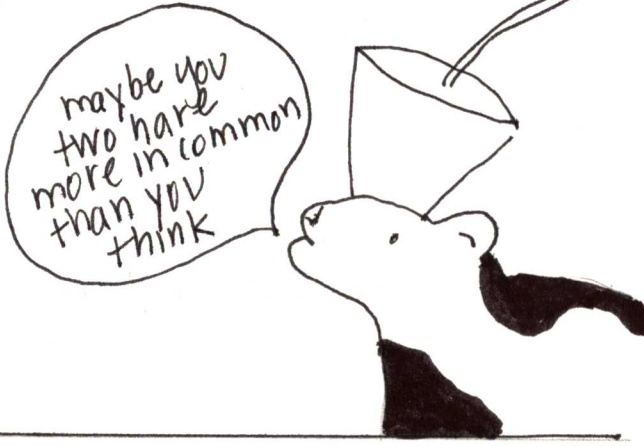
...and a little ahead of speed



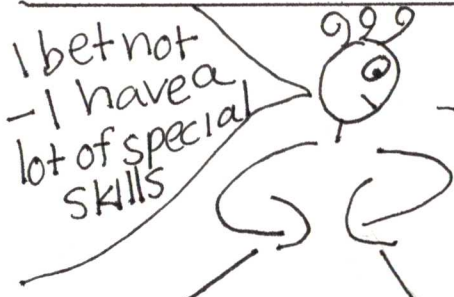




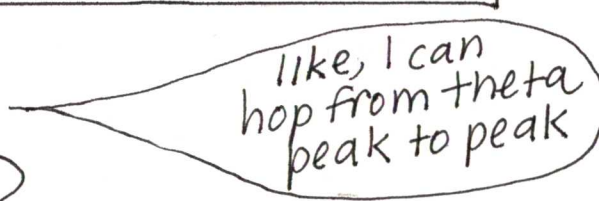
um, I can do that too



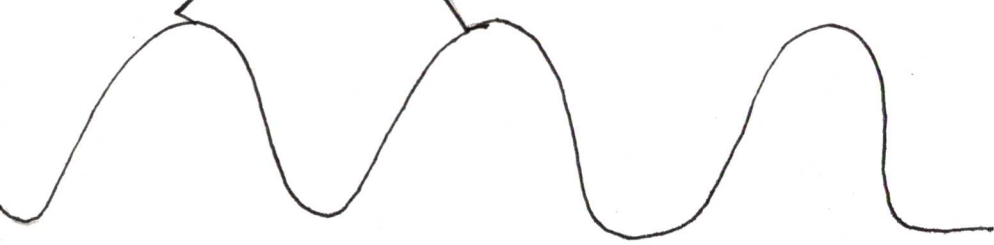
maybe you two have more in common than you think



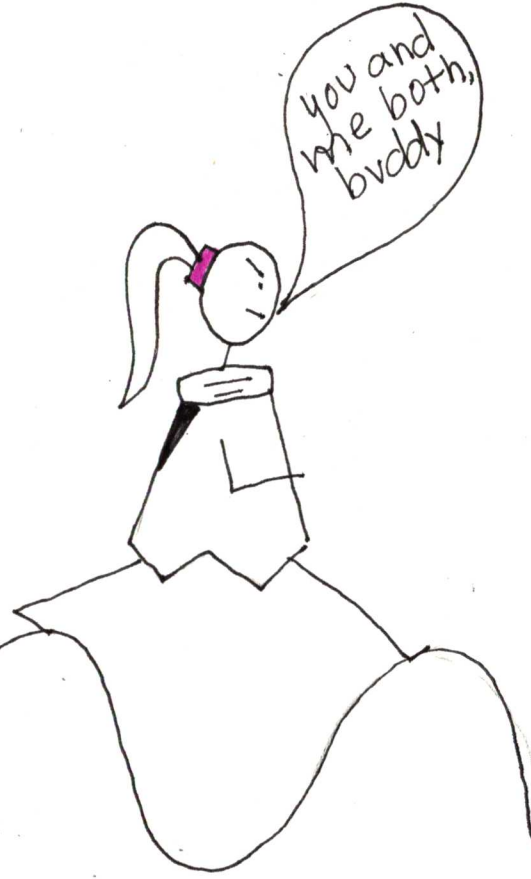
I bet not - I have a lot of special skills



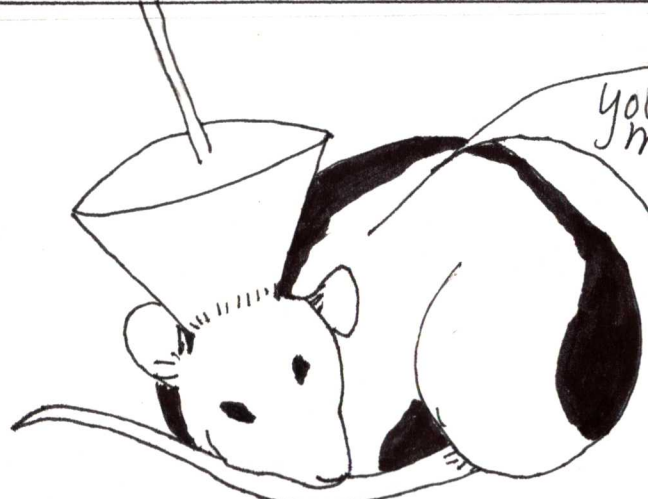
like, I can hop from theta peak to peak



theta: a 4-12 hz rhythm in the hippocampus during locomotion and REM sleep, hypothesized to contribute to information processing and coordinating interactions between the HPC and other areas



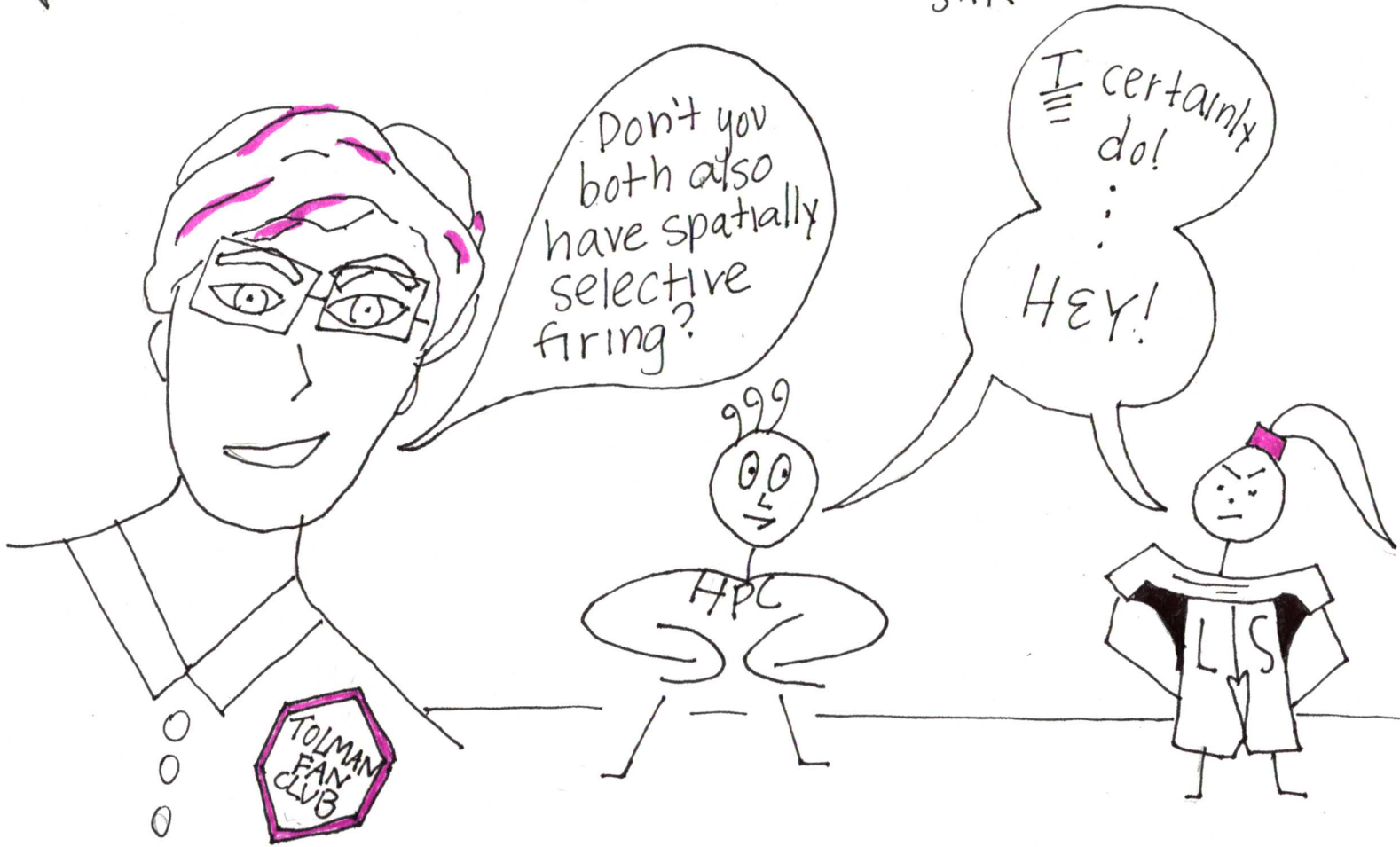
you and me both, buddy

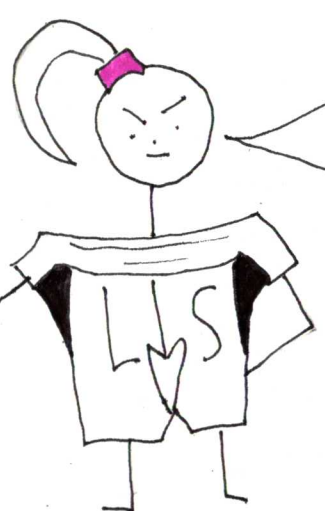
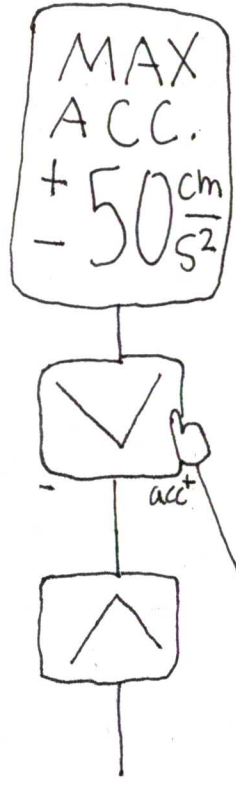
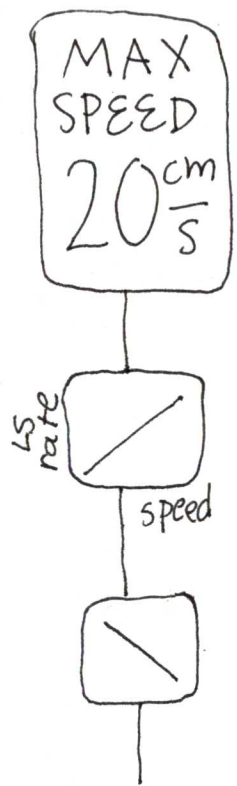
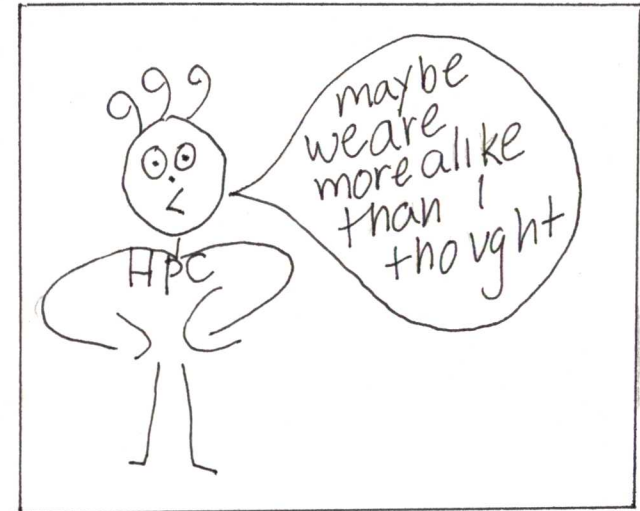


you all are putting me to sleep with these same old tired arguments

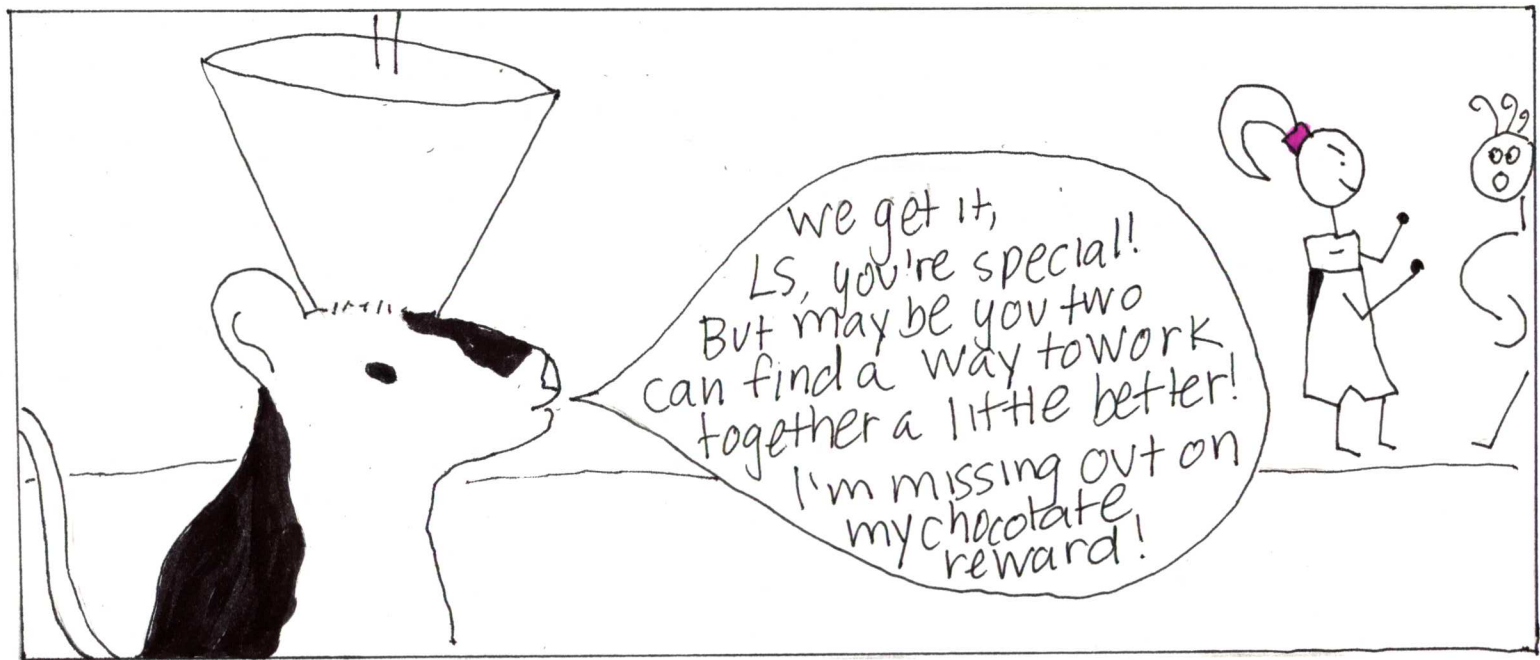
Hey HPC! Hold my beer - watch what I can do when he's asleep

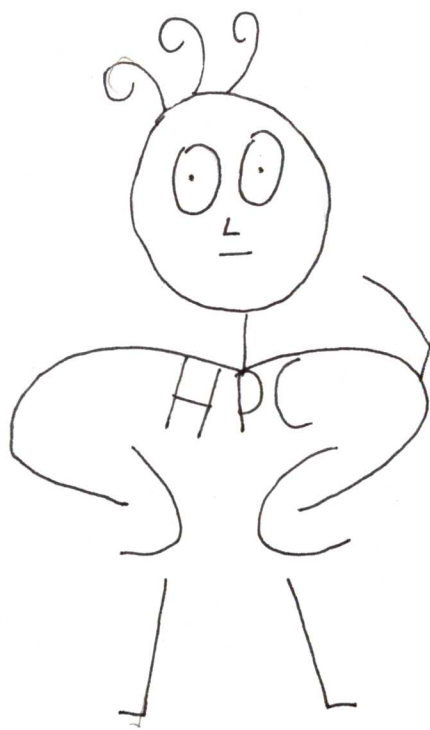






I still have my speed + acceleration modulated cells, and they have nothing to do with you!



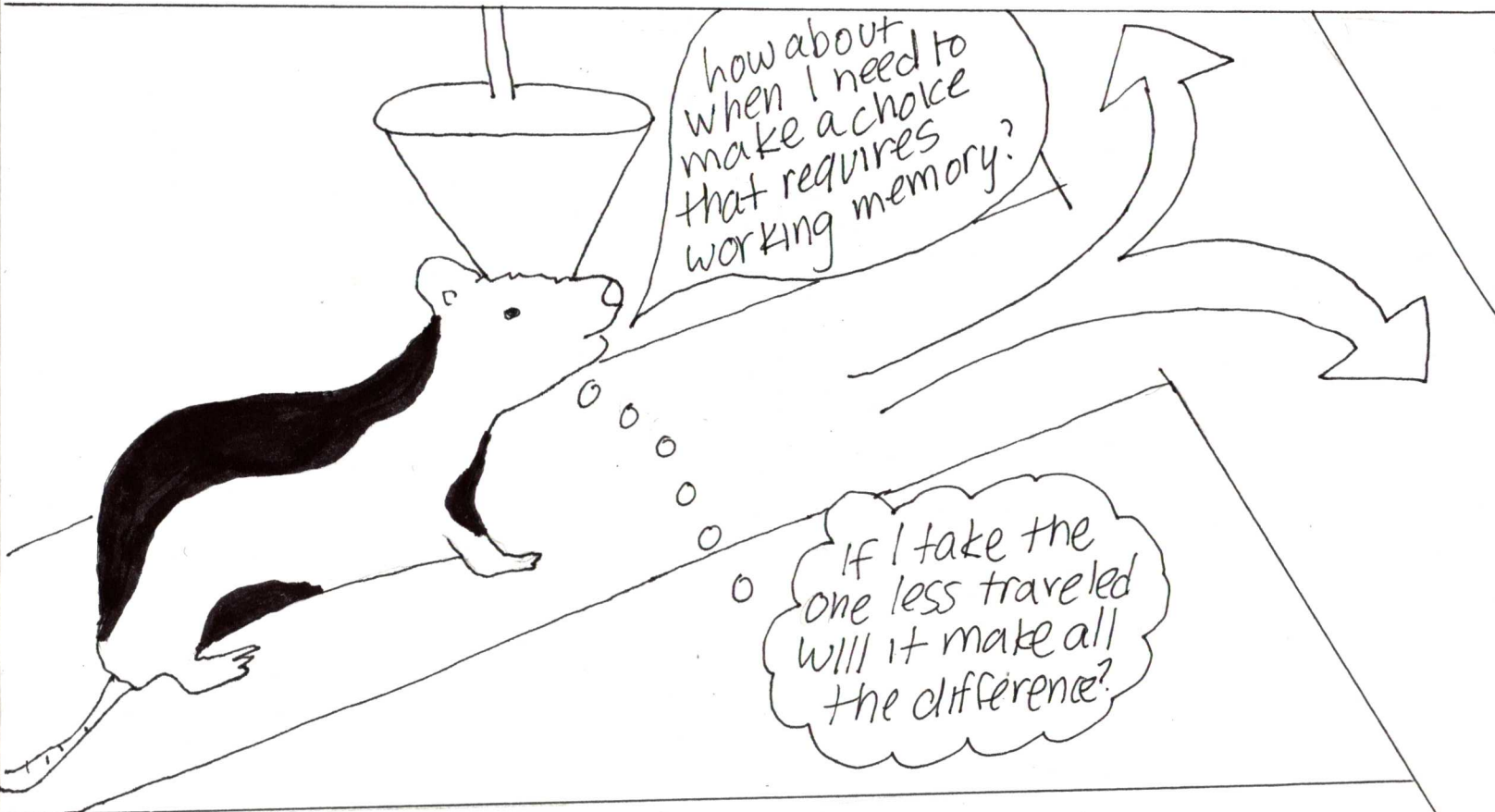


fine, I'll cooperate, but only when absolutely necessary

when is absolutely necessary?



I must be getting soft



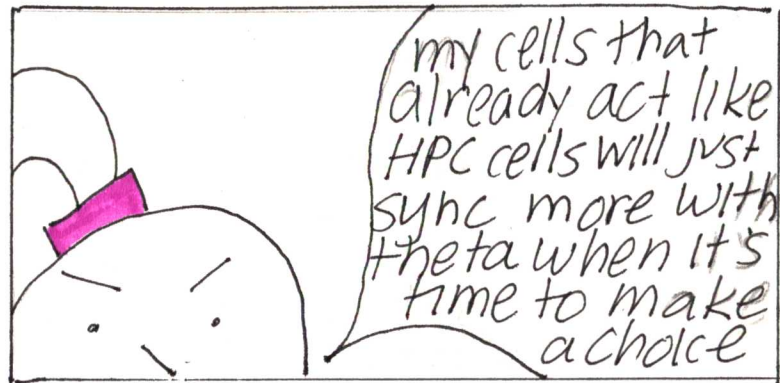
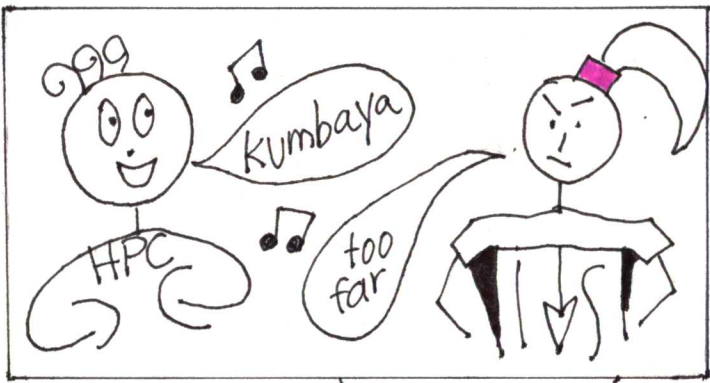
how about when I need to make a choice that requires working memory?

if I take the one less traveled will it make all the difference?



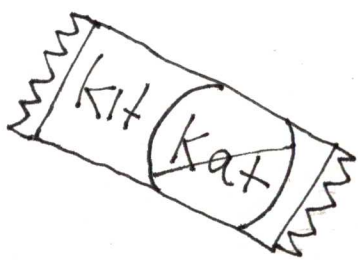
fine, but only my cells that are already coordinated with you will participate





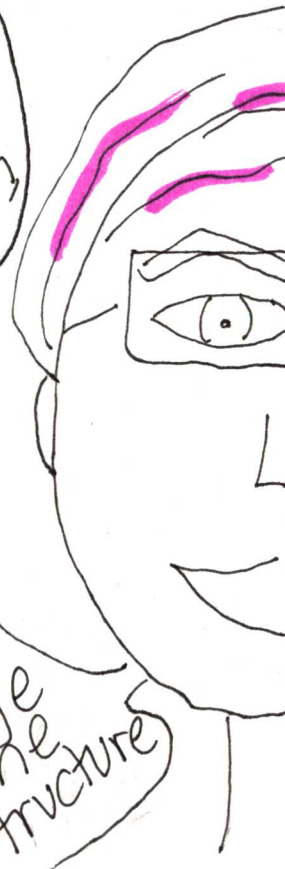
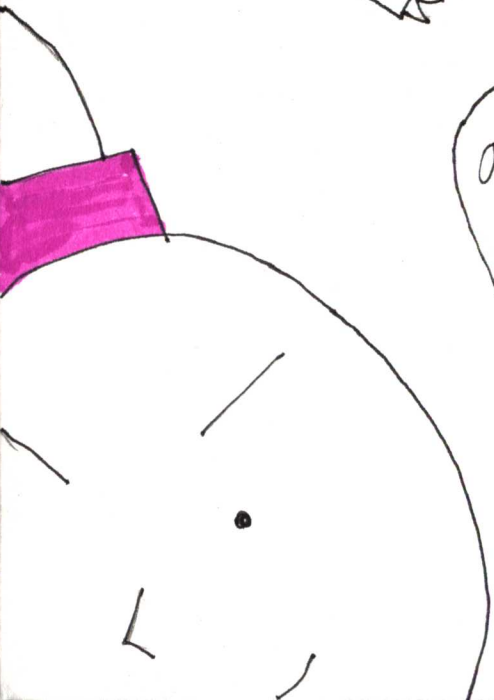
But what does this mean for me? Besides more chocolate?

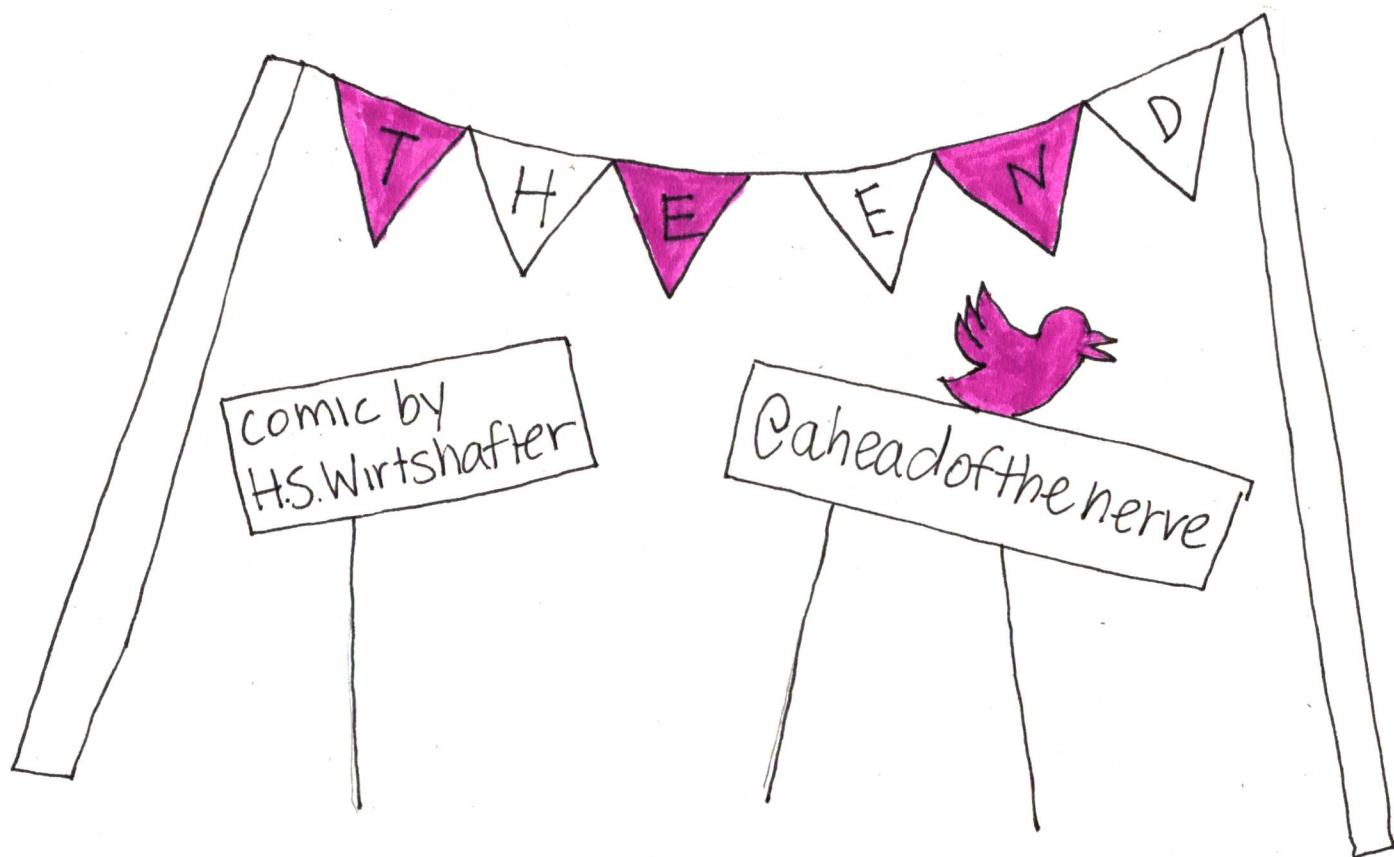
well, we didn't know that much about what the LS did. But now it looks like the LS can represent lots of things - including speed, acceleration, cue, and reward (and place!)



In addition, LS firing is theta and SWP modulated. So movement AND HPC info converge in one structure

and I can use these powers for good... or evil. Maybe I'll only help you plan where and how fast you need to go to get more chocolate... or maybe I'll orchestrate more motivated behaviors that's for you to find out...





Thanks to co-author Matt Wilson, the Wilson Lab, MIT, and Israel Donato Ridgley and Molly Quan.

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