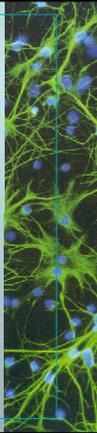


## The Amazing Developing Brain



Presented by Pat Wolfe, Ed.D.  
LACOE Transitional Kindergarten  
Conference  
May 1, 2014



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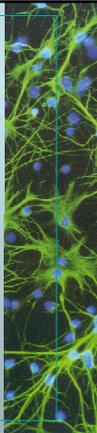
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## How the Brain Works



What are some of the common **neuromyths** concerning the brain?



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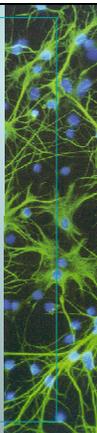
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The brain is covered with a thin layer of cells called the **neocortex**. (Latin for "new bark")



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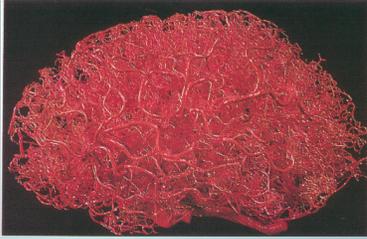
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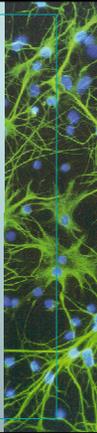
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## Vascular System of the Brain



You can go 30 days without food, a week without water but only 4 or 5 minutes without oxygen!



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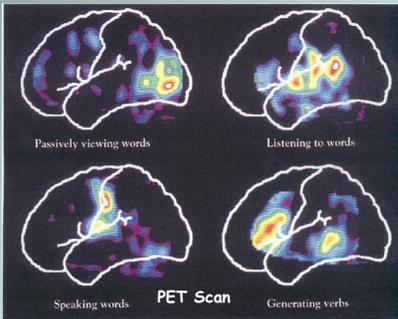
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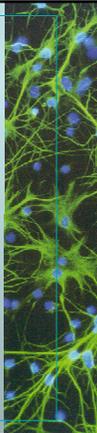
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Brain imaging techniques allow us to see which areas of the brain control various functions.



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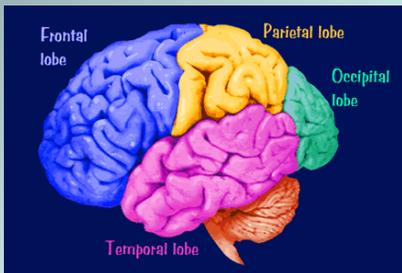
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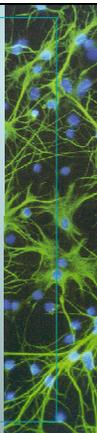
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## The Lobes of the Brain



Each lobe is covered with cortex...visual cortex, auditory sensory cortex and association cortex.



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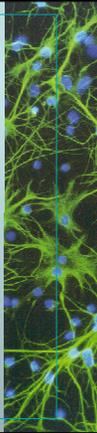
## Two Types of Long-term Memory

### 1. Procedural Memory

(Best rehearsed by repetition)

Processes that have been practiced or repeated to the extent that they have become automatic.

Driving a car, writing, reading, typing, throwing a pass in football, walking, playing the piano, etc.



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## Two Types of Long-term Memory

### 2. Declarative Memory

(Best rehearsed with elaboration.)

#### Semantic

Our general knowledge:

Language, people, places, faces, concepts, facts.

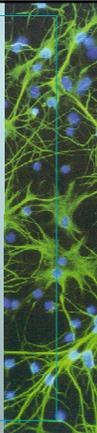
(Independent of context, acquired by learning.)

#### Episodic

Our life experiences:

Specific events and emotions connected with these events.

(Reconstructed over time, recall not necessarily accurate.)



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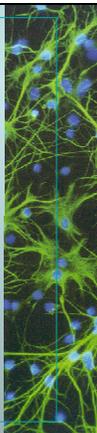
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## Planning for Procedural Memory

- Carefully **plan and practice** the routines and procedures you will use in your classroom
- Repetition is necessary to get these skills and habits to the **automatic level**.
- When routines and procedures become automatic, **discipline problems** are greatly reduced.



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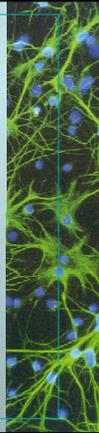
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## Brain Cells

- The brain is composed of two types of cells...
- **Neurons** - the basic functional unit of the nervous system
- **Glial cells (neuroglia)** - provide support and bring nutrients to the neurons



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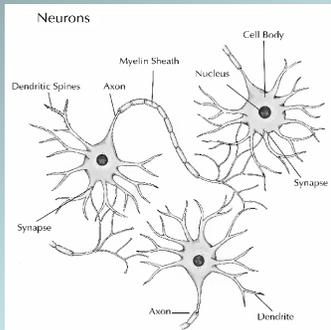
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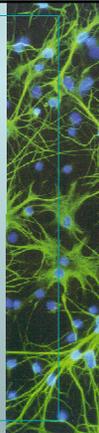
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The 100 billion neurons communicate with one another at junctures called synapses.



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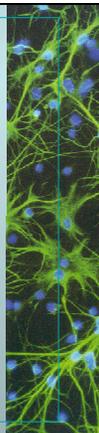
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## What is Learning & Memory?

- **Learning** is the act of making (and strengthening) connections between thousand of neurons forming neural networks or maps.
- **Memory** is the ability to reconstruct or reactivate the previously-made connections.
- **Neurons that fire together, wire together!**



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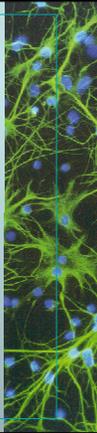
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## Neurogenesis (Growth of Neurons)

- During the 9 months of fetal development, neurons grow at the rate of **250,000** per minute.
- At birth the brain has approximately 100 billion neurons and weighs about 1 pound. By one year it has doubled and by age 5 or 6 it is 90% of its adult size and weight
- What causes this tremendous growth in such a short time? (Hint: It's not more neurons.)



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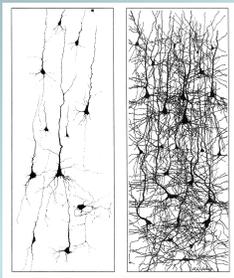
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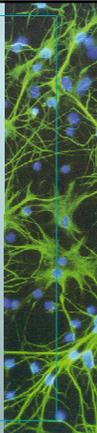
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## Answer: Growth of Connections (Synaptogenesis)



Cerebral cortex neurons in a newborn and a two-year-old.



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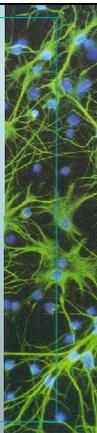
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## Synaptogenesis and Pruning

- Between the second month in utero and the age of two, each neuron in the cortex forms an average of 1.8 synapses per second. **At this point the brain begins to prune away large numbers of connections.**
- Which connections remain, and which are pruned, depends on whether or not they are used.
- **Experience literally changes the brain!**



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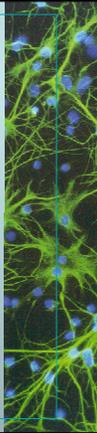
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## Neuroplasticity

- When children are born, they can hear the sounds of **6000 languages**. However, very early the neural connections representing the sounds that have been reinforced remain and the others wither away.
- What do you think would happen in the brain of a person born blind?
- **Plasticity** is a feature of the brain throughout an individual's lifetime, however, young brains are much more plastic than adult brains.



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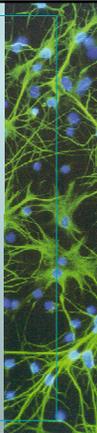
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## Mirror Neurons

- Our **brains actually practice** what we watch others doing! (looking up...yawning...crossing arms)
- Within hours after birth, **newborns** begin to **imitate** faces of adults around them.
- Mirror neurons are found in **Broca's area**...a language area of the brain.
- Listening to speech **activates tongue muscles** and aids in learning to speak.



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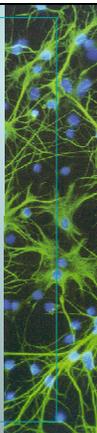
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## Mirror Neurons

- Children "catch" their sense of **security and self worth** from parents and caregivers.
- Teachers can positively or negatively influence children's **learning and well being**.
- **Positive** - optimism, encouragement, smiles, patience
- **Negative** - disapproval, prejudice, biases,



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## The Developing Brain

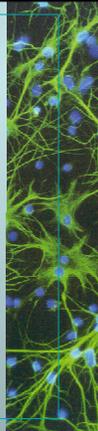
There are two factors that determine how the brain develops...

1. **Genes** are the building blocks.



Some genes are determinants.

Some genes are predispositions.



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## The Developing Brain

2. **Environment** - the on-the-job foreman.  
The environment provides the instruction for the final construction of the brain.

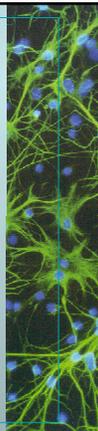


The brain gobbles up the external environment through its sensory system and then reassembles the digested world in the form of trillions of connections which are...

Constantly growing or dying, becoming stronger or weaker....

Depending on the richness of the banquet.

(Adapted from Kotulak's Inside the Brain, 1997.)



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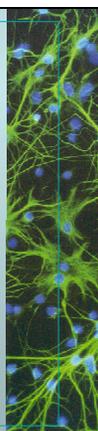
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## Genes & Environment as Partners

Genes and the environment work closely together during the first three to four years to form a healthy brain.

It is during these years that the foundations are laid down for:

- \* vision
- \* language
- \* vocabulary
- \* intellectual development
- \* emotional development



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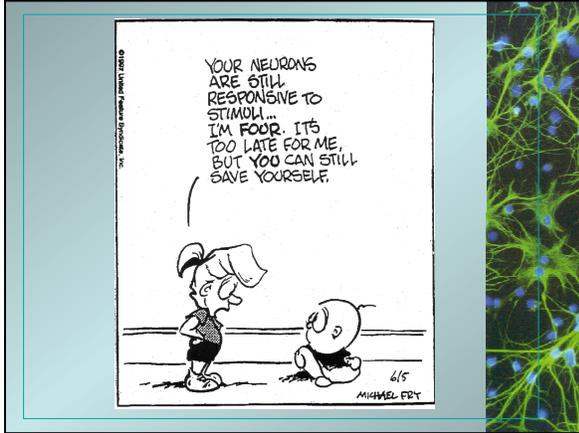
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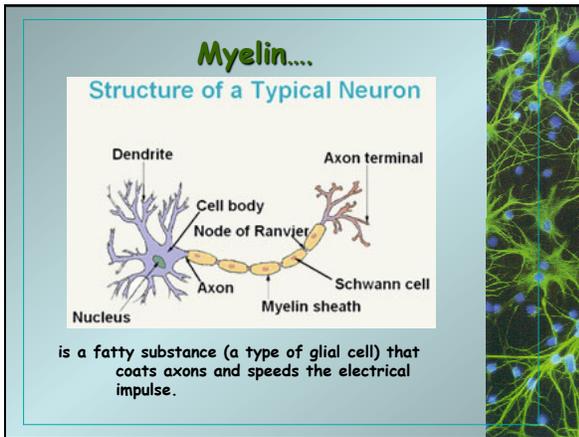
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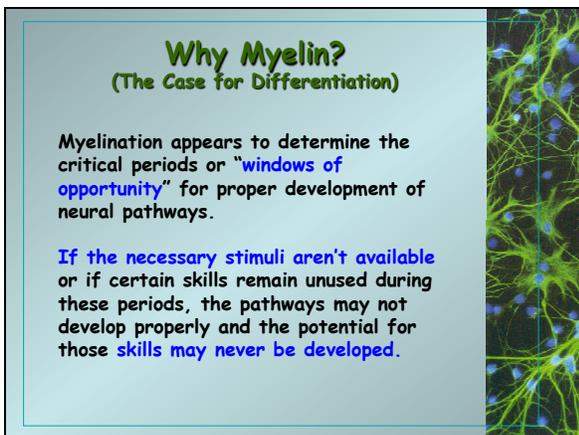
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