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

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Unconscious Brain, Decision-Making, and Learning
by James Stellar
March 2, 2016

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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

- 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

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/)

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

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/nishimoto-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 McLean

• **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

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

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

- **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](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

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

Allman et al., Annals New York Academy of Science, 2006
What is old is New Again

Many new books out and coming out – fMRI revolution.

- Daniel Kahneman - *Thinking Fast and Slow* (2011)
- Cathy Davidson - *Now You See It* (2011)
- Bruce Hood – *The Self Illusion: Why There is No You Inside the Head* (2012)

- Back to Freud’s unconscious, but with an iPad in your head
- Basis for new field of Neuroeconomics, etc.
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
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
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

Expected in April, 2016