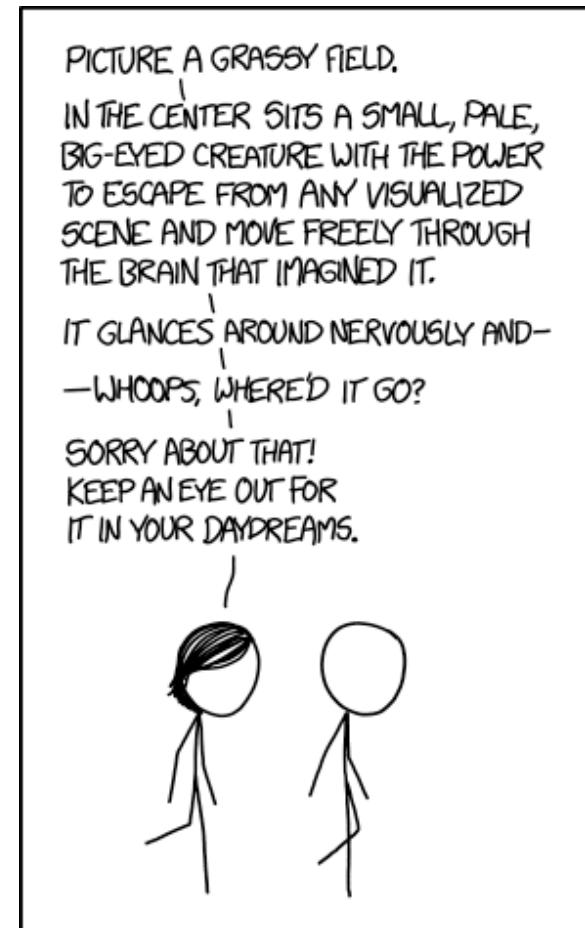


# Making Pictures: Using the Neuroscience of Visual Imagery to Improve Student Learning

Center for the Advancement of Teaching & Learning

Please . . . .

- Get lunch
- Find a table
- Introduce yourself to others at the table



Source: <http://xkcd.com/1582/>

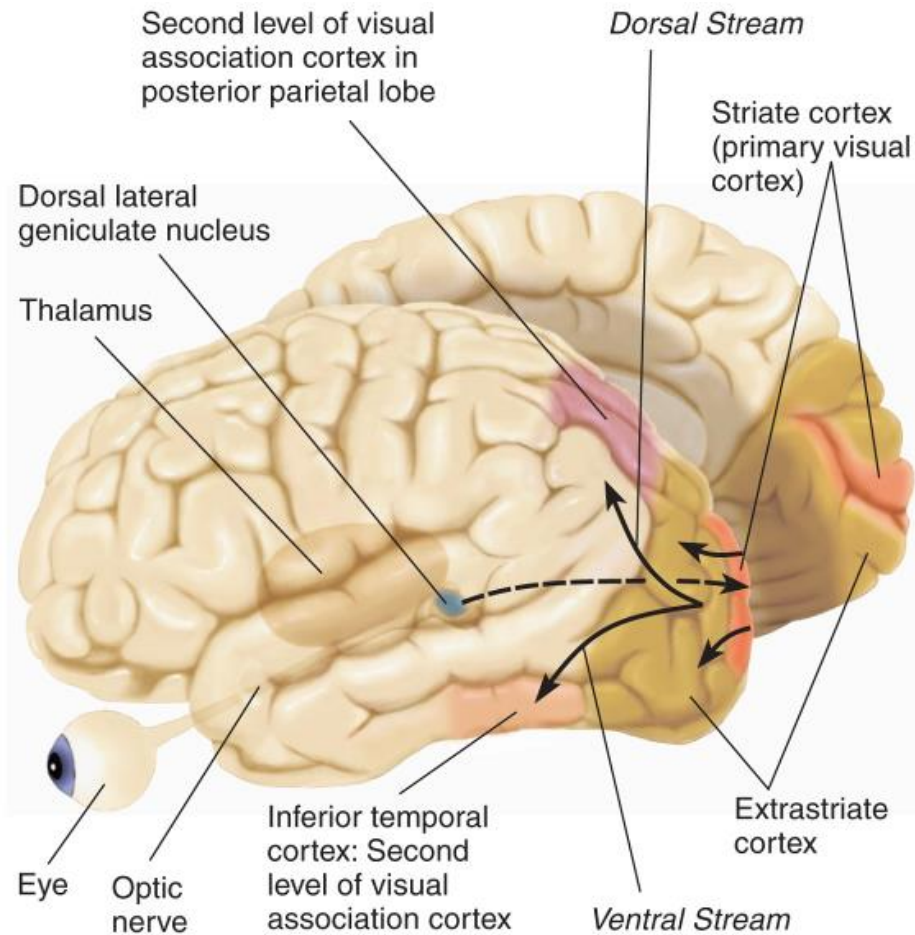
# Mnemonics

- What mnemonics do you know or have you used?
- As a table, come up with 3-4 and then write them on the whiteboards around the room

# Brain real estate dedicated to visual processing

- Humans are highly dependent on vision
- Large portion of brain dedicated to processing visual information
- More than just occipital cortex
- Visual imagery uses same brain circuits as perception

(e.g., Kosslyn, et al., 2001)



This is just the outside layer. Much more visual processing occurs underneath this layer.

# Memory

- Memory is not simply rote regurgitation
- Memory is the core of comprehension and transformative, deep learning
  - Memory allows us to achieve goals
  - Memory defines “self”
- Memory uses all parts of the brain
  - including visual areas
- Memory is reconstructive

# Hippocampus role in visual imagery & comprehension

- Quick learner
  - Especially good at contexts
  - Doesn't store all or only information, stores links between brain areas

- Connected reciprocally to sensory systems

(e.g., McClelland, McNaughton, O'Reilly, 1995)

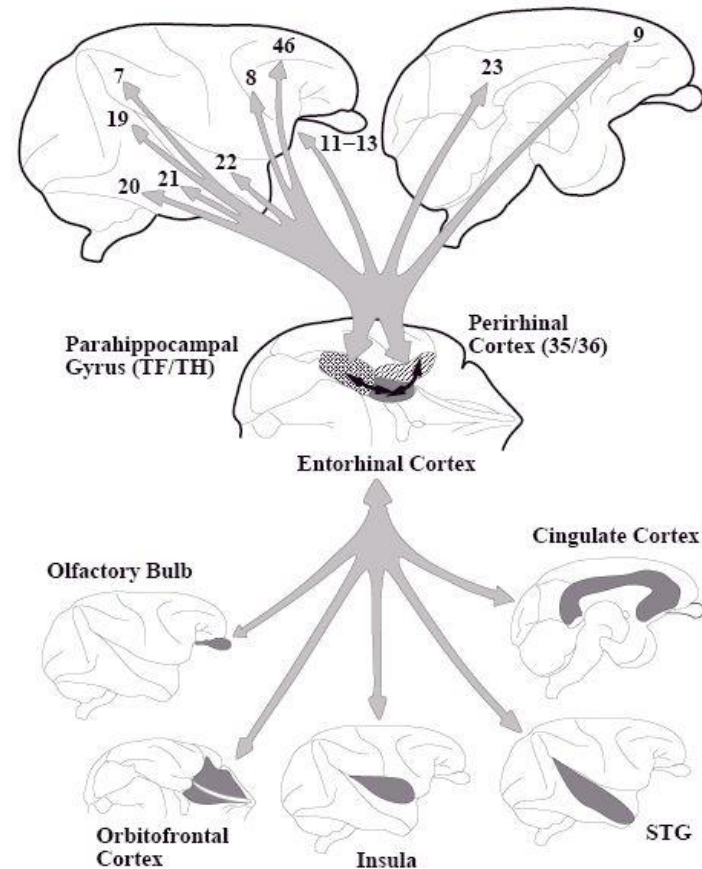


Figure 2: Schematic representation of the inputs and outputs of the hippocampal system in the primate. The upper panel shows the frontal, temporal, and parietal areas reciprocally connected with the parahippocampal gyrus and the perirhinal cortex, which in turn connect reciprocally with the entorhinal cortex. The lower panel shows the areas that have direct reciprocal connections with the entorhinal cortex. *Note:* From Figure 10 of "Memory and the Hippocampus" (p. 227), by L. R. Squire, A. P. Shimamura, and D. G. Amaral, in *Neural Models of Plasticity: Experimental and Theoretical Approaches*, edited by J. H. Byrne and W. O. Berry, 1989, New York: Academic Press. Copyright 1989 by Academic Press, Inc. Reprinted with permission.

# Visual imagery characteristics that improve learning

- Vividness
- Bizarreness
- Emotion
- Meaningfulness
- Self-reference
- Self-generation

(e.g., McDaniel & Bugg, 2008)

# Deep learning

- Thinking deeply
  - Requires prior knowledge of, and experiences with, content and process
  - More likely to occur with scaffolding to connect prior knowledge and experiences to current knowledge and experiences  
(e.g., McNamara & Kintsch, 1996)

# Strategy: Memory palace/Method of loci

- Associating lists or sequences with contexts
- Use our Elon campus to memorize one of the lists I gave your table
  - When everyone at your table is finished, pair up and walk each other through your Elon memory palaces
  - Think about ways you could use this strategy in one of your classes



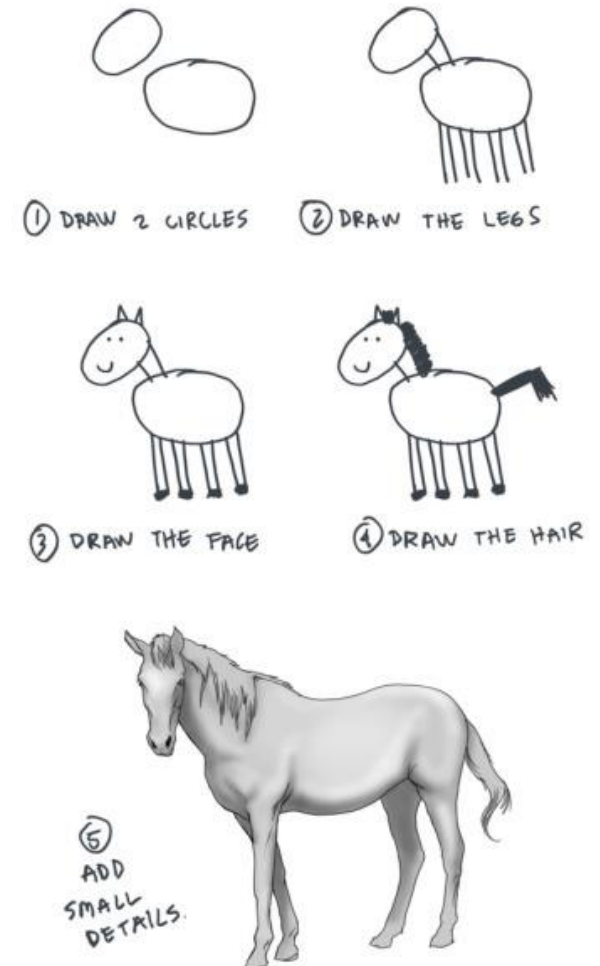
Source: <http://www.musee-jean-de-la-fontaine.fr/jean-de-la-fontaine-fable-uk-238.html>



# Strategy: Visual elaboration

- Elaboration – making connections or links by adding details
- Take an abstract or higher-order concept(s) from one of your courses
  - Think about how to represent it within a rich, detailed visual image, possibly using analogy (e.g., Plato's cave)
  - Think about how to make use of visual elaboration to represent the interaction or relationship of the aspects of the concept
  - Write your concept on the whiteboard
  - Share with your table

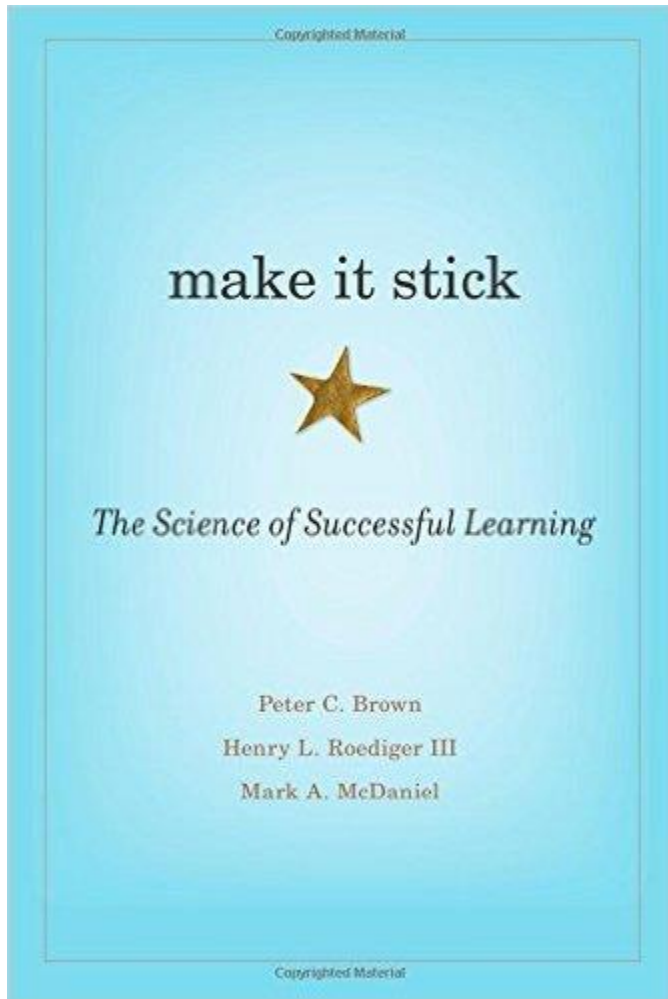
## HOW TO: DRAW A HORSE BY VAN OKTOP



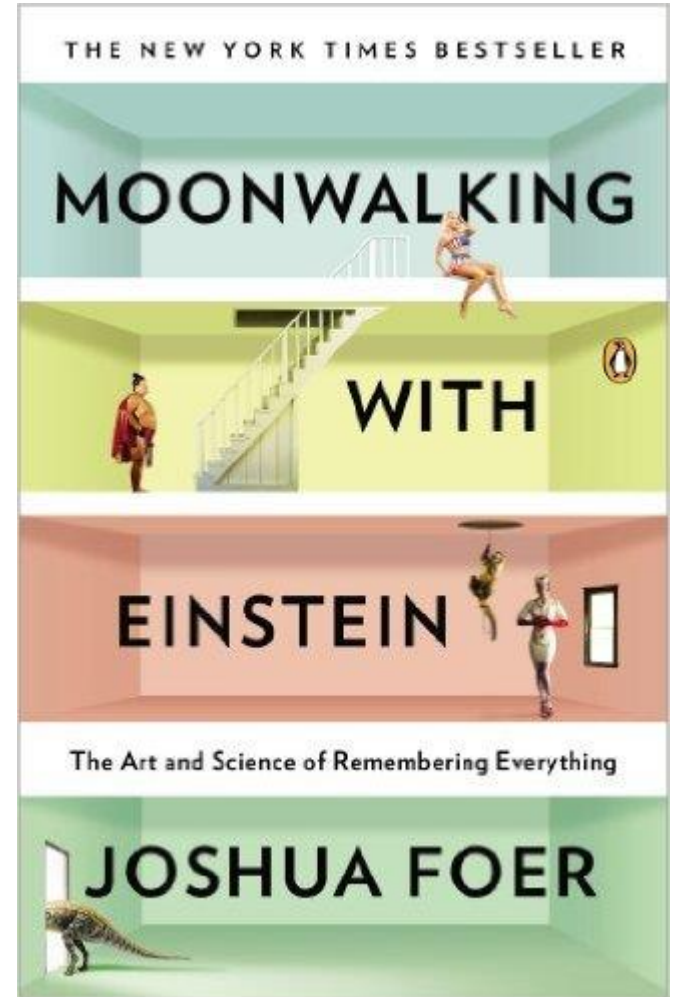
# Next steps

- What did you learn today?
- What action do you want to take regarding incorporating visual imagery into your teaching?
- What further resources do you need?  
(CATL team members would be happy to follow up with an individual consultation)

# Book suggestions and Q&A



**Read this for specific evidence-based teaching strategies**



**Read this for the pleasure of a good story and/or tips on becoming a mnemonist**

# References

- Kosslyn et al., 2001  
[http://www.nature.com/nrn/journal/v2/n9/abs/nrn0901\\_635a.html](http://www.nature.com/nrn/journal/v2/n9/abs/nrn0901_635a.html)
- McDaniel & Bugg, 2008  
<http://link.springer.com/article/10.3758/PBR.15.2.237>
- McClelland et al., 1995  
<http://psycnet.apa.org/psycinfo/1995-42327-001>
- McNamara & Kintsch, 1996  
<http://www.tandfonline.com/doi/abs/10.1080/01638539609544975#.Via3NG5WV1E>

*Contact Amy Overman ([aoverman@elon.edu](mailto:aoverman@elon.edu); 336-278-5152) for more reading suggestions!*