Lecture 3

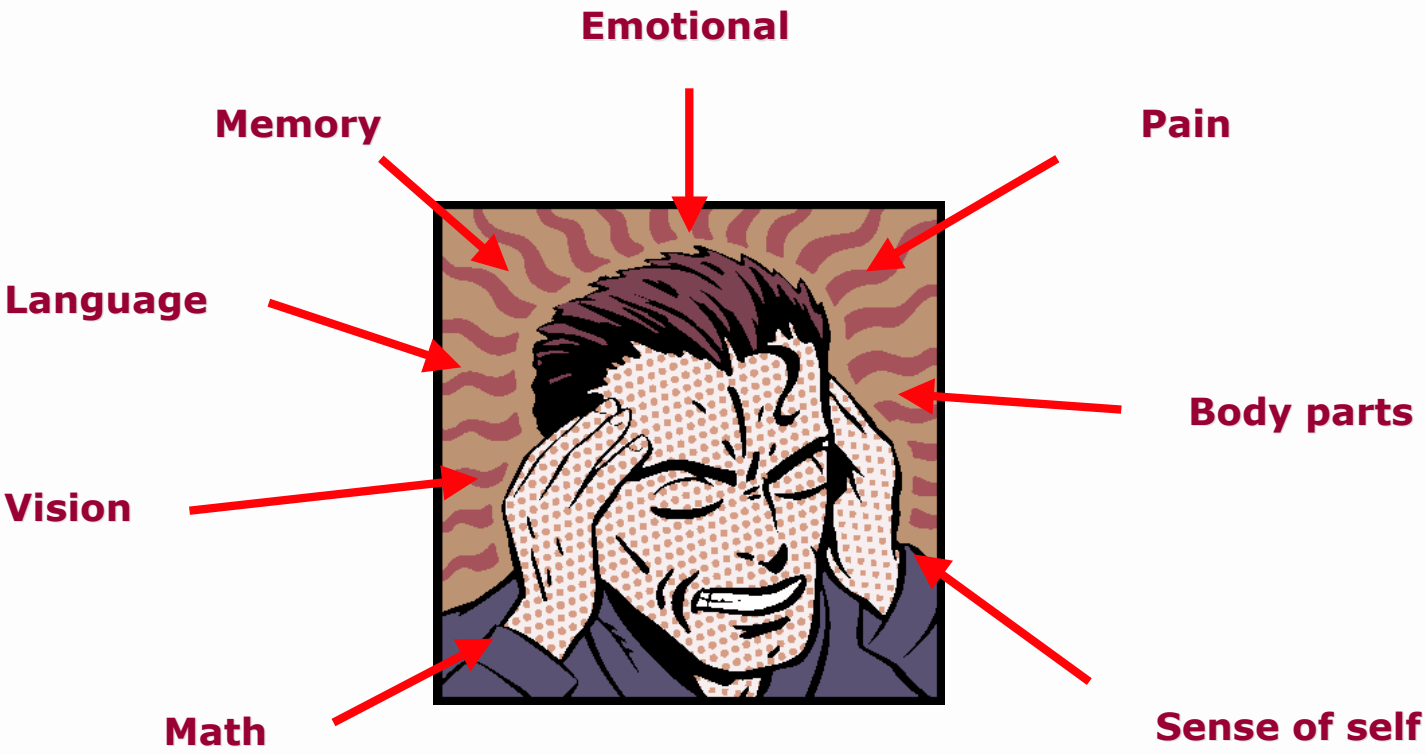
Body Representation

- Review from Lecture 2 and Psych 100
- How is the body represented?
  - A focus on "neuroplasticity"
  - The example of phantom limbs
- Understanding the body conceptually
  - A function of the left hemisphere

Note: videos on youtube -- search for "cogmonaut"

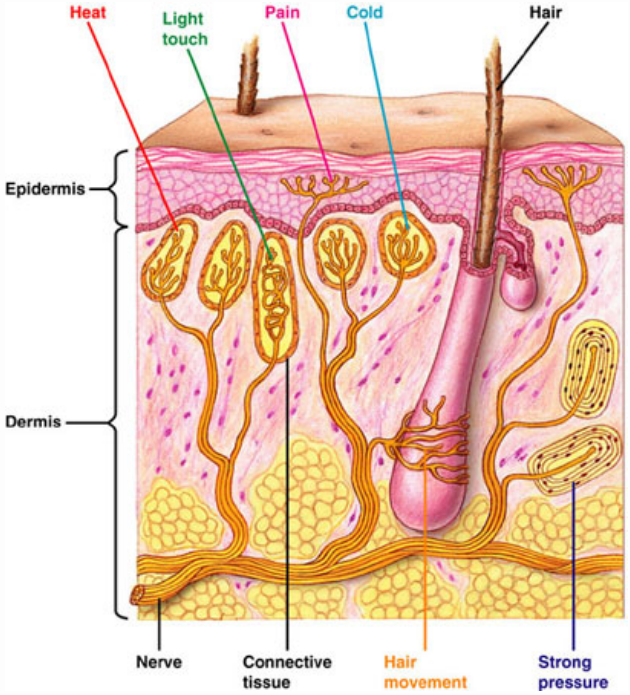
From Lecture 2

The second key idea



We represent different kinds of information in different parts of the brain

From Psych 100



Skin sensations

Disproportionate surface representations

Basics of "Body" representation

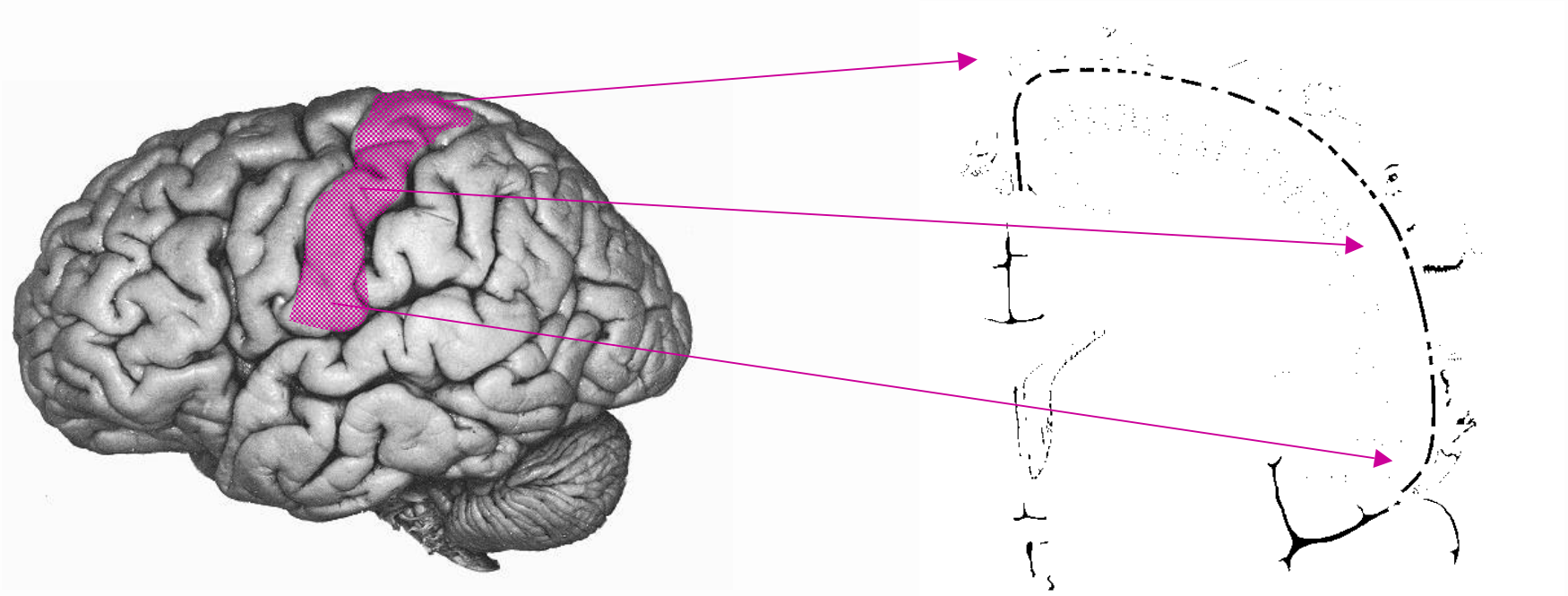
How is the Body Represented?

From *Pulp Fiction*

How is the Body Represented?

Somatosensory cortex or "strip"

The somatosensory "homonculus"



Different parts of the strip represent different parts of the body

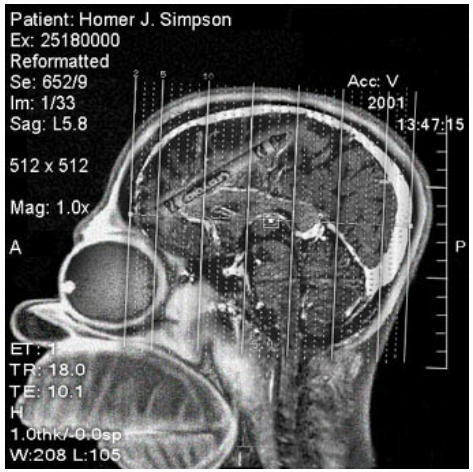
Neuroplasticity

"Plasticity" refers to something that can be changed, re-formed, or re-molded

Hence the name "plastic surgery", for example

Neuroplasticity

With respect to brain function:



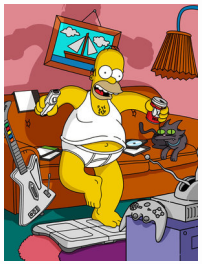
The ability of cognitive/neural processes to change and adapt over time, which is referred to as *neuroplasticity*

Neuroplasticity

Why do cognitive/neural processes change and adapt over time?

Learning

Brain/body changes

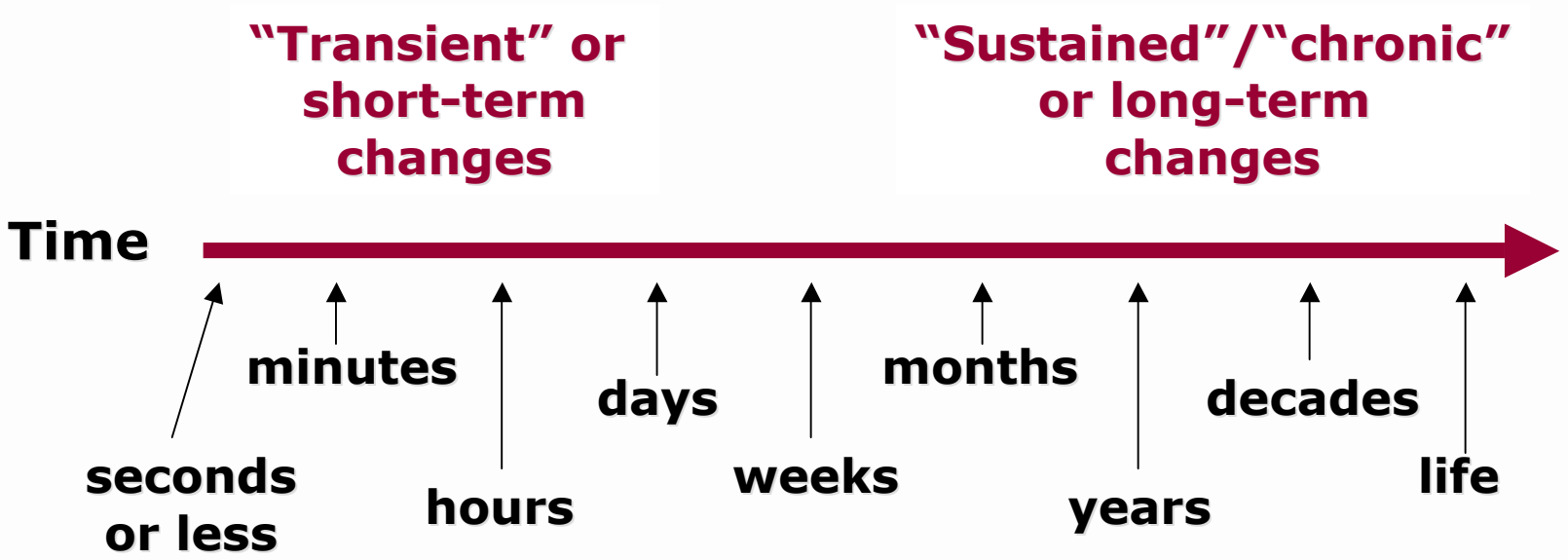


Experience

Aging/ maturation

Neuroplasticity

How long do changes/adaptations last?

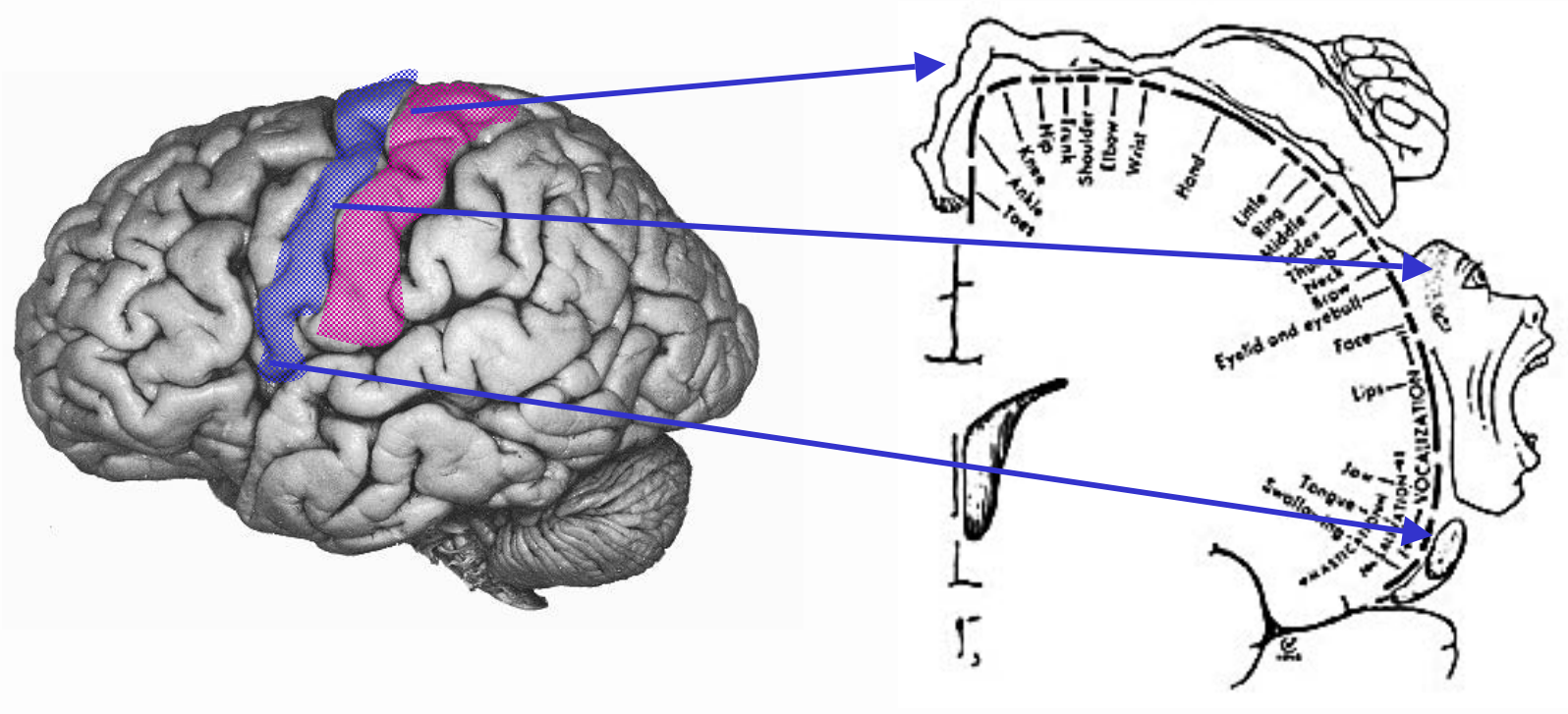


Phantom Limbs

An example of cortical plasticity

From Psych 100

The motor homonculus



Body representations and movement

Conceptual Understanding of Body

The ability to imitate simple, meaningless hand gestures was tested in three different groups of people

Because organizing limb movements relative to the body is based on representations in the left hemisphere, it was predicted that at least some of the LBD patients would have problems with the task

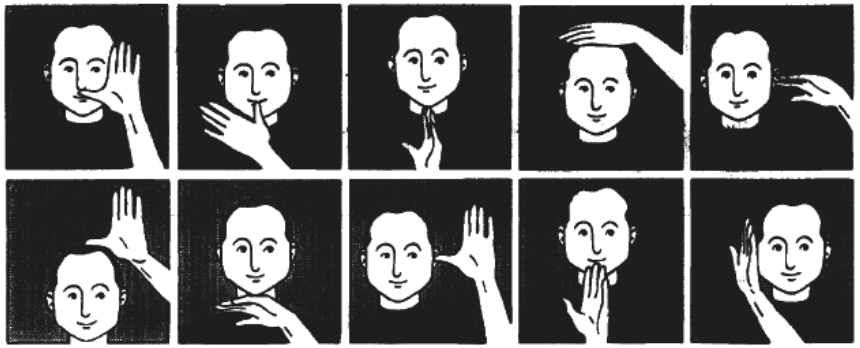
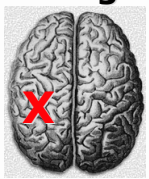
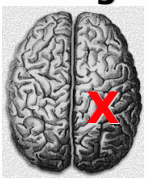


Fig. 1. Ten meaningless gestures of the hand for imitation.

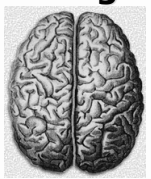
Left Brain damage



Right Brain damage



No Brain damage



Goldenberg (1995)

Conceptual Understanding of Body

While not all LBD patients had problems with the task, some did. This variance is due to variance in where the specific left hemisphere brain damage was in each patient

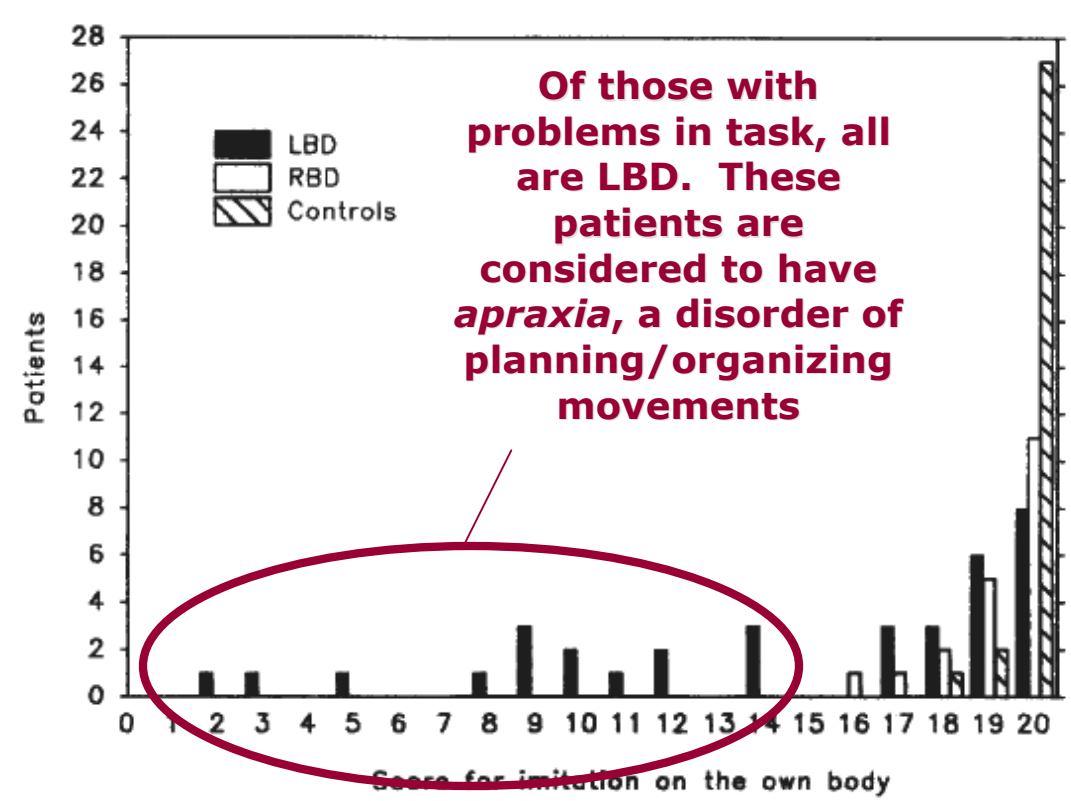


Fig. 2. Results of apraxia testing.

Goldenberg (1995)

Conceptual Understanding of Body

Test	controls	RBD	LBD No problems	LBD problems
 Mannequin test	17.9	16.2	16.5	8.0
 Dexterity test	7.7	9.6	8.6	8.9

Apraxia patients

Goldenberg (1995)

Conceptual Understanding of Body

Edited Abstract

Imitation of meaningless gestures was examined in patients with left brain damage (LBD), right brain damage (RBD) and controls. In addition to imitation on the own body, patients were asked to replicate the gestures on a life-sized mannikin. Manual dexterity was assessed by manipulation of beads. LBD patients who displayed apraxia when imitating gestures on their own bodies scored dramatically worse than any other group when imitation was assessed on the mannikin. By contrast, on the dexterity test patients with RBD were inferior not only to LBD patients without apraxia but also to apractic patients. The results support the contention that the basic deficit underlying impaired imitation of meaningless gestures in apraxia is to be sought at a conceptual level. Possibly, patients with apraxia are not able to evoke and represent conceptual knowledge about the human body which is necessary for performing the apparently simple task of imitating gestures.

Goldenberg (1995)