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Learning How to Learn: Powerful Mental Tools to Help You Master Tough Subject

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Learning How to Learn: Powerful Mental Tools to Help You Master Tough Subjects



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Workshop with Barbara Oakley

Date: Thursday, May 7, 2015, 10:00am to 11:00am

LESSONS FROM A BASEMENT STUDIO—

HOW TO MAKE A RIVETING ONLINE CLASS

This talk describes the key elements behind the making of high quality educational videos for online learning, including scripting, filming, and editing.

Online is *highly* competitive

Academia

**Silicon
Valley**

Hollywood

People *love* it.



Impact

Little ability to reach the public.

A nonfiction book

a $\left(\frac{\text{MIND}}{\text{for}}\right) =$
NUMBERS



**HOW TO EXCEL AT
MATH AND SCIENCE**
(Even If You Flunked Algebra)

BARBARA OAKLEY, Ph.D.



Barb Oakley with *Science Friday's*
Ira Flatow (1.3 million weekly listeners)
and the *New York Times'* Ben Carey



**Silicon Valley
meetup—45 people**

**Look cool in front of colleagues
Standing room
only...**

LylePhotos.com, Atlanta?



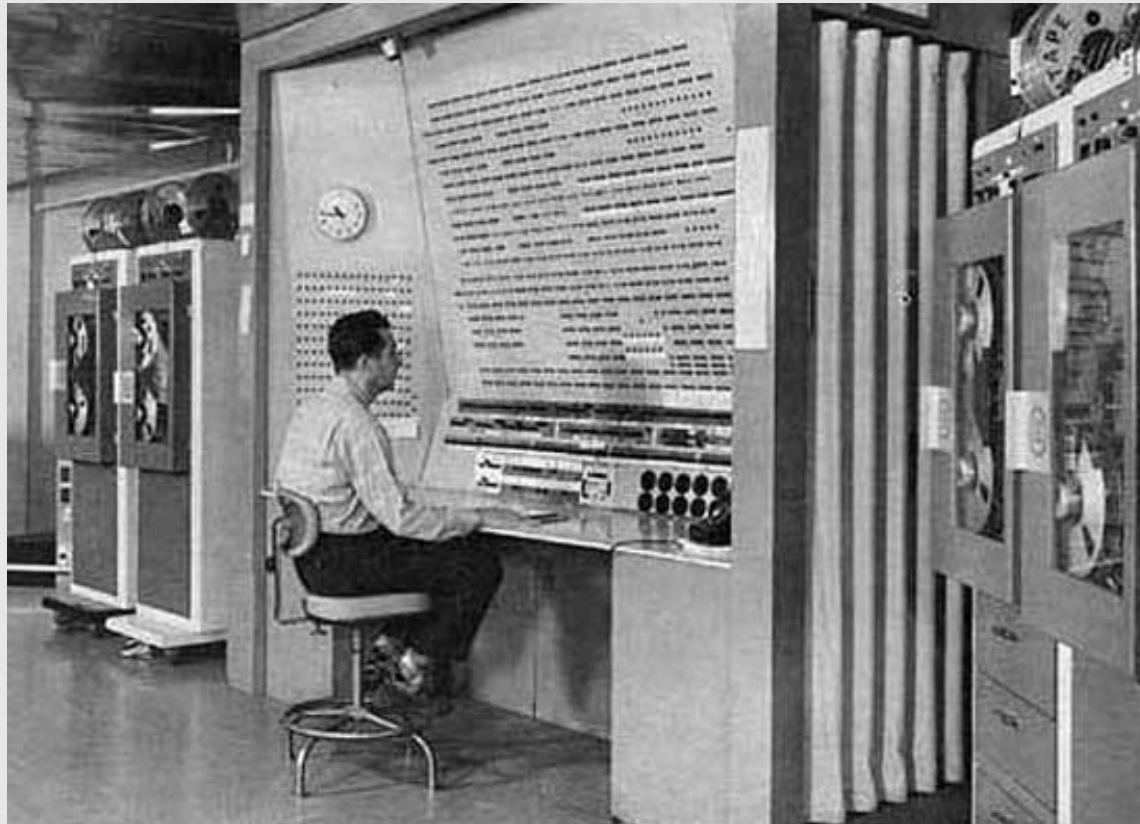
- **Baidu HQ**
- **Singapore**
- **Hong Kong**
- **Madrid**
- **Jakarta**
- **Bogota**
- **South Africa**
- **Brazil**
- **Norway**



MOOCs & Online

- Reach
- “Legs”
- Your own educational television show
- Endless reruns
- Only investment—startup time

Most universities have not yet decoded MOOCs



"Caged" versus "Free Range" learners



18 to 24-
year-olds

18 to 85-year-olds





The biggest challenge?





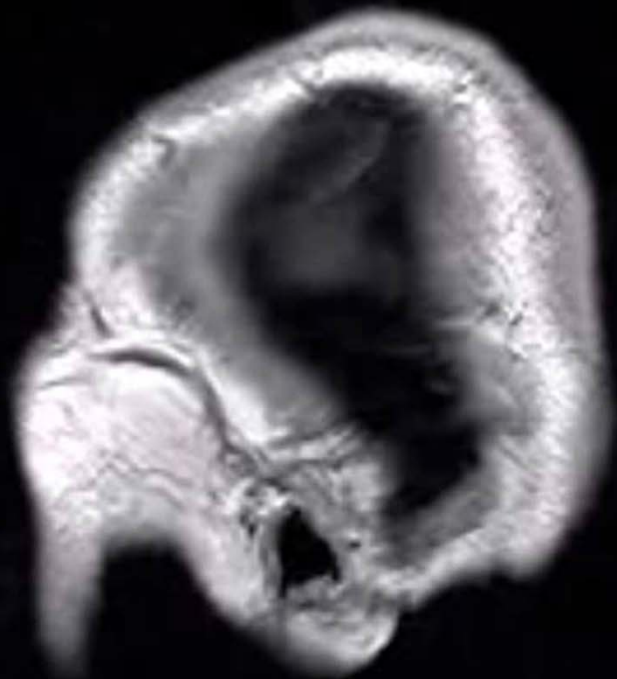
How did you do it?



Philip Oakley

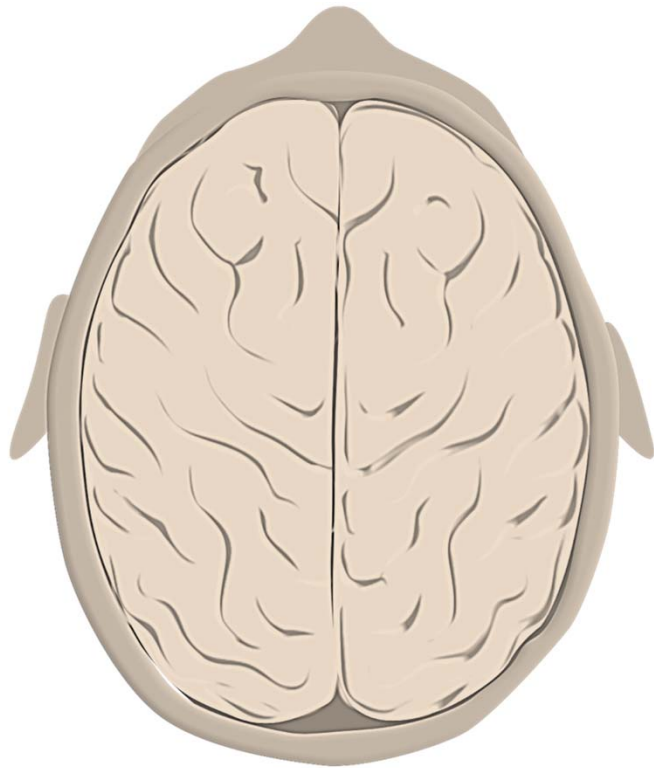
Function $f(x)$	Derivative $f'(x)$	Integral $\int f(x)dx$ (constant term is omitted)	Multiplicative derivative $f^*(x)$	Multiplicative integral $\int f(x)^{dx}$ (constant factor is omitted)	Discrete derivative (difference) $\Delta f(x)$	Discrete integral (antidifference) $\Delta^{-1} f(x)$ (constant term is omitted)	Discrete multiplicative derivative ^[5] (multiplicative difference)	Discrete multiplicative integral ^[6] (indefinite product) $\prod_x f(x)$ (constant factor is omitted)
a	0	ax	1	a^x	0	ax	1	a^x
x	1	$\frac{x^2}{2}$	$\sqrt[x]{e}$	$\frac{x^x}{e^x}$	1	$\frac{x^2}{2} - \frac{x}{2}$	$1 + \frac{1}{x}$	$\Gamma(x)$
$ax + b$	a	$\frac{ax^2 + 2bx}{2}$	$\exp\left(\frac{a}{ax + b}\right)$	$\frac{(b + ax)^{\frac{b}{a} + x}}{e^x}$	a	$\frac{ax^2 + 2bx - ax}{2}$	$1 + \frac{a}{ax + b}$	$\frac{a^x \Gamma\left(\frac{ax+b}{a}\right)}{\Gamma\left(\frac{a+b}{a}\right)}$
$\frac{1}{x}$	$-\frac{1}{x^2}$	$\ln x $	$\frac{1}{\sqrt[x]{e}}$	$\frac{e^x}{x^x}$	$-\frac{1}{x + x^2}$	$\psi(x)$	$\frac{x}{x + 1}$	$\frac{1}{\Gamma(x)}$
x^a	ax^{a-1}	$\frac{x^{a+1}}{a + 1}$	$e^{\frac{a}{x}}$	$e^{-ax} x^{ax}$	$(x + 1)^a - x^a$	$\frac{B_{a+1}(x)}{a + 1}, a \notin \mathbb{Z}^-$ $\frac{(-1)^{a-1} \psi^{(-a-1)}(x)}{\Gamma(-a)}, a \in \mathbb{Z}^-$	$\left(1 + \frac{1}{x}\right)^a$	$\Gamma(x)^a$
a^x	$a^x \ln a$	$\frac{a^x}{\ln a}$	a	$a^{\frac{x^2}{2}}$	$(a - 1)a^x$	$\frac{a^x}{a - 1}$	a	$a^{\frac{x^2 - x}{2}}$
$\sqrt[x]{a}$	$-\frac{\sqrt[x]{a} \ln a}{x^2}$	$x \sqrt[x]{a} - \text{Ei}\left(\frac{\ln a}{x}\right) \ln a$	$a^{-\frac{1}{x^2}}$	$a^{\ln x}$	$a^{\frac{1}{1+x}} - a^{\frac{1}{x}}$?	$a^{-\frac{1}{x+x^2}}$	$a^{\psi(x)}$
$\log_a x$	$\frac{1}{x \ln a}$	$\log_a x^x - \frac{x}{\ln a}$	$\exp\left(\frac{1}{x \ln x}\right)$	$\frac{(\log_a x)^x}{e^{\text{li}(x)}}$	$\log_a\left(\frac{1}{x} - 1\right)$	$\log_a \Gamma(x)$	$\log_x(x + 1)$?
x^x	$x^x(1 + \ln x)$?	ex	$e^{-\frac{1}{4}x^2(1-2\ln x)}$	$(x + 1)^{x+1} - x^x$?	$\frac{(x + 1)^{x+1}}{x^x}$	$K(x)$
$\Gamma(x)$	$\Gamma(x)\psi(x)$?	$e^{\psi(x)}$	$e^{\psi^{(-2)}(x)}$	$(x - 1)\Gamma(x)$	$(-1)^{x+1}\Gamma(x)!(-x)$	x	$\frac{\Gamma(x)^{x-1}}{K(x)}$

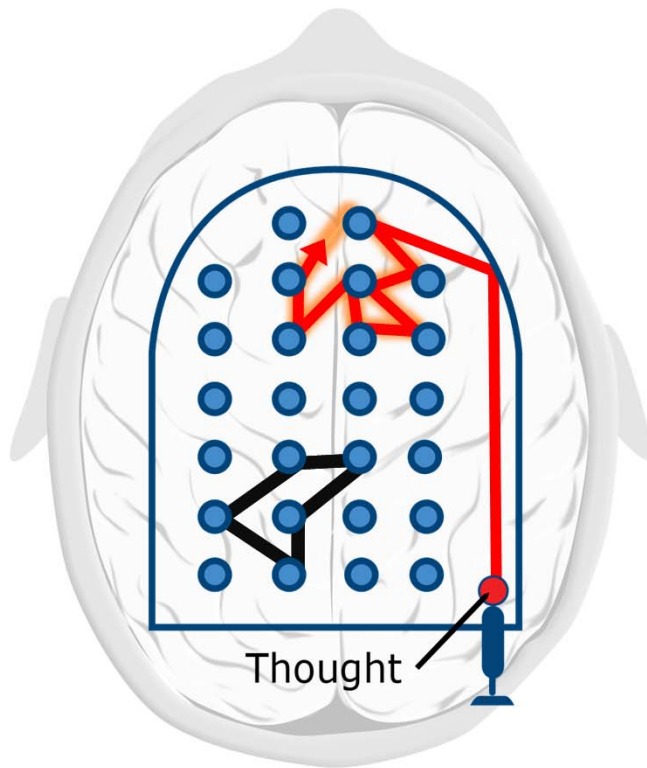




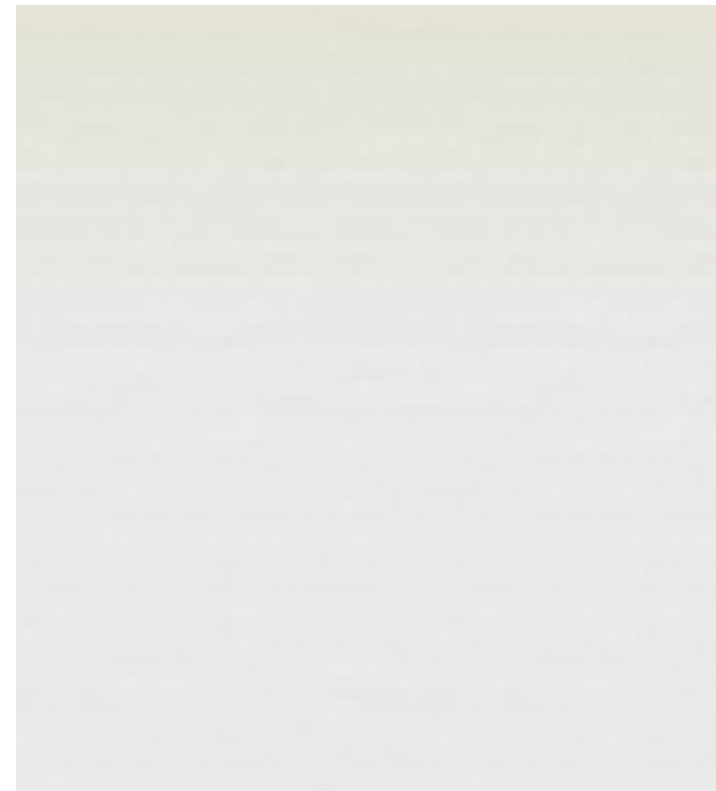
Focused mode

Diffuse mode

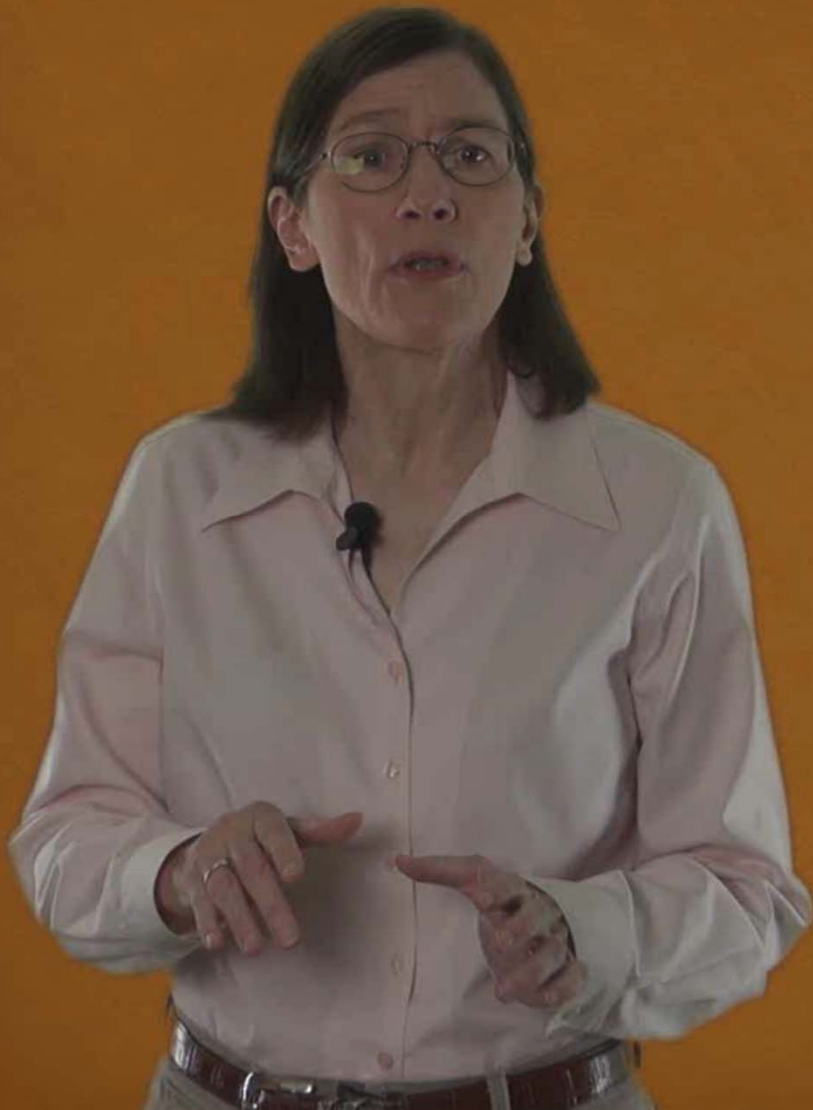




Focused Mode

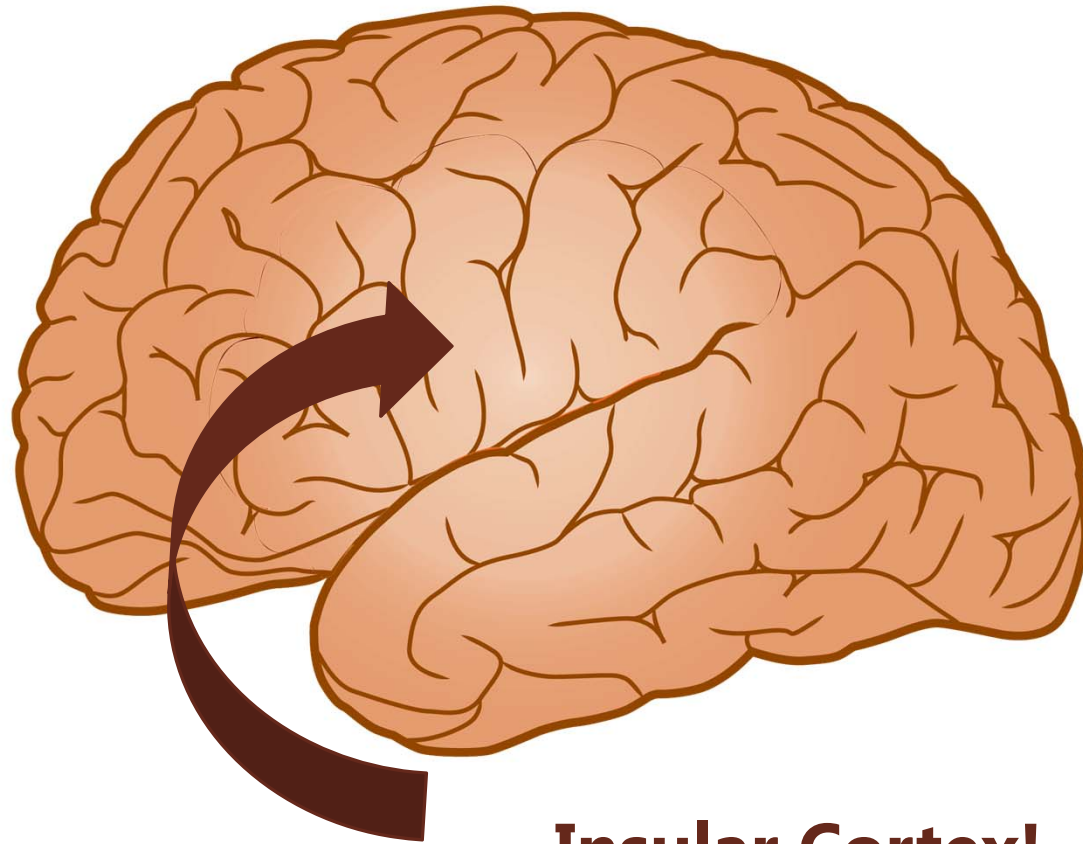


Diffuse Mode



Procrastinate

Procrastinate



Insular Cortex!

Procrastination – A Habit

3

Feel happy
(temporarily)

2

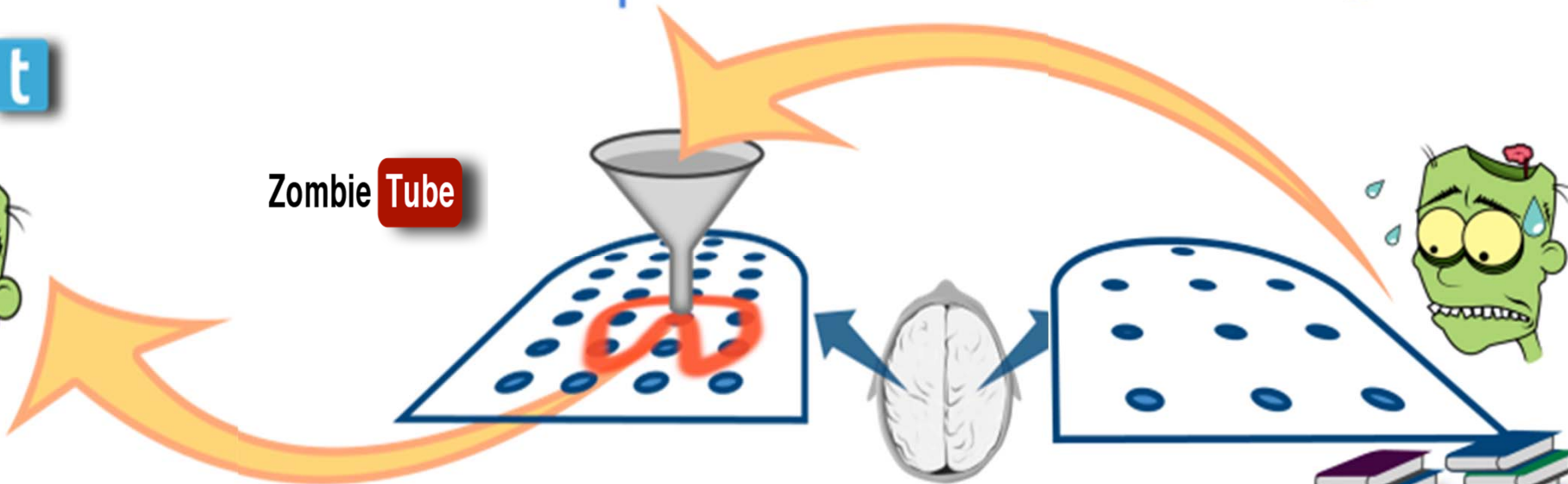
You funnel attention
onto a more pleasant task

1

Unhappy
feeling



Zombie Tube

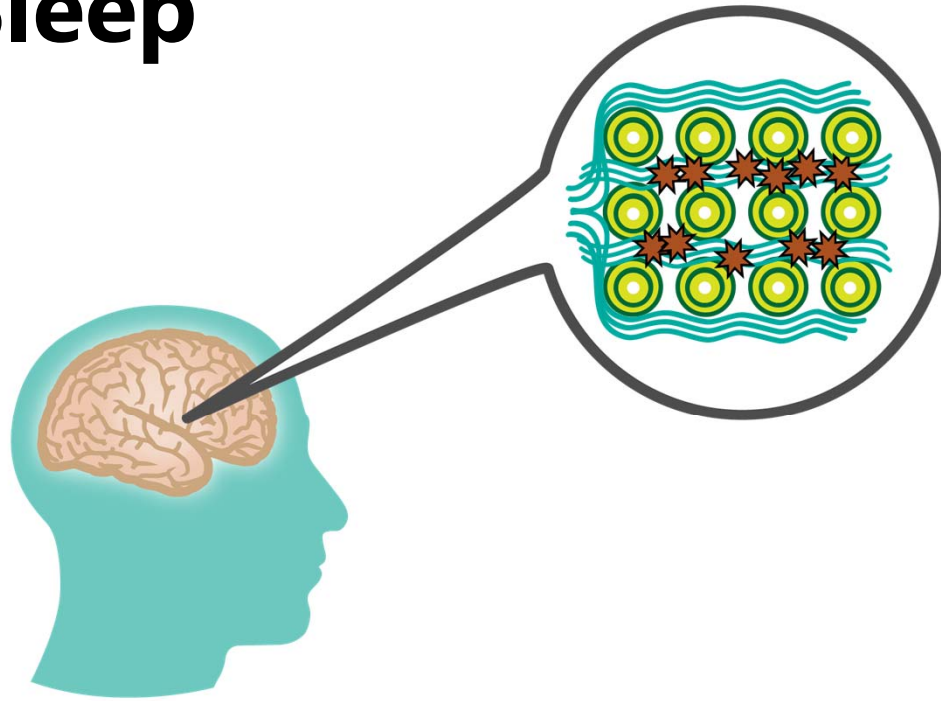




- **Turn off all distractions**
- **Set timer for 25 minutes**
- **Focus**
- **Reward!**

- **Do NOT focus on finishing a task**

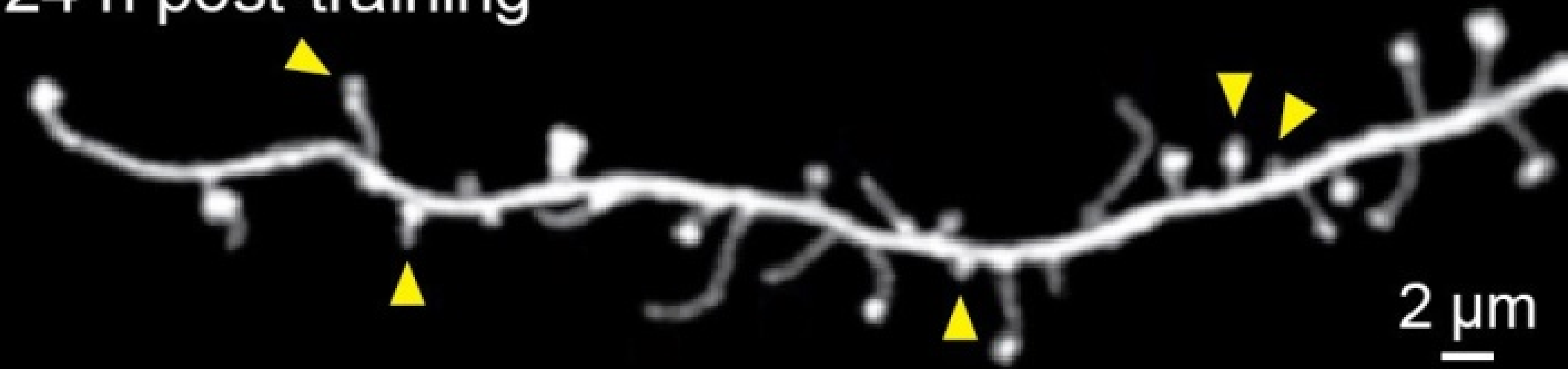
Sleep



Pre-training

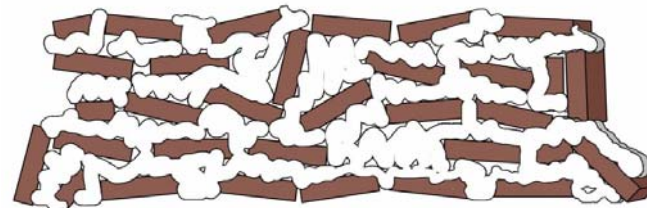
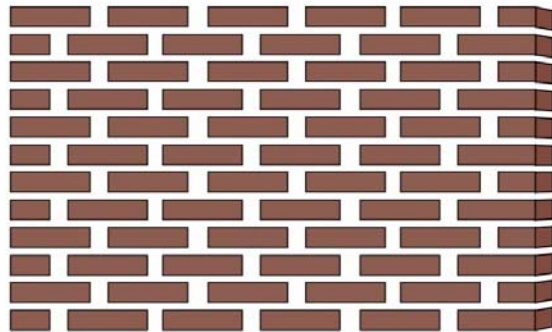


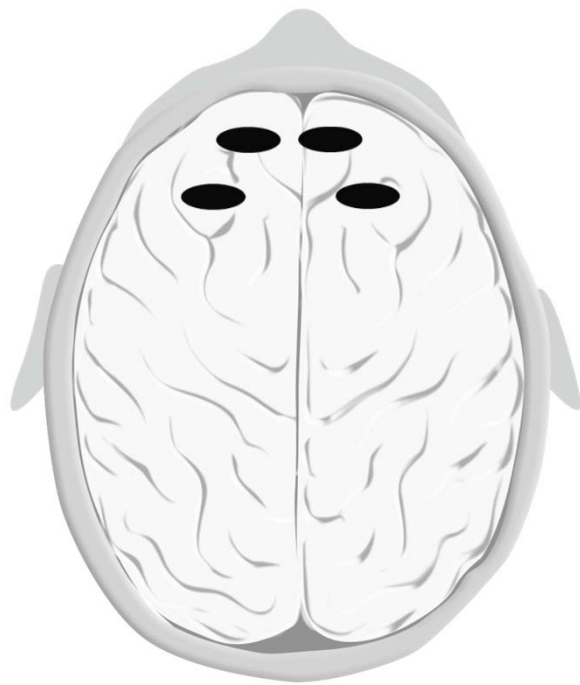
24 h post-training



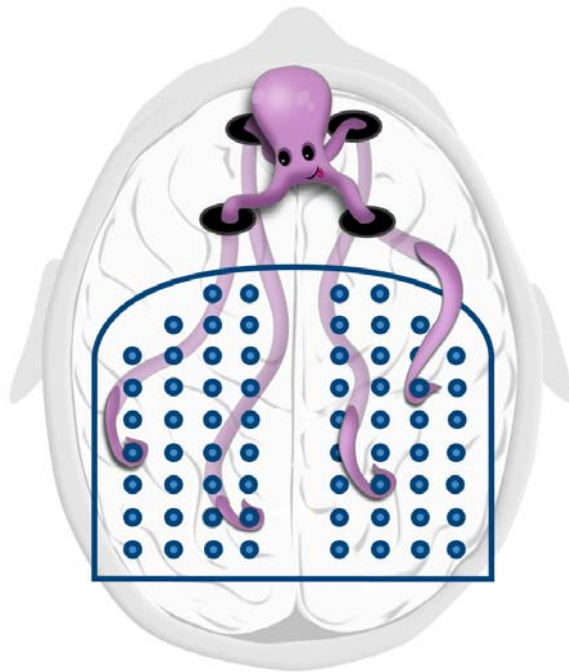
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						





Working memory



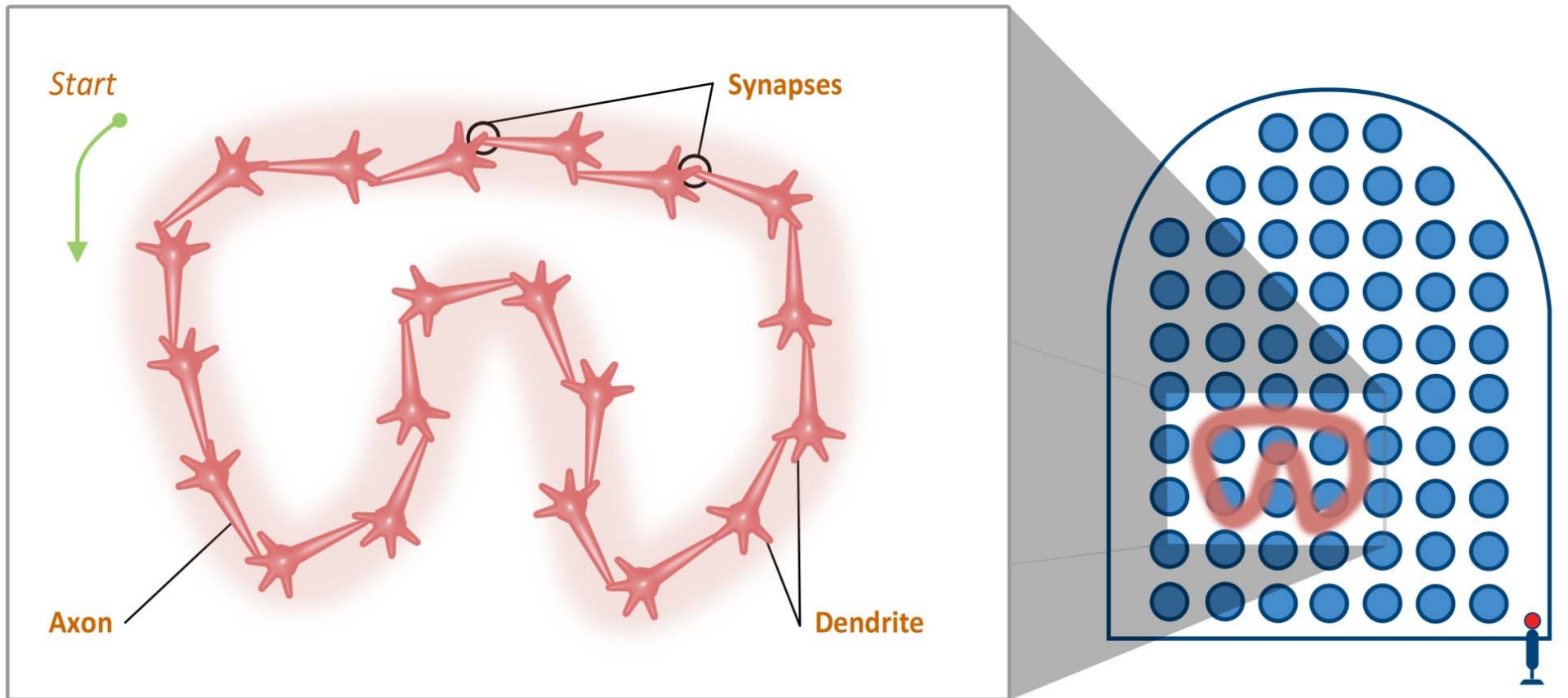
Focused mode

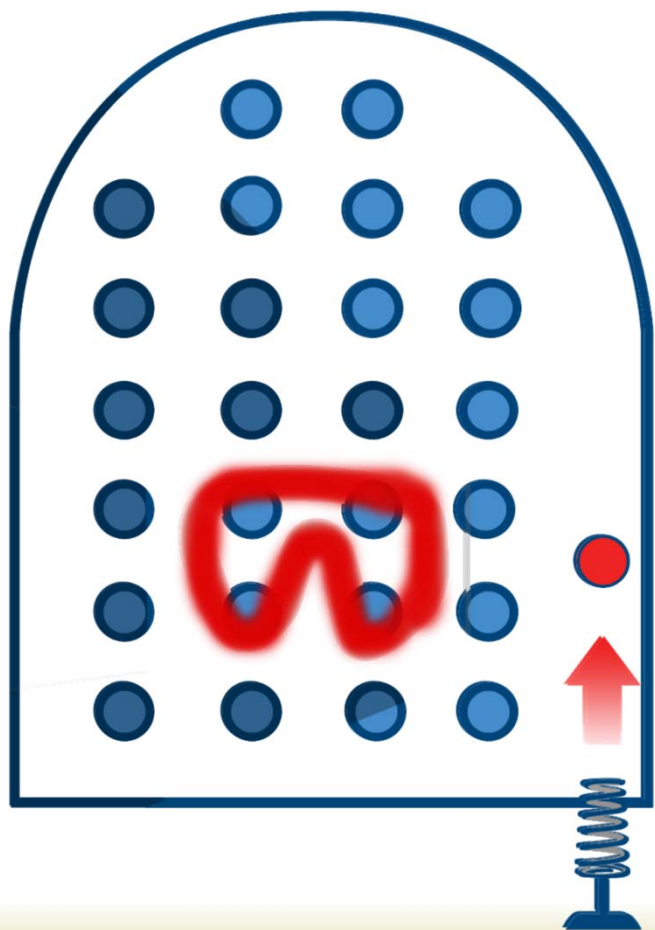
Working memory



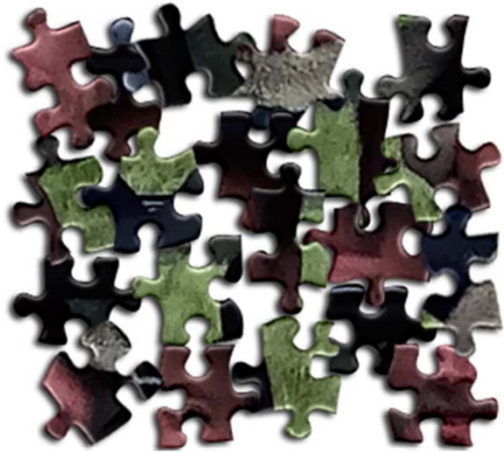
Long term
memory

Practice Makes Permanent





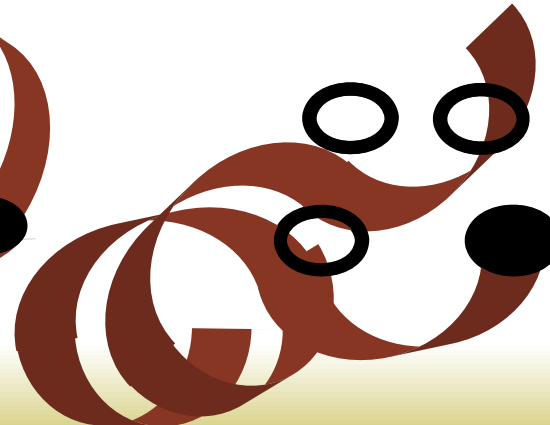
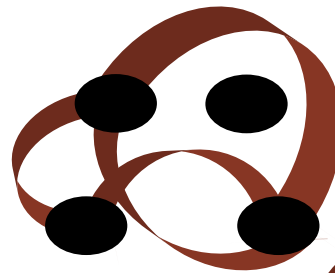
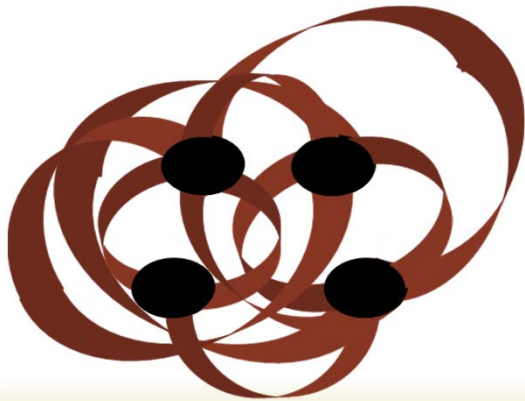
Working memory and *chunking*



Raw information

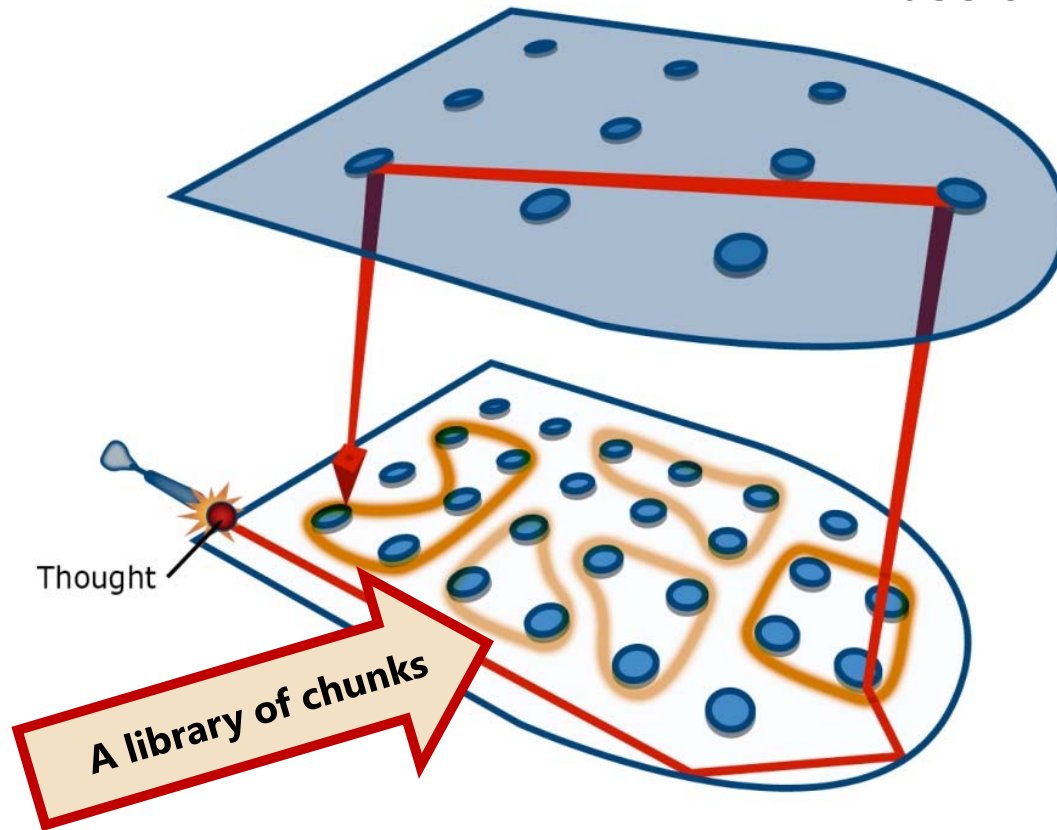


**Information is chunked
and understood**





Diffuse thinking



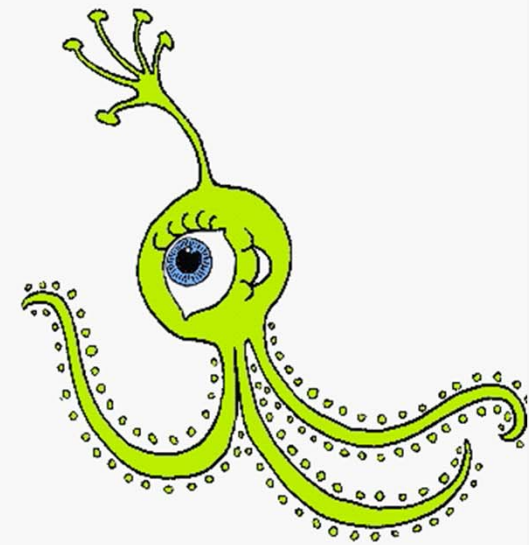
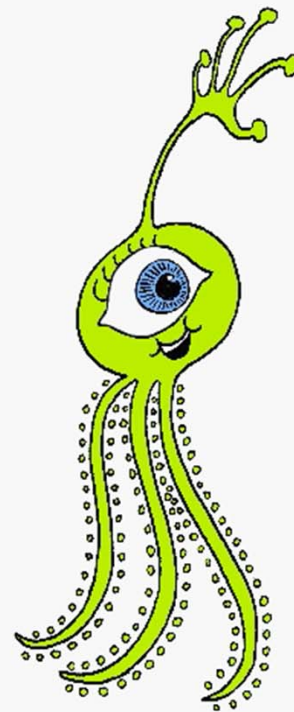
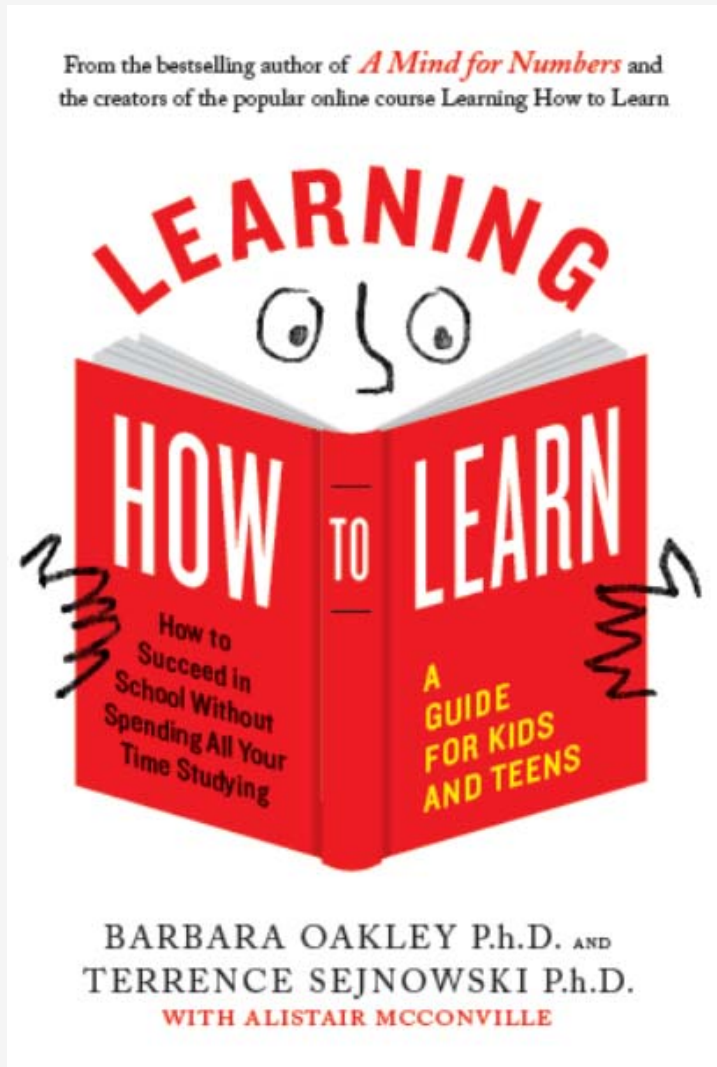
Thought

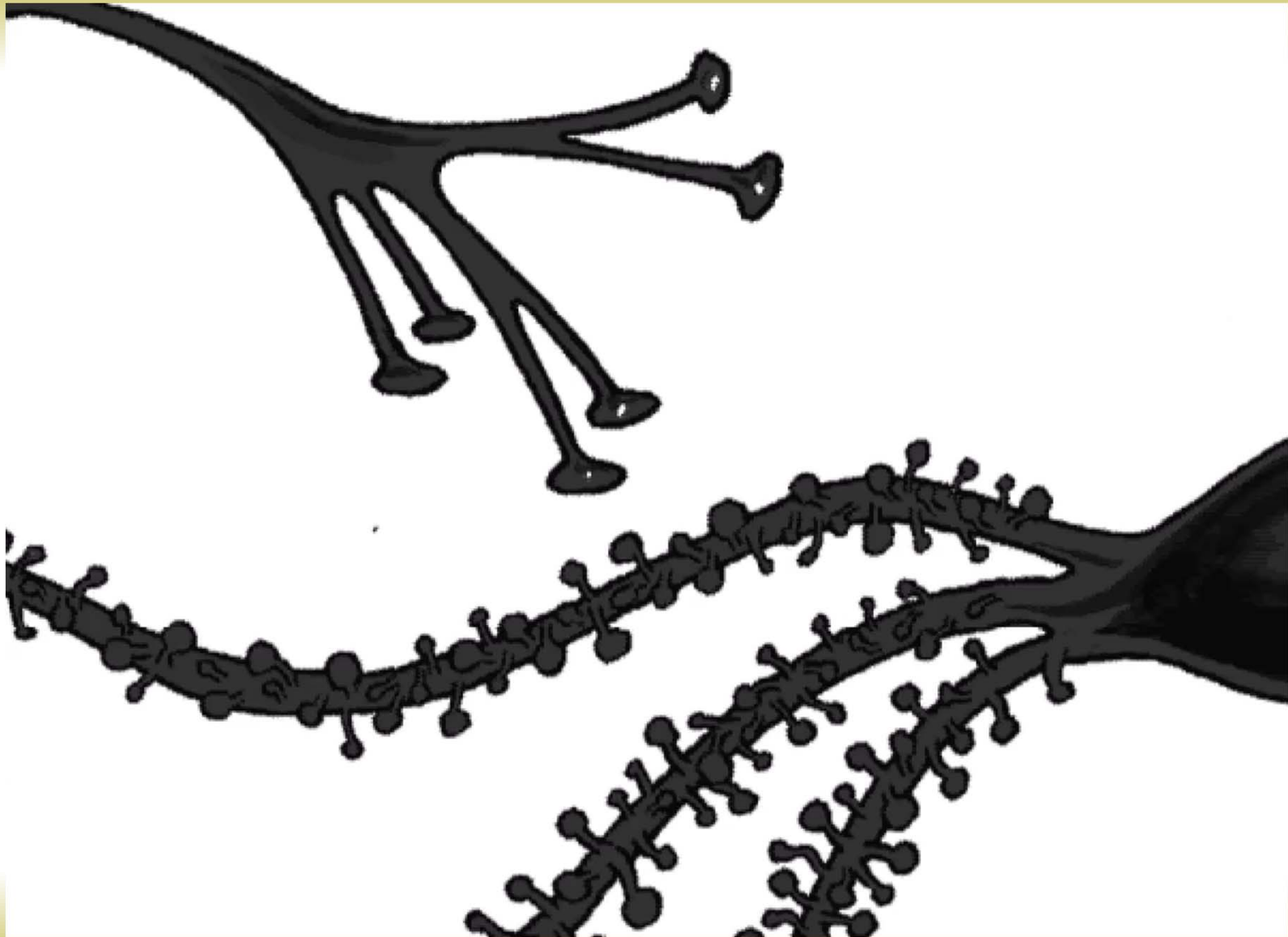
A library of chunks

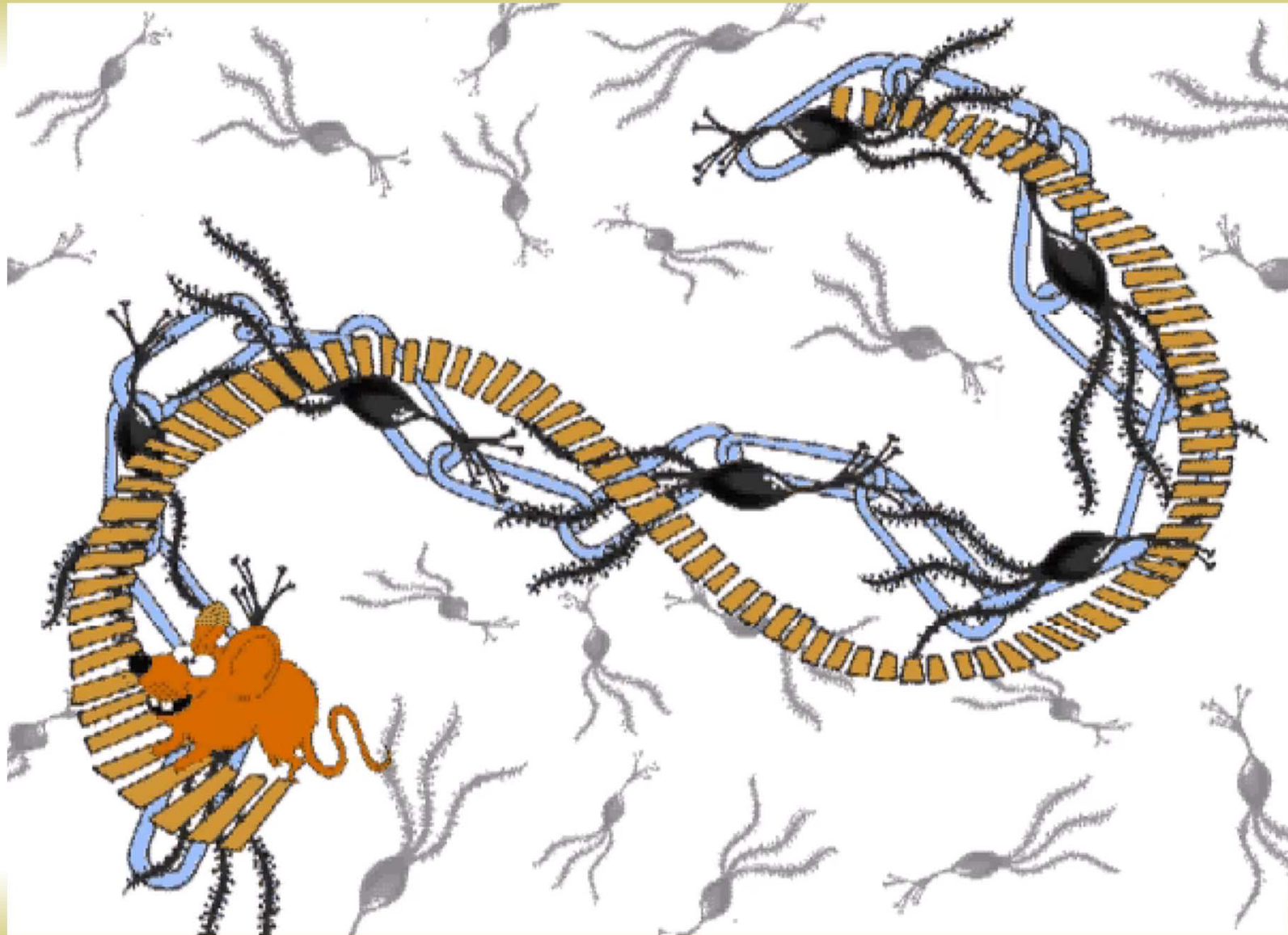
Focused thinking

Next project?

16 five-minute videos







The down side

The fan letters

We are at the ground
floor of a learning
revolution!

What are you waiting for?