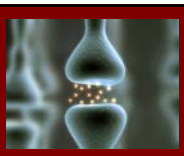
- Website & Syllabus

  psychiatry.wisc.edu/courses/Nitschke/2013_bio_psycho_class/

  Username: **seminar**

  Password: **brain7**

  If you do not have a background in biology, please see introductory materials.



- Integration of psychological and biological conceptions of psychopathology
- Neuroplasticity
  - Brain constantly changes in response to the environment

Bio-Psycho-Social-Cultural Framework

Levels of Analysis

- Distal social environment
- Proximal social environment
- Behavioral responses
- Psychological experience
- Biological functioning

Mistreating Psychology in the Decades of the Brain

- Error 1 (equation of mind & brain):
  - Depression = Brain disease
- Error 2 (reductionism):
  - Brain alteration *underlies* depression
- Error 3 (levels of analysis):
  - Brain alteration and depression are different levels of analysis

Miller, G.A. (2010) Perspectives Psych Science.

Mistreating Psychology in the Decades of the Brain

Suggestions:

"Sadness is a psychological *aspect* and anterior cingulate dysfunction a biological *aspect* of depression."

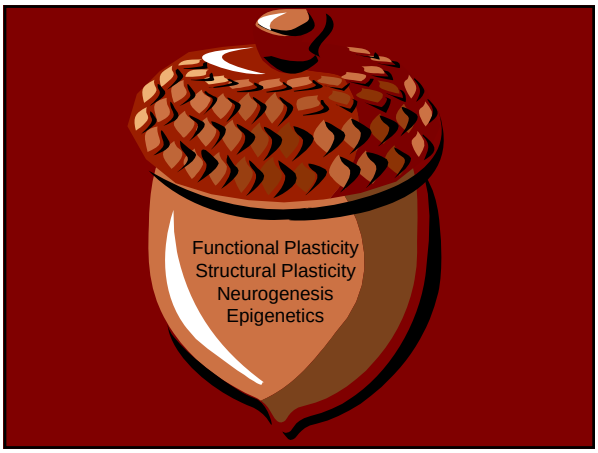
"Psychological process *implemented* or *supported* by neural process"

Miller, G.A. (2010) Perspectives Psych Science.

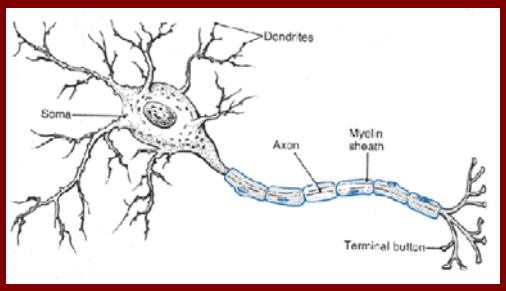
Neuroplasticity: What is it?

- Functional & structural adaptations to the environment (Citri & Malenka, 2008)
- Experience-dependent changes in brain function & structure, related to:
  - Learning and acquiring new information
  - Adaptive behavioral choices

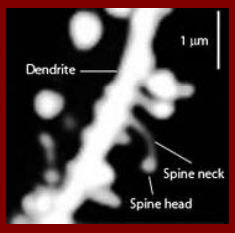
  (Pittenger & Duman, 2008; Kasper & McEwen, 2008; Tononi & Cirelli, 2006)
- Activity-dependent: "Cells that fire together wire together" (referred to as Hebb's law)

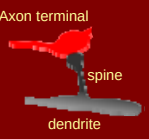


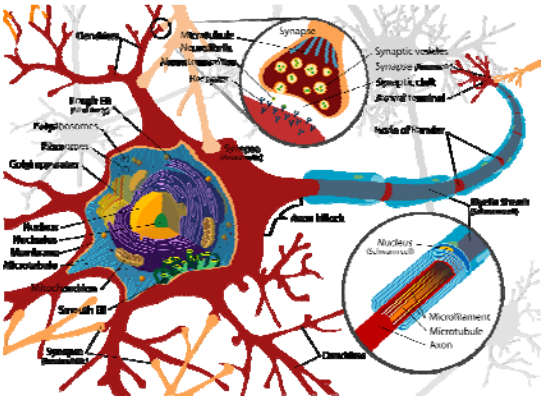
Neuron



Dendritic Spines



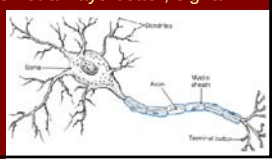




From: http://en.wikipedia.org/wiki/Activity-dependent_plasticity

Neuroplasticity

- **Functional Plasticity**
  - Synaptic plasticity (e.g., LTP, LTD, synaptic scaling)
  - Depends on glutamate at NMDA & AMPA
  - Signaling components as regulators of synaptic plasticity: cAMP, protein kinases, CREB
  - Neurotrophic factors as regulators of synaptic plasticity: BDNF, VEGF
  - More synaptic potentiation is not always better; signal to noise ratio is key
- **Structural Plasticity**
  - Growth or regression of dendrites
  - Changes in spine density



Neuroplasticity

- Neurogenesis in dentate gyrus
  - Proliferation and survival of newborn neurons
  - Migration into the granual cell layer (into circuits sculpted by experience)
- Epigenetics
  - Long-term changes in transcriptional regulation of gene expression due to experience

Conclusions

- Biological, Psychological, and Social factors do not “cause” psychopathology in isolation
- Psychological and social explanations of pathology cannot be “reduced” to biological explanations
- The brain is constantly changing in response to our environment
- As neuroplasticity is more widely understood reductionistic viewpoints are becoming obsolete