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Your Brain: Unconscious Decision-making and How it Affects Your Life and Learning

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Campus Conversations in Standish

Unconscious Brain, Decision-
Making, and Learning

by James Stellar

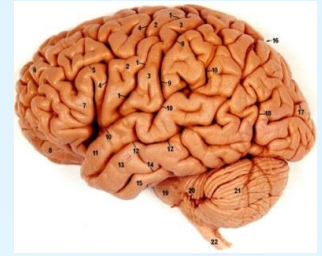
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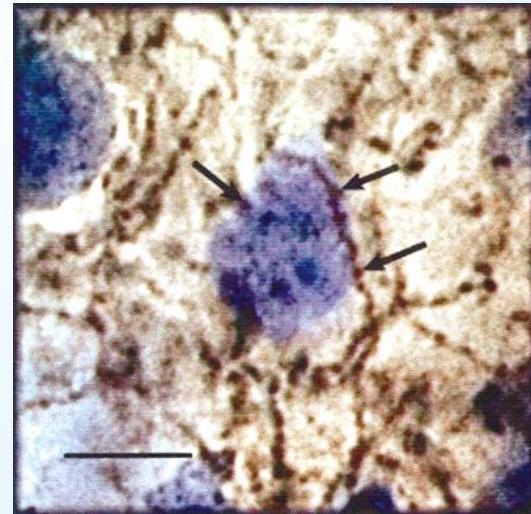
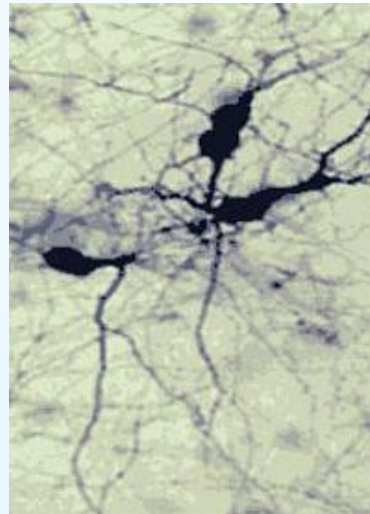
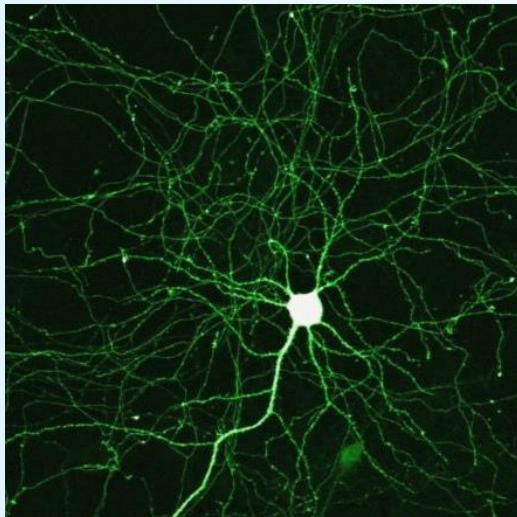


The Brain



Amazingly complex in cellular structure

- 100 billion nerve cells and each one is a computer, 14 times the number of people on earth.
- 10,000 contacts between nerve cells and they change

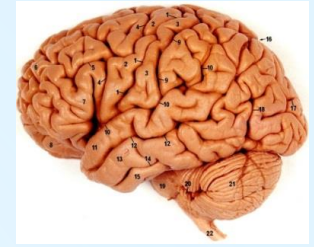


<- My Lab
SYNAPSE
38:261-270
(2000)

- Massively parallel in its organization, every cell is talking at once

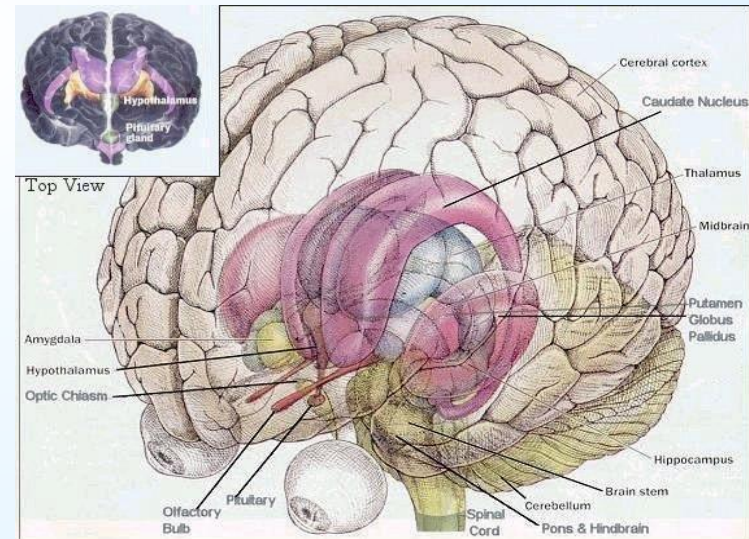
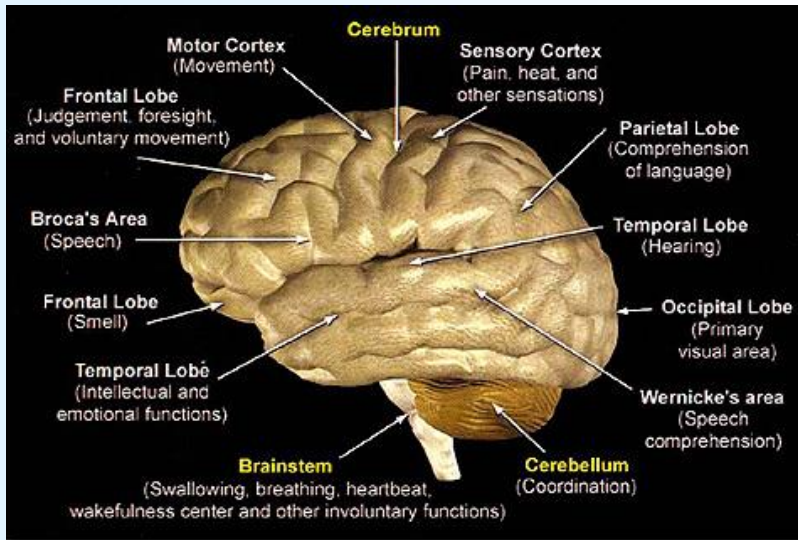


The Brain



Its Geography is of regions

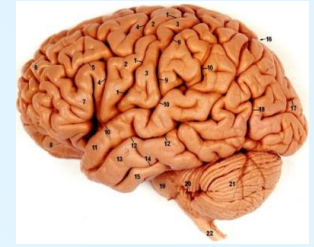
- Surface or cortex has hills/valleys in a sheet of 6 cellular layers
- Older internal structure, known by anatomical appearance and connections. Everything has a name



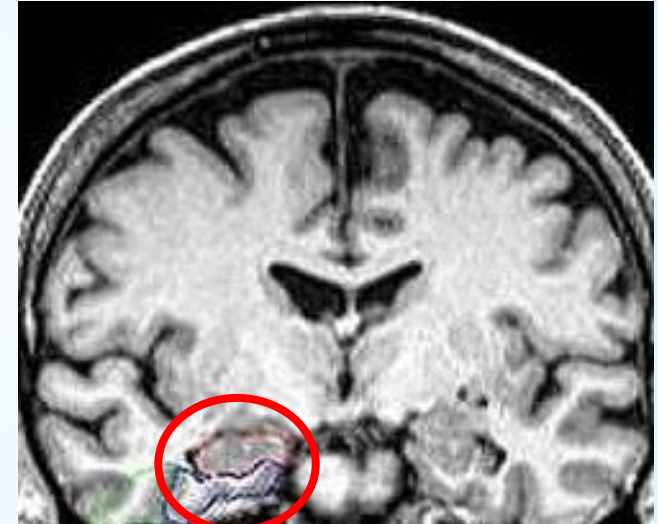
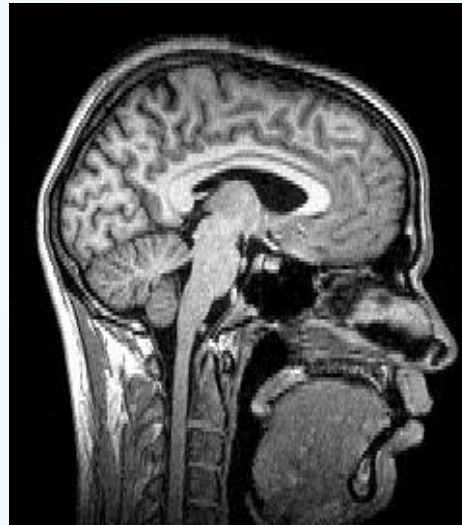
- Defined by **FUNCTION**, especially with modern brain scanners



Modern Brain Scanners



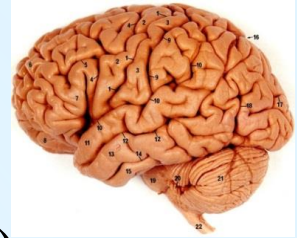
Brain anatomy by regions – Magnetic Resonance Imaging (MRI)



Not good

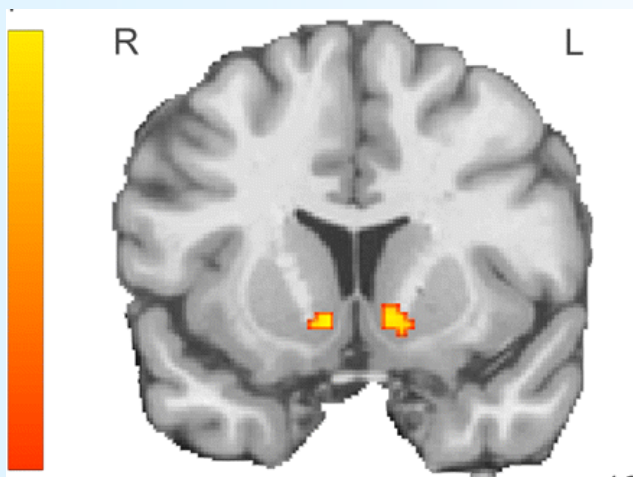


Brain Function by Regions



Functional Magnetic Resonance Imaging (fMRI)

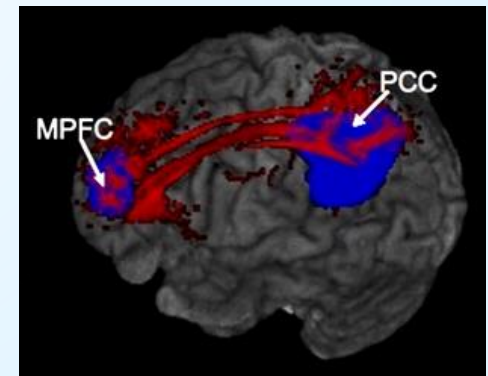
fMRI – accumbens (cocaine area) activation from seeing cute faces of infants



infant faces activates accumbens in nulliparous women
<http://www.pnas.org/content/106/22/9115.full>

Advanced fMRI – correlated activity between brain systems

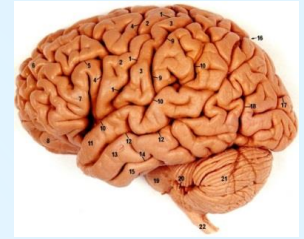
- Default Mode Network – what you do at rest (i.e. think)
- Recent blog with a student on gender differences (<http://otherlobe.com/women-decision-making-and-experiential-education/>)



<http://www.emoryhealthsciblog.com/what-is-the-default-mode-network/>



Brain Function by Regions



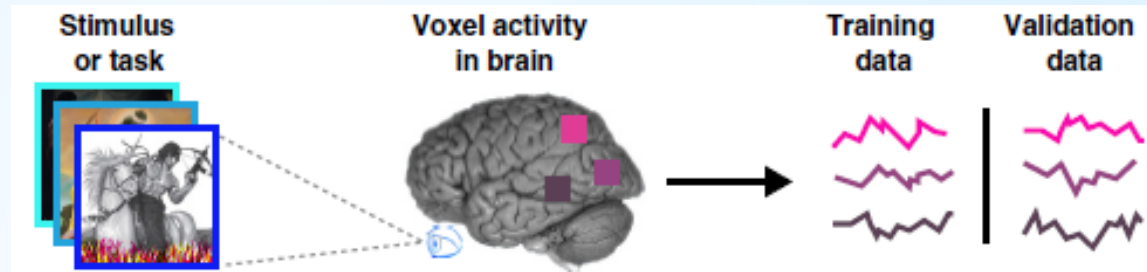
Functional Magnetic Resonance Imaging (fMRI)

Hyper-advanced fMRI

To reconstruct what subject is seeing

Only works on the individual the computer has learned

Could you tell what they are dreaming?



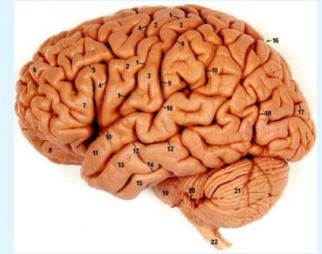
Taken from Gallant lab, Berkeley

<https://sites.google.com/site/gallantlabucb/publications/nishi-moto-et-al-2011>

http://www.youtube.com/watch?v=nsjDnYxJ0bo&feature=player_embedded



Levels of Brain Function

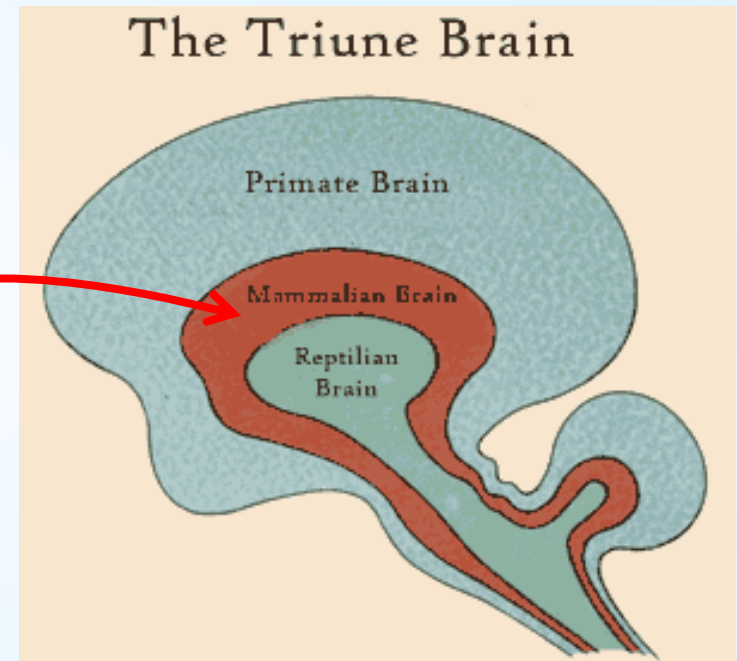


Key Concept: levels of function.

“Triune Brain” after Paul MacLean

- Top level - cognitive thinking, words
- Lower level - reflexes

Example of the anencephalic child and the grasp reflex.

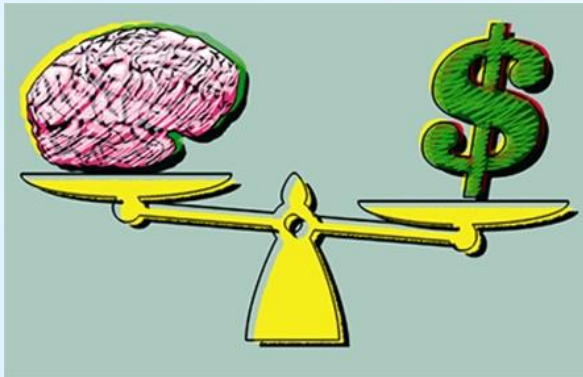
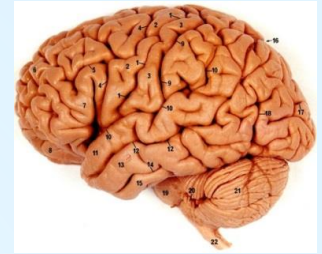


- Middle level – focus of the talk is here, where motivation exists, where you make decisions in what David Eagleman calls the “hidden brain,” where experience educates to compliment learned facts and theories



Middle Level

Neuroeconomics/Behavioral Economics



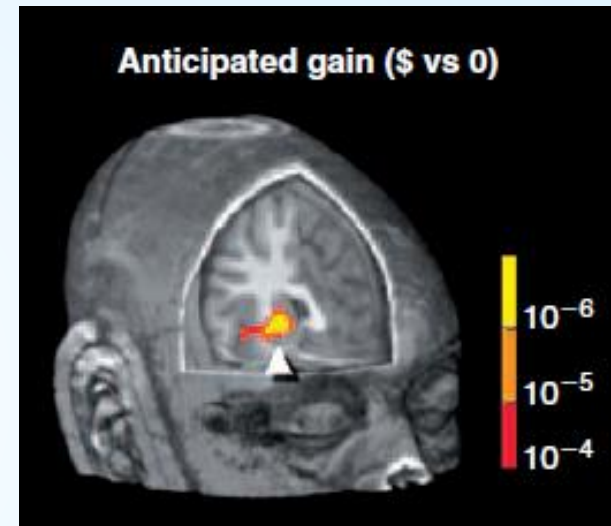
Glimcher Lab at NYU -
<http://www.cns.nyu.edu/~glimcher/index.html>

Neuroeconomics: Decision Making and the Brain
Edited by Glimcher, Camera, Fehr, and Poldrack
for Academic Press, 2008

Related:

Paul Zac TED talk on
Oxytocin http://www.ted.com/talks/paul_zak_trust_morality_and_oxytocin.html

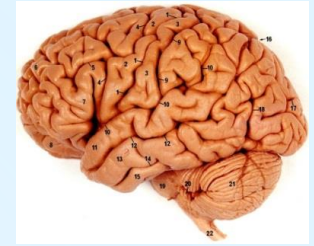
Paper on dopamine gene analysis of successful wall street traders in January 2012 in PLoS ONE
<http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0030844>



Brian Knudson, Stanford University (in Glimcher book) asks what is desire. Answer: It is accumbens activation, here in anticipation of making money
<http://www.youtube.com/watch?v=CUK8D-kX0fE>



Neuroeconomics/ Behavioral Economics



- Somatic Marker Hypothesis

- from Navqi et al. 2006

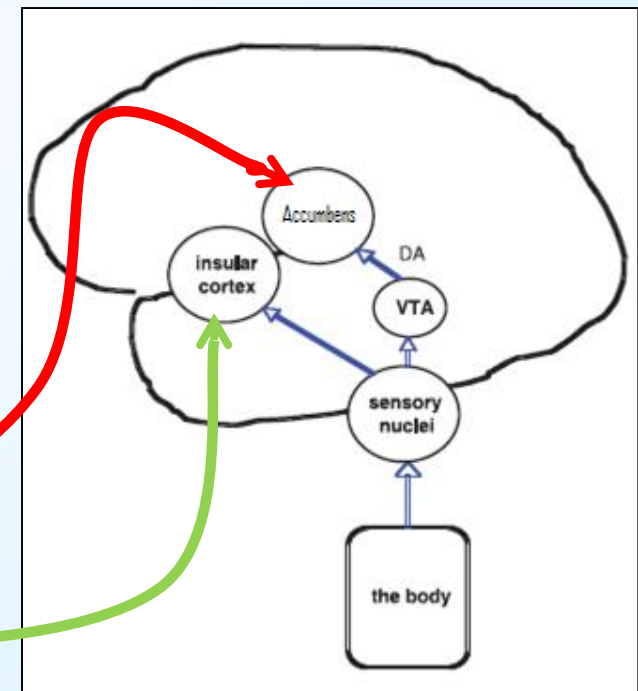
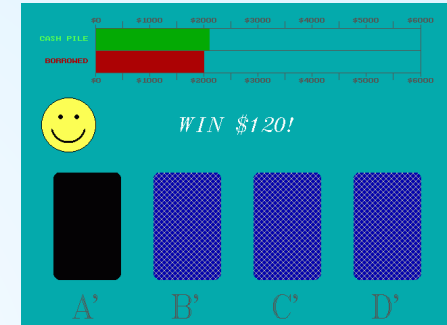
<http://phi673uw.files.wordpress.com/2007/01/naqvietal.pdf>

- **Paper Abstract:** Decision making often occurs in the face of uncertainty about whether one's choices will lead to benefit or harm. The somatic-marker hypothesis is a neurobiological theory of how decisions are made in the face of uncertain outcome. This theory holds that such decisions are aided by emotions, in the form of bodily states, that are elicited during the deliberation of future consequences and that mark different options for behavior as being advantageous or disadvantageous. This process involves an interplay between neural systems that elicit emotional/bodily states and neural systems that map these emotional/bodily states.

- Uses Iowa Gambling Task, good & bad decks (http://en.wikipedia.org/wiki/Iowa_gambling_task)

- Two key brain areas

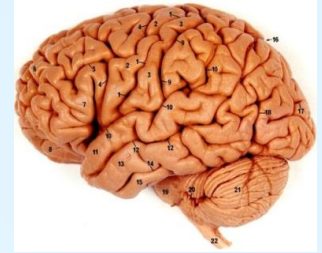
- Accumbens (desire, pleasure)
- Insular Cortex (risk, negative)



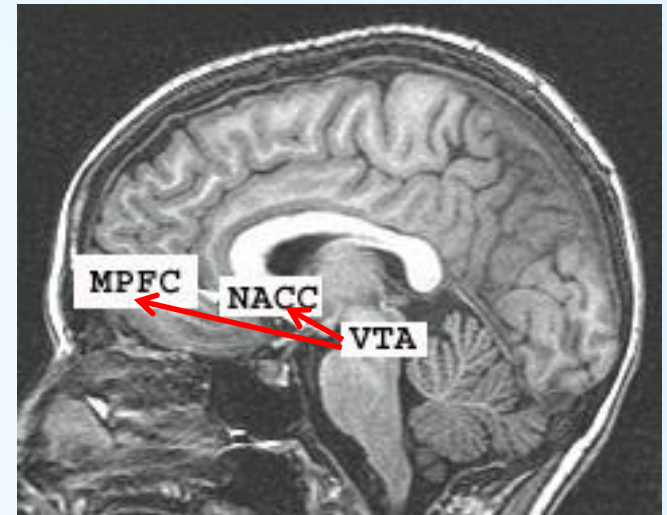


Unconscious Decisions

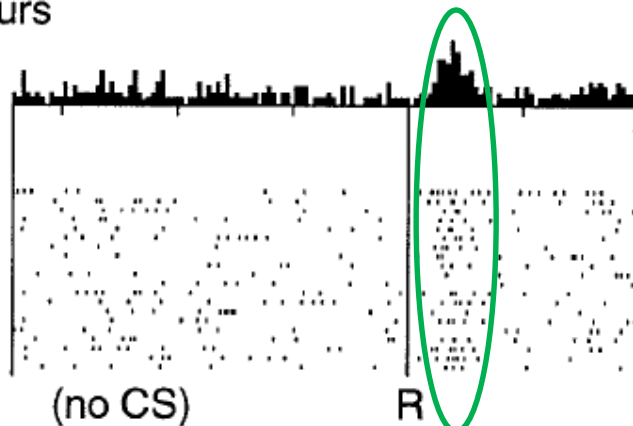
Reward Prediction Error



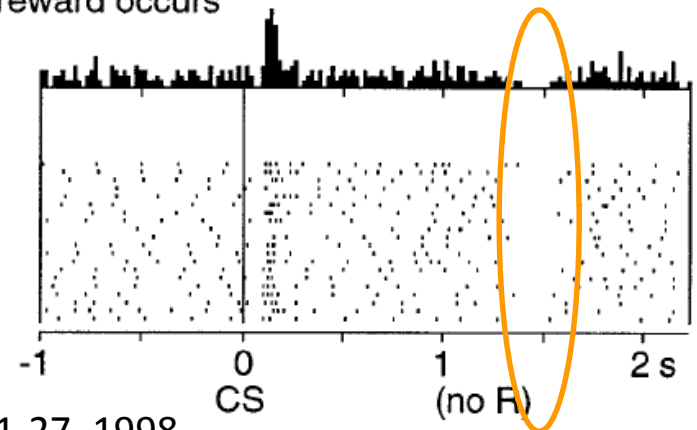
- Ventral tegmental area (VTA) projects to Nucleus accumbens (NACC)
- Neurotransmitter is dopamine
- VTA dopamine firing encodes reward
- Absence of dopamine firing encodes absence of expected reward as predicted by the cue of a conditioned stimulus



No prediction
Reward occurs



Reward predicted
No reward occurs



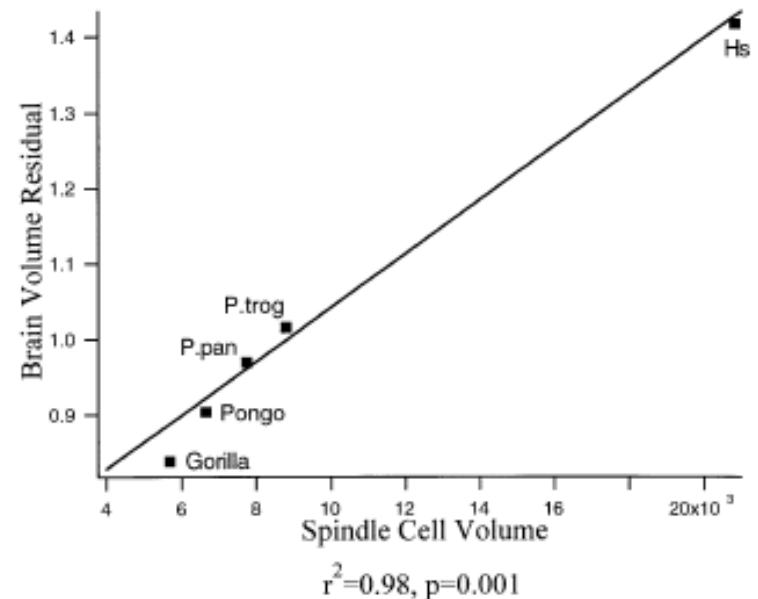
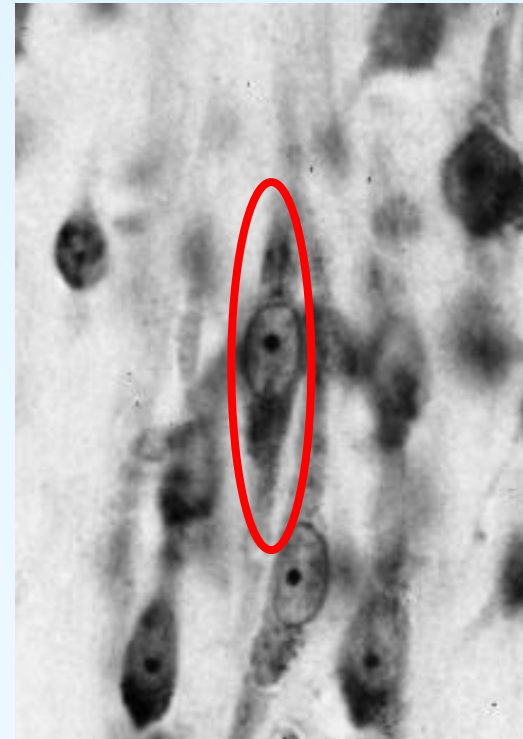
Schultz. *J Neurophysiol* 80:1-27, 1998.



A conscious-unconscious Connection?

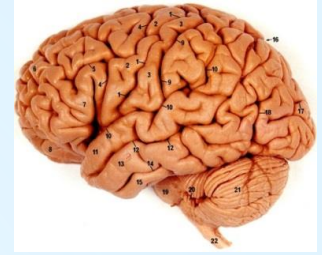
Anterior Cingulate Cortex - Tying emotion to cognition

- Big spindle-shaped neurons
- Long cellular processes - connect over great distances and with many neurons in the brain
- Only found in primates
- Correlated with total brain size
- Function: Perhaps a role in **reflection**, an important component in taking the learning from the experience





What is old is New Again

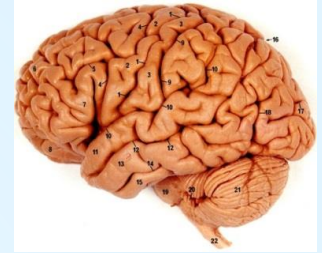


Many new books out and coming out – fMRI revolution.

- Malcolm Gladwell – *Blink* (2005)
- William Duggan – *Strategic Intuition* (2007)
- Gary Marcus - *Kluge: The Haphazard Construction of the Human Mind* (2008)
- Ori Brafman and Rom Brafman - *Sway: The Irresistible Pull of Irrational Behavior* (2008)
- Jonah Lehrer – *How We Decide* (2009)
- Daniel Coyle - *Talent Code: Greatness isn't Born. It's grown. Here's How* (2009)
- Shankar Vedantam - *The Hidden Brain: How Our Unconscious Minds Elect Presidents, Control Markets, Wage Wars, and Save Our Lives* (2011)
- David Eagleman - *Incognito: The Secret Lives of the Brain* (2011)
- Daniel Kahneman - *Thinking Fast and Slow* (2011)
- Cathy Davidson - *Now You See It* (2011)
- Jonah Lehrer - *Imagine: How Creativity Works* (2012)
- Jonathan Haidt – *The Righteous Mind : Why good people are divided by politics and religion* (2012)
- Antonio Damasio – *Self Comes to Mind: Constructing the Conscious Brain* (2012)
- Jonathan Haidt – *The Righteous Mind: Why good people are divided by politics and religion* (2012)
- Bruce Hood – *The Self Illusion: Why There is No You Inside the Head* (2012)
- Steven Pinker – *The Better Angels of Our Nature: Why Violence Has Declined* (2012)
- Daniel Bor – *The Ravenous Brain: How the New Science of Consciousness Explains Our Insatiable Search for Meaning* (2012)
- Joshua Greene – *Moral Tribes: Emotion, Reason, and the Gap Between Us and Them* (2013)
- Leonard Mlodinow - *Subliminal: How Your Unconscious Mind Rules Your Behavior* (2013)
- Richard Thaler - *Misbehaving: The Making of Behavioral Economics* (2015)
- Back to Freud's unconscious, but with an iPad in your head
- Basis for new field of Neuroeconomics, etc.



In-Group/Out Group & Tolerance



Blog with Lara Porter on 4/23/12 combining two points:

1. The limbic brain chemical oxytocin
 - Increases generosity within the in-group
 - Decreases generosity in the out-group
2. 2011 Study by Dweck - **Promoting the Middle East Peace Process by Changing Beliefs About Group Malleability** – increases scope of in-group.

www.otherlobe.com

The Other Lobe of The Brain

A Blog About Experiential Education, Social Media, and the Brain...

23 | Taking Ex Ed into international relations

APR | Posted by Jim as [Academic](#), [Global perspective](#), [Student Views](#), [Brain](#)

Taking Ex Ed into international relations

Lara Porter QC'14 and Jim Stellar

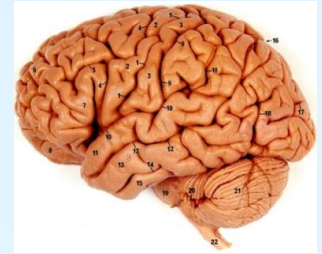
LP is an economics and [political science major](#) who works in the Queens College [Center for Ethnic, Racial, and Religious Understanding \(CERRU\)](#) as well as participates in a small group JS runs to study the learning power of experiential education and some of its underlying psychology and neuroscience. We came across this interesting [recent study in Science](#), "Promoting the Middle East Peace Process by Changing Beliefs about Group Malleability" out of Carol Dweck's lab at Stanford and it seemed to resonate with some other work we were reading on a brain chemical called oxytocin. So we decided to write about these pieces and try to tie them back to experiential learning.

The [Science](#) study cited above focuses on Israeli-Jews, Israeli-Arabs, and Palestinian attitudes toward peace after learning about and believing in the malleability of character traits. The study concludes that belief in malleable character traits promoted "better intergroup dynamics" and "increased willingness to compromise for peace." In other words, the study finds that each of these groups showed more positive and hopeful attitudes towards the Israeli-Palestinian peace process after learning about and believing in the ability of individuals to change their characteristic way of thinking.

Oxytocin is a neurohormone that is released by the pituitary gland and causes, among other things, a milk-let-down neuroendocrine reflex in [nursing](#) mothers that allow them to eject milk into the vestibule of the breast upon suckling so that the baby can nurse. More interestingly, it has an ability to create empathy or compassion between groups and it can even be administered as a spray in the nose – see the [TED talk by Paul Zak](#) where he discusses trust, empathy, and morality. In fact a very recent [study from the University of Derby](#) showed that oxytocin increases the "ease of imaging compassionate qualities" in others, which seems highly relevant to the Science study discussed above.



Higher Education

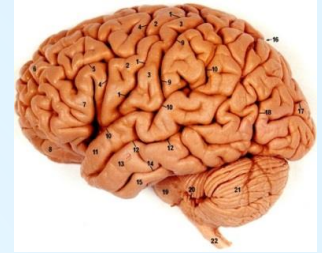


What is the role of Experiential Education or Applied Learning in Higher Education?

- A compliment to an excellent academic curriculum based in the classroom and the credit hour.
- **High Impact Practices** leading to increased confidence, mastery, and knowledge fluency. That leads to increased graduation rate and increased success after graduation (job and graduate school)
- Types of programs to supplement learning in the classroom
 - Internships (particularly paid, i.e. cooperative education)
 - Service-Learning (typically important)
 - Undergraduate research (leads to mentoring)
 - Abroad programs (outside your culture comfort zone)
 - Field experiences of short duration
 - more



Education that Works

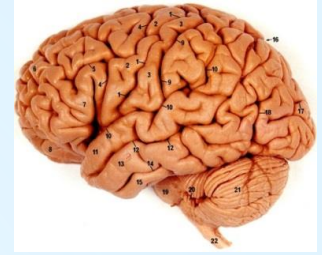


What is the role of Experiential Education or Applied Learning in Higher Education?

- Programs must be **substantial and authentic** (real and uncontrolled, relevant and outside student's normal experience)
- Important role of **reflection** in getting “out” the instinctive learning
- Importance of the co-curricular transcript and either integrating with or going beyond the credit-hour, so the university is seen as a partner to the student
- At UAlbany, this will take place as a push now for Applied Learning

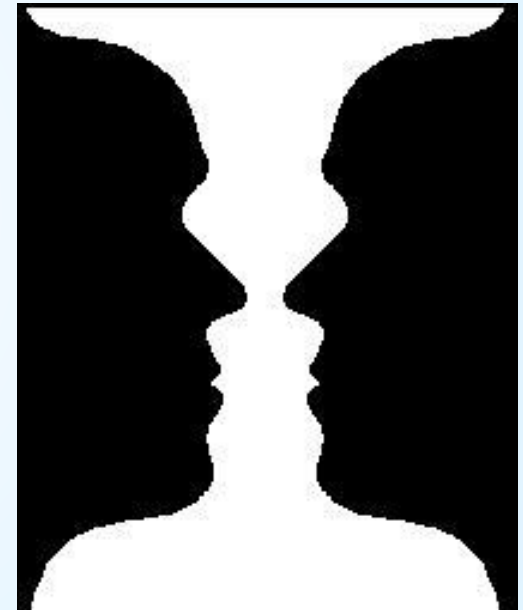


Education that Works



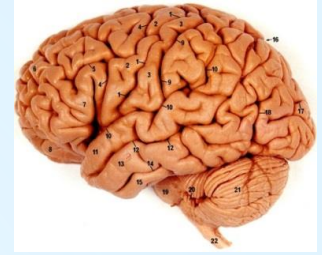
Lessons for the University

- Universities should design Ex Ed programs...for your brain
 - First need to get out of the box
 - Figure-ground illusion shows the trap
 - One can not see both black faces and the white vase at the same time
 - Higher Education sees only the “vase”
 - What I mean is that Higher Education sees only facts and theories, curriculum and certification – It can be an ivory tower
 - We should teach both lobes of the brain
- Your thoughts are welcome (jstellar@albany.edu)
- I write a blog with students and colleagues (www.otherlobe.com)

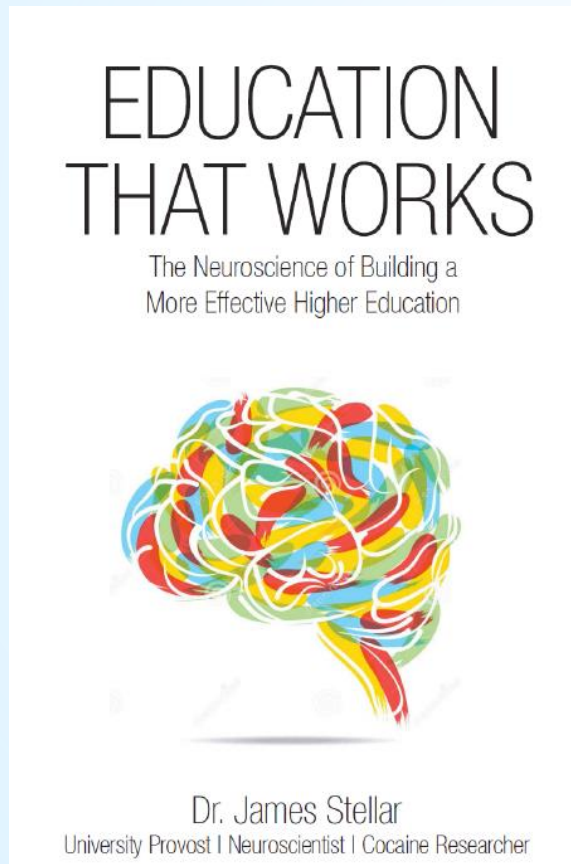




Education that Works



Thank you



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