

# “GENERAL SEMANTICS”

The Key To Understanding The Brain



Charles E Bailey MD

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"We've given you a brain scan and  
we can't find anything."

# Agenda

- Normal Brain Anatomy and Function
- Relationship Between Rodent and Human Brain
- “Semantics” and the Frontal Lobes

# Brain Tasks

# Location

Executive functions	Prefrontal Cortex
Reward system +	Nucleus Accumbens
Alarm system -	Amygdala
External input integration	Parietal Lobe
External input regulation/distribution	Thalamus
Drive	Reticular Activating System
Internal regulation of body functions	Hypo-Thalamus
Sensory systems	Sensory Organs
Motor systems	Motor Cortex
Memory system	Hippo Campus
Memory-language-emotional integration	Temporal Lobes
Activation...on	Locus Ceruleus
Deactivation...off	Raphe Nucleus

# ***Dopamine pathway involvement***

## **Mesocorticolimbic Pathway**

Connects VTA to:

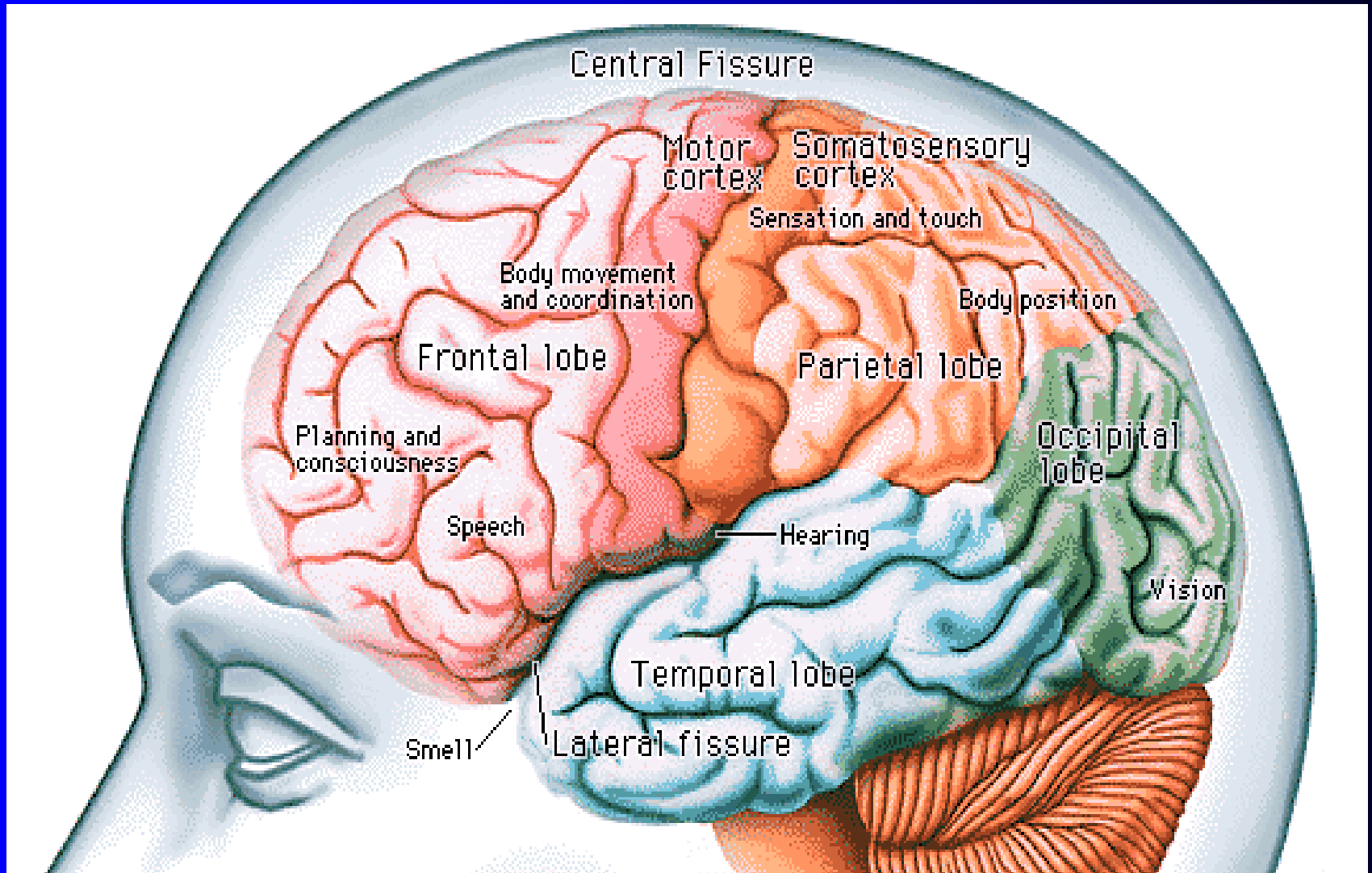
- Hippocampus.....memory
- Nucleus Accumbens.....reward
- Prefrontal Cortex.....executive function
- Anterior Cingulate.....attention/conflict
- Amygdala.....fear/anxiety

## **Nigrostriatal Pathway**

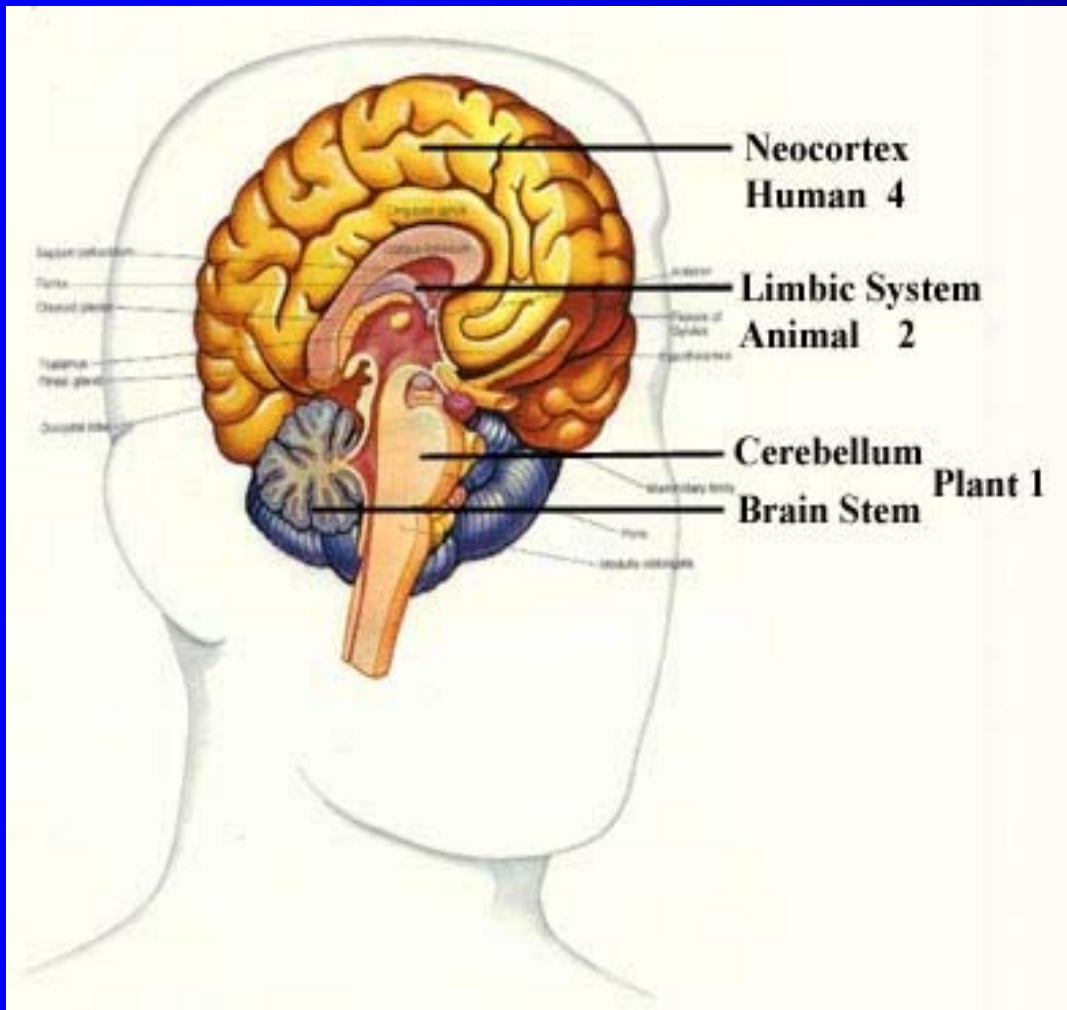
Connects Substantia Nigra to:

- Caudate and Putamen.....PP, EPS, TD

# Normal Brain



# Brain Evolution; The Importance of the Frontal Lobes



- Neocortex  
New Brain  
Rational  
Reasonable  
Logical
- Limbic System  
Old Brain  
Emotional  
Feels good  
Feels bad

# Evolution of the Frontal Lobes

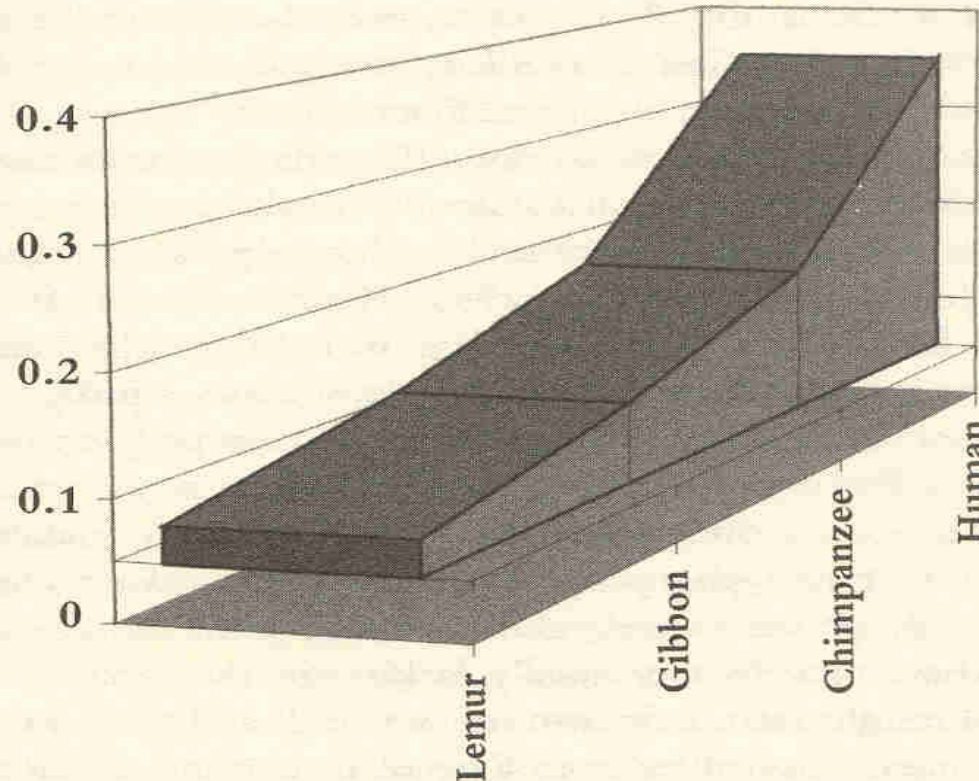
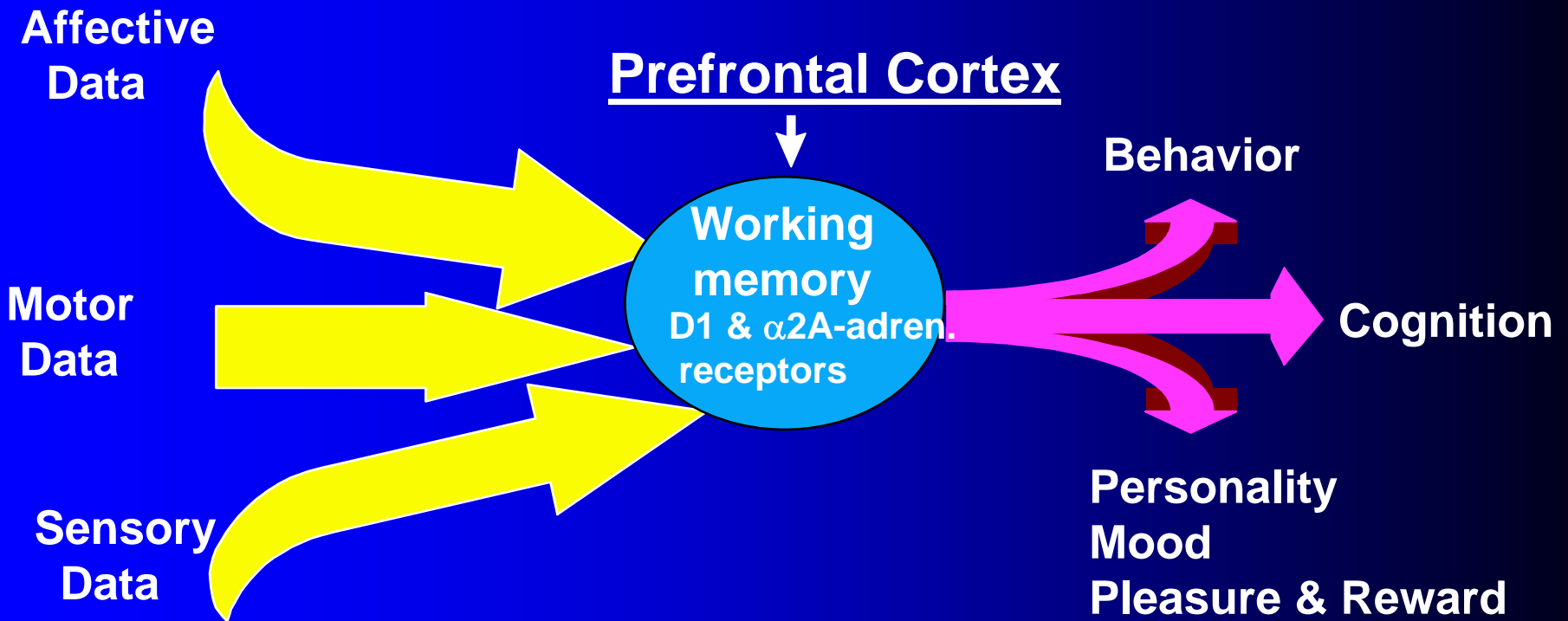


FIGURE 13. **Evolution of the frontal cortex.** Expressed as the ratio of frontal cortex to all cortices. Based on Brodmann. (1909).


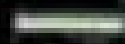

From; *The Wisdom Paradox*,  
Elkhonon Goldberg, Ph.D.

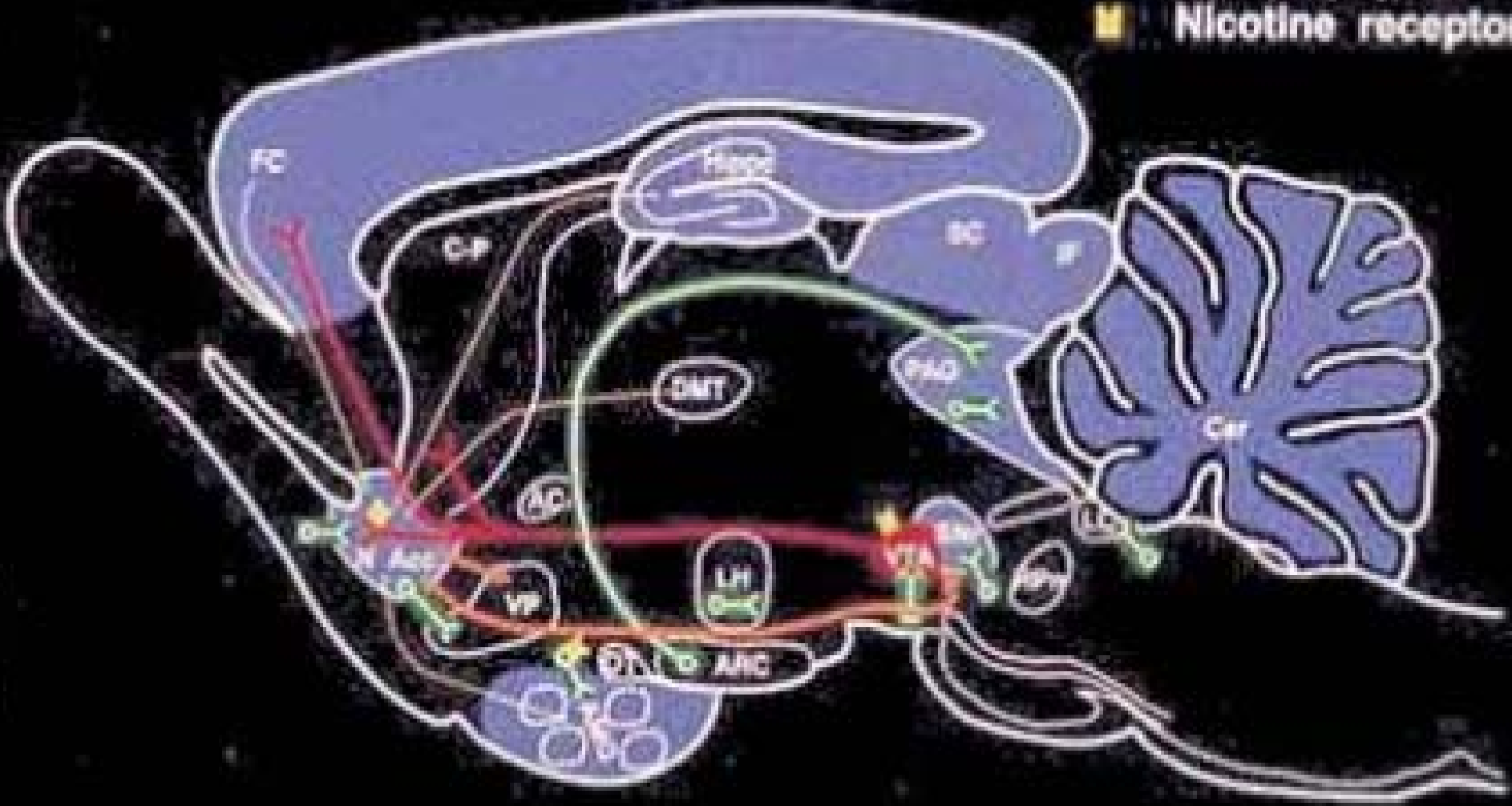


# Prefrontal Cortex Exercises 'Top Down' Modulation, Integration & Coordination of Behaviors, Including Mood & Reward...All Relevant to Depression

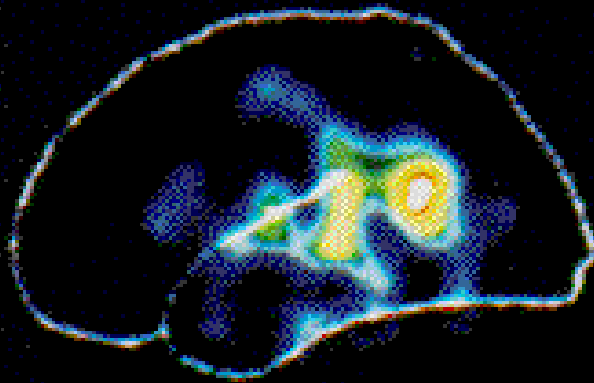


# DA~END~NICT

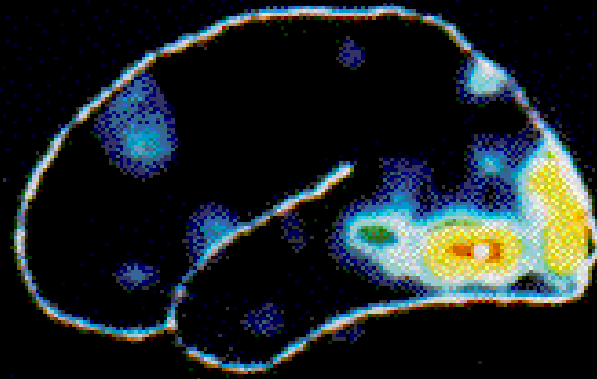
-  Dopamine
-  Opioid peptide
-  Nicotine receptor



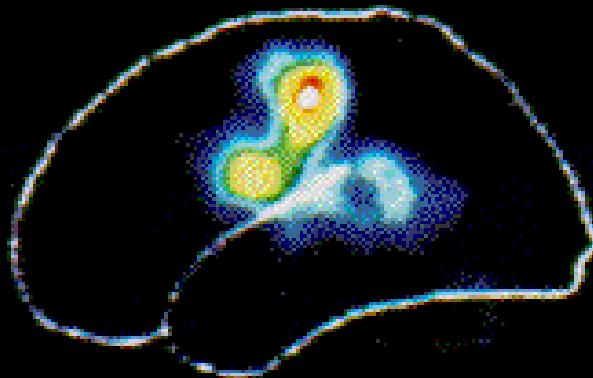
# Normal



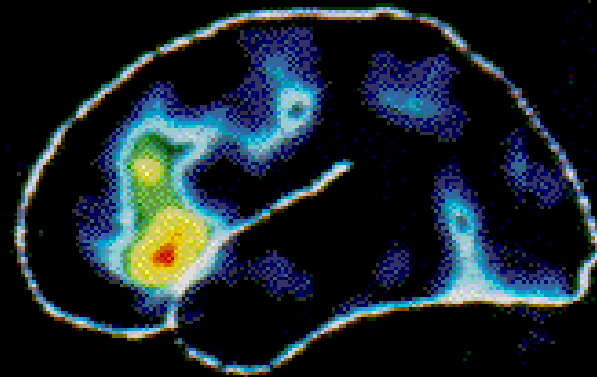
Hearing words



Seeing words



Speaking words



Generating words

# Frontal Lobes

- Planning and executing
- Forecasting
- Anticipating
- Screening irrelevant stimuli
- Regulating impulses

# Executive Functioning

- Organizing, prioritizing, and actuating
- Focusing, sustaining, and shifting attention
- Regulating alertness, sustaining effort and processing speed
- Managing frustration and modulating emotions
- Utilizing working memory and accessing recall
- Monitoring and self regulating actions

# ADHD

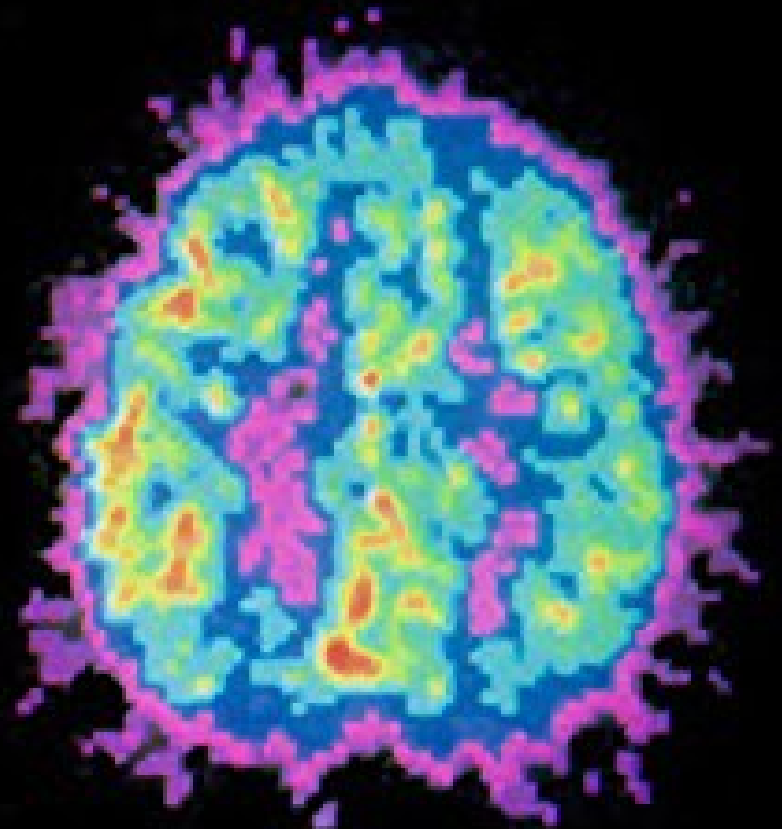
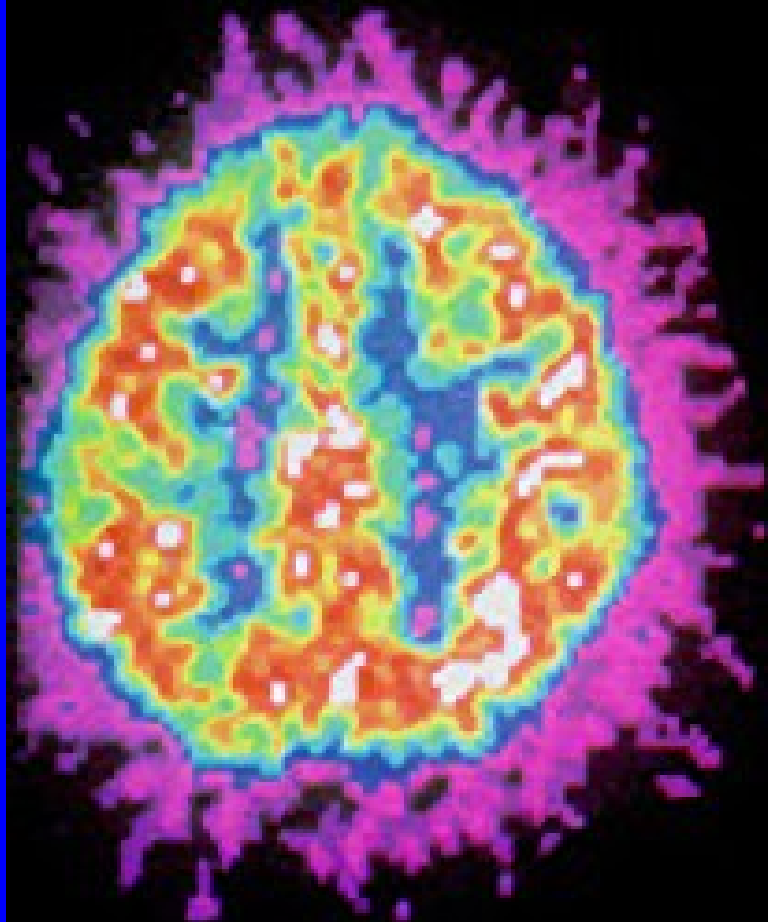
Dysexecutive  
Syndrome

# ADHD

decreased metabolism

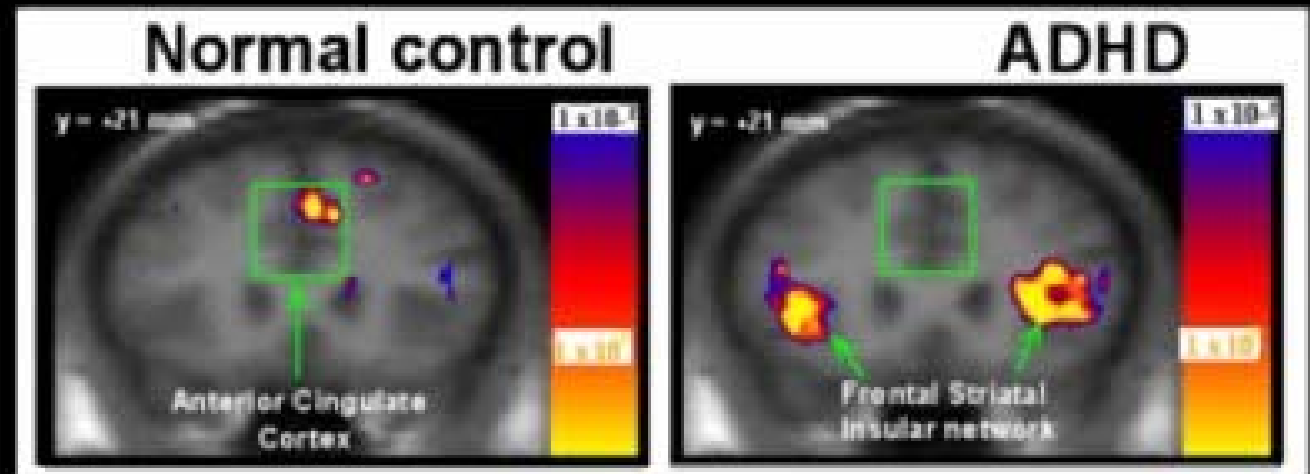
**NO ADHD**

**ADHD**



# ADHD f-MRI

## Neuroimaging and ADHD



- fMRI shows decreased blood flow to the anterior cingulate and increased flow in the frontal striatum
- PET imaging shows decreased cerebral metabolism in brain areas controlling attention
- SPECT imaging shows increased DAT protein binding

MGH-NMR Center & Harvard-MIT CTRP. Adapted from Bush, et al. *Biol Psychiatry*. 1999;45:1541-1551.



# Understanding the Brain...

## Brain-Computer Model

- Frontal lobes (executive functioning)
- Parietal Lobe, Temporal Lobe, Hippocampus (information and “process” storage)
- RAM (random access memory)
- Hard Drive (memory and software storage)

# Brain-Computer

- The frontal lobes or Prefrontal Cortex (PFC) function much like the RAM of a computer, manipulating data/information that is stored in the memory storage areas of the brain.
- The Process information or “how we think” is also stored in these memory areas just like software on a computer.
- Changing the information and the way the information is processed contributes to the effectiveness of Cognitive Behavioral Therapy.

# Brain-General Semantics

GS increases the “accuracy” of the stored information by clarifying irrational assumptions and increases the “accuracy” of information processing by replacing irrational processing with more healthy rational processing...healthy thinking

# GENERAL SEMANTICS/CBT Improves Cognitive Accuracy

- Information accuracy
- Process accuracy
- Event level accuracy

# Cognitive Behavioral Therapy Rx

- ADHD
- SUDS
- AD
- MD
- BP
- SCPT

# CBT Helps In Dealing With

- Mood
- Guilt
- Anger
- Anxiety
- Coping skills
- Stress management skills
- Communication skills

# CBT

- Improves functioning of PFC by enhancing executive skills
- Old “irrational” software replaced by new “logical” software”

# Process Change

“NEW SOFTWARE”

## Healthy vs Unhealthy

### CBT

- Flawed
- Fallible
- Flexible
- choices/consequences
- preferential thinking
- Self responsibility
- continuous quality improvement

### Cultural

- Perfection
- Mistake free
- Rigid
- should, must, have to, got to, need to, etc.
- Fault finding and blaming and punishing



You were always  
on my mind The End



The End

