

Your Child's Brain



What's Going On In There?

**The Brain is wider than the sky,
For, put them side by side,
The one the other will contain
With ease, and you, beside.**

**The Brain is deeper than the sea,
For, hold them, blue to blue,
The one the other will absorb,
As sponges, buckets, do.**

Emily Dickinson

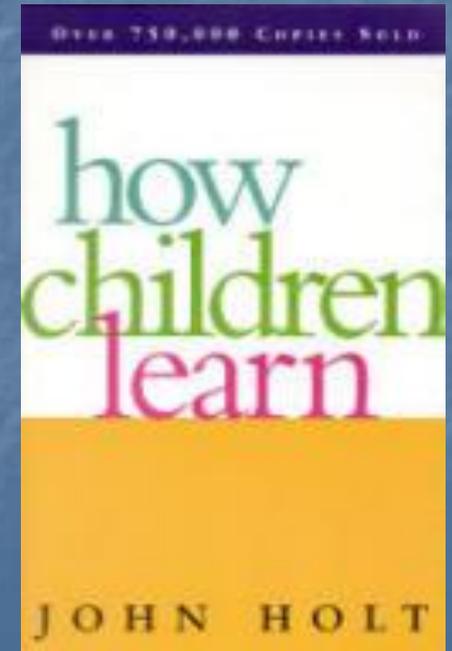
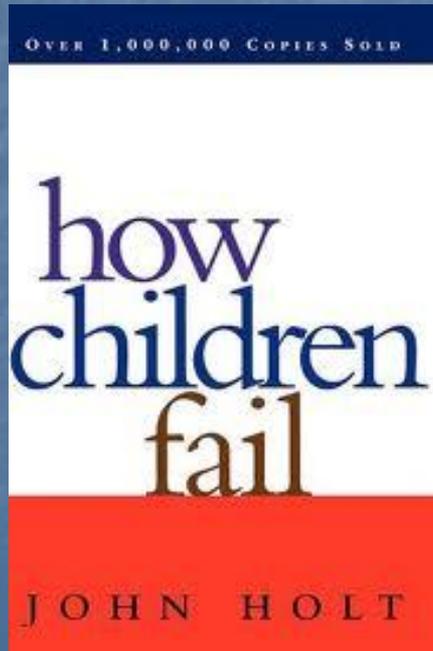
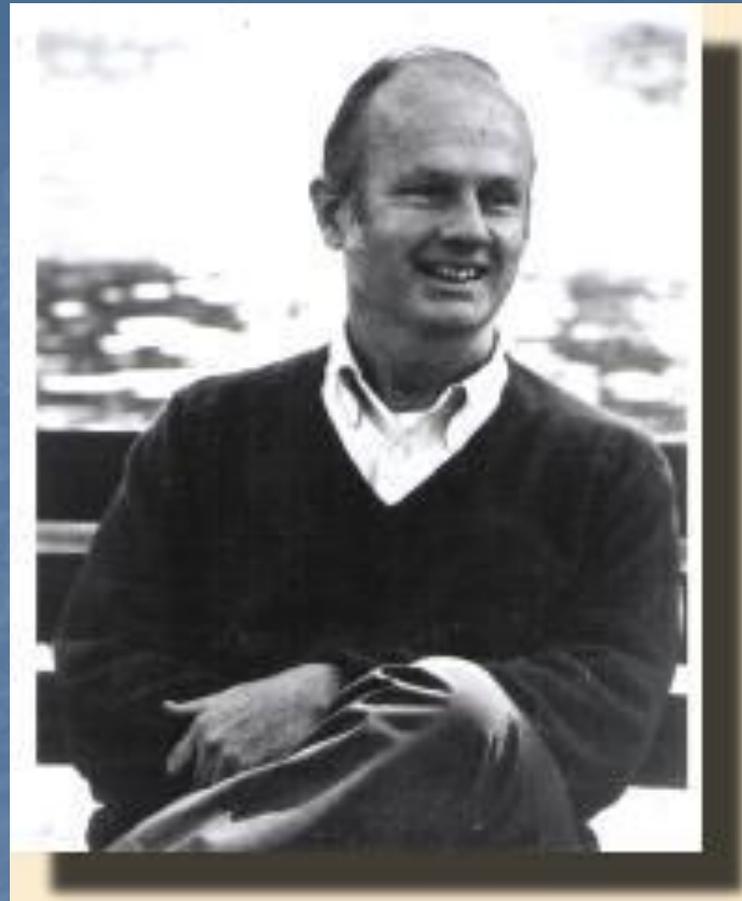
As we begin the 21st century, the Hubble space telescope is providing us with information about as yet uncharted regions of the universe.

This same spirit of adventure is also being directed to the **most complex structure that exists in the universe - the human brain.**

Floyd E. Bloom (in *Fundamental Neuroscience*, 2003)

What seems astonishing is that a mere **three-pound object**, made of the same atoms that constitute everything else under the sun, is capable of directing virtually everything that humans have done: flying to the moon and hitting seventy home runs, writing *Hamlet* and building the Taj Mahal -- even unlocking the secrets of the brain itself.

Joel Havemann (from *A Life Shaken*, 2002)









Stroke

Old: Static Brain

No new growth after childhood.

No change or improvement to learning pathways that are set up in childhood – SO THEY'D BETTER BE SET UP BY EXPERTS!



Therapy causes Brain Reorganization after Stroke



Lots of Challenge and Decision-Making = Lots of Brain Reorganization



No Challenge, No Brain Reorganization

New: Plastic Brain

Continual change and growth throughout life... IF you stay mentally active (use it or lose it).

Brain capacities emerge on a timetable that is unique for each person.



3 weeks



4 weeks



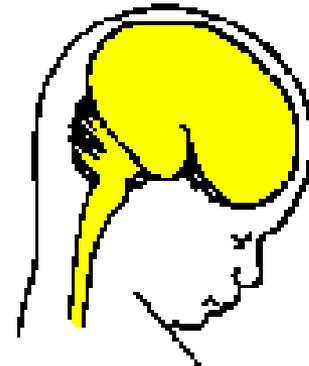
5 weeks



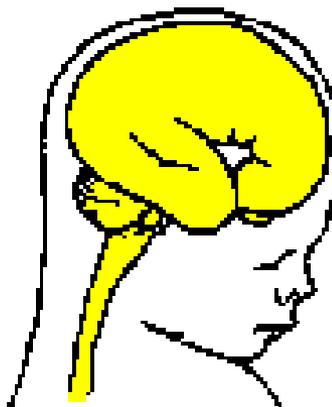
7 weeks



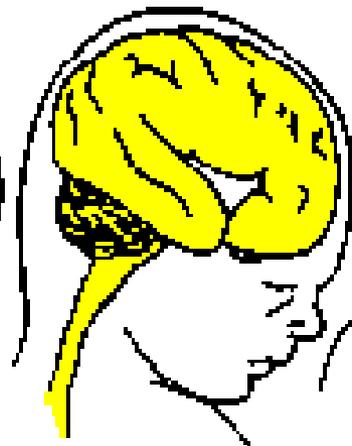
11 weeks



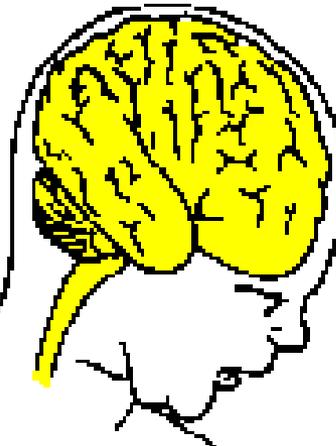
4 months



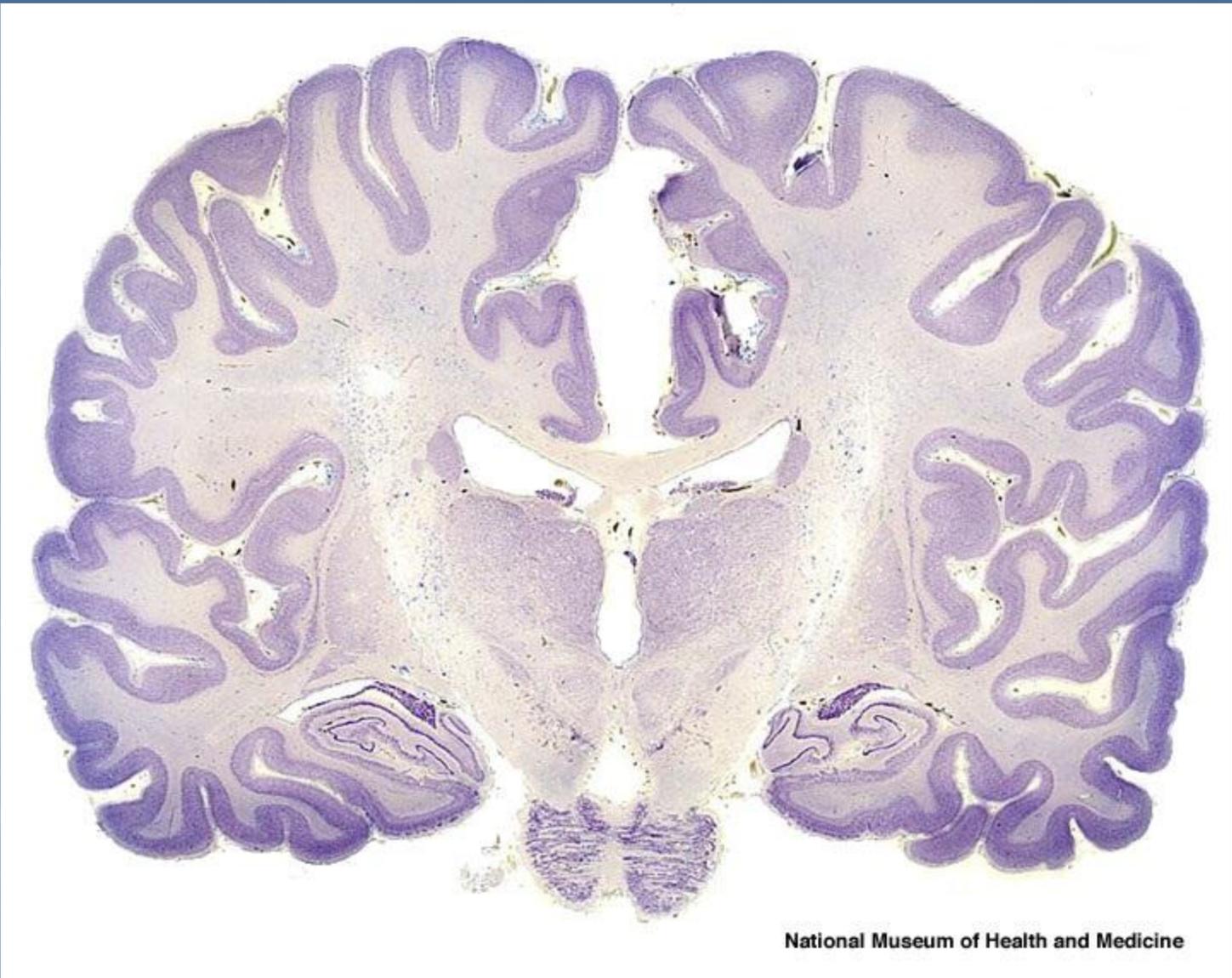
6 months



8 months

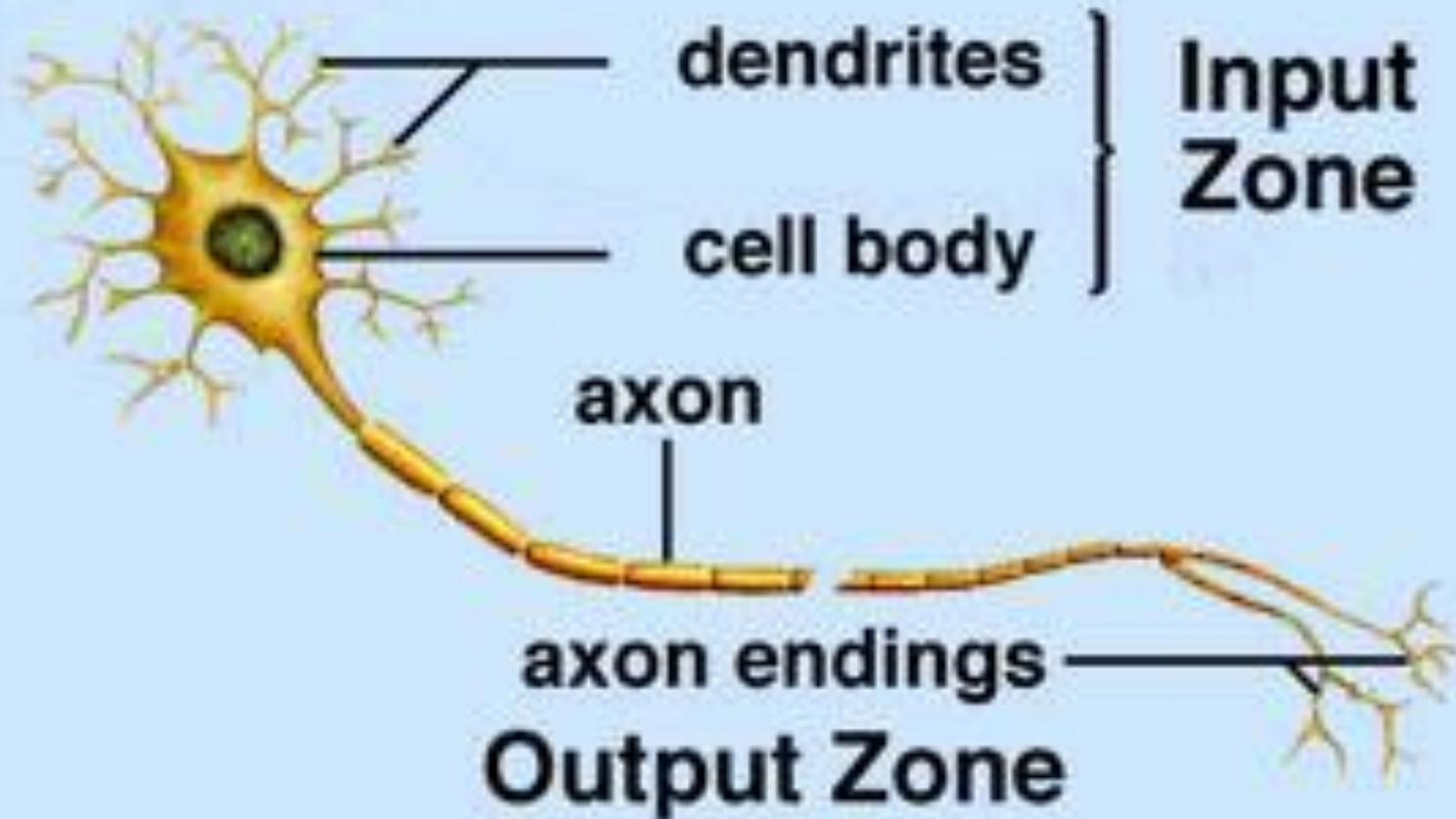


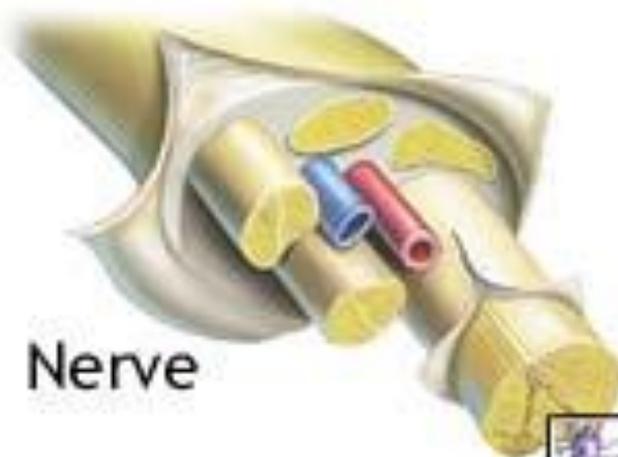
Newborn



National Museum of Health and Medicine

A Motor Neuron

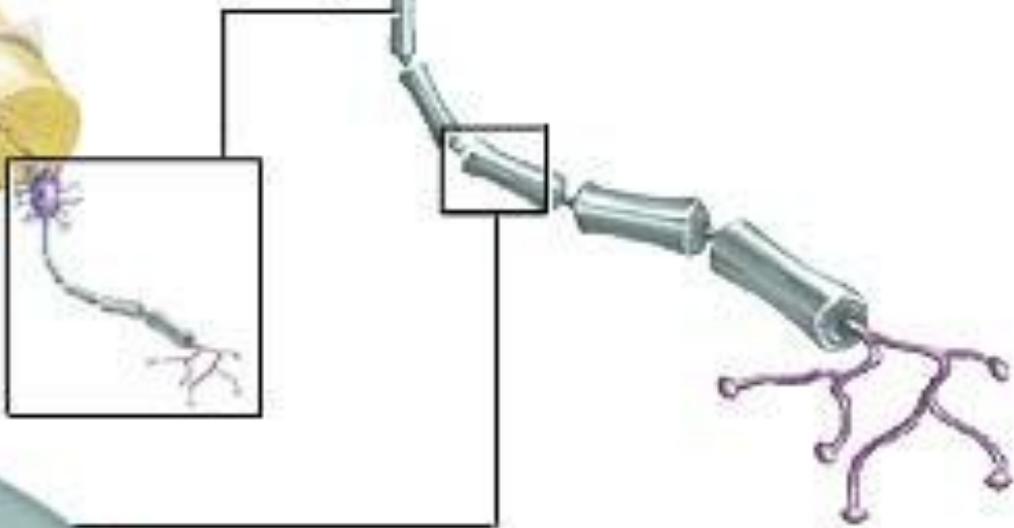




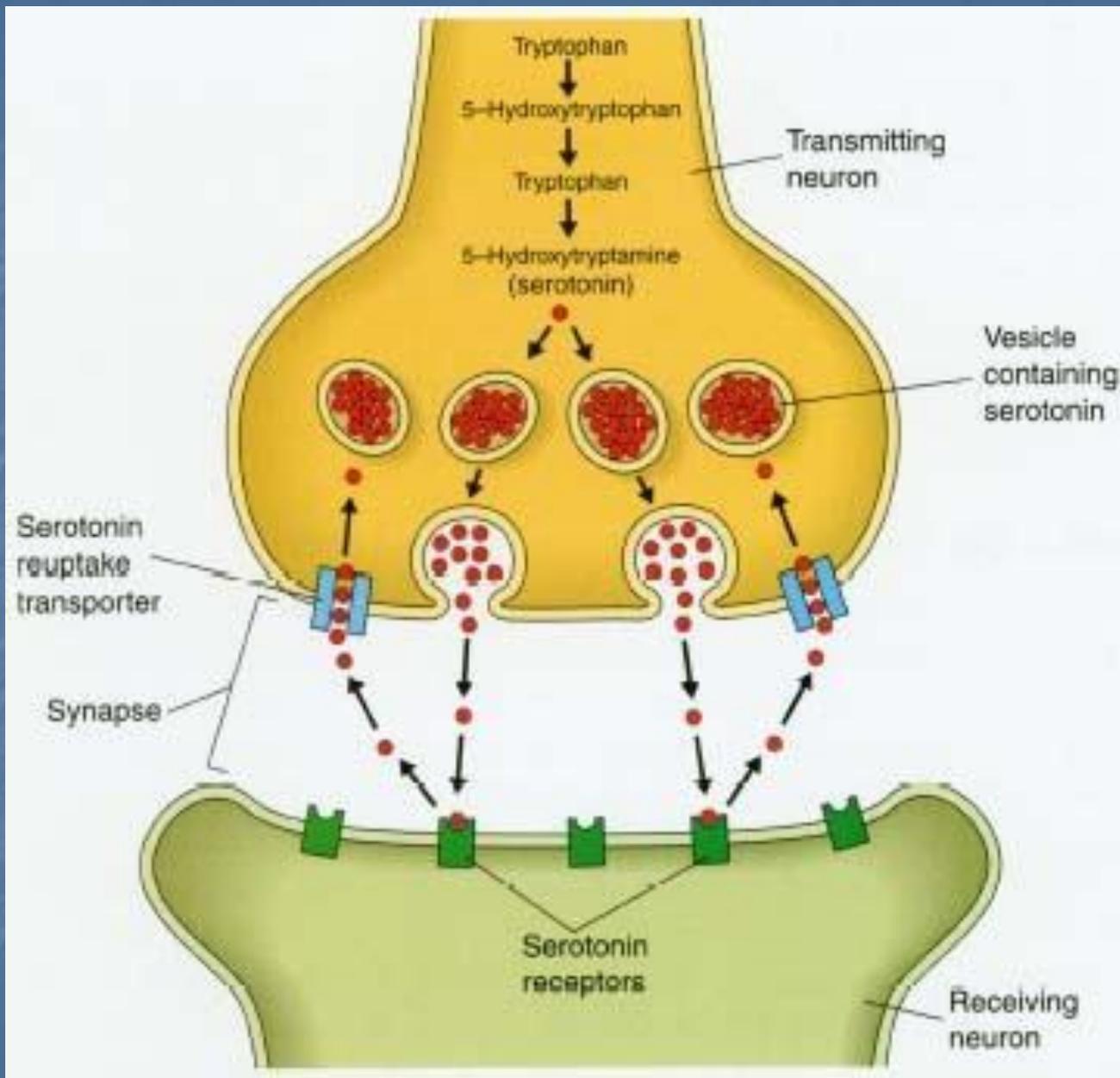
Nerve



Neuron



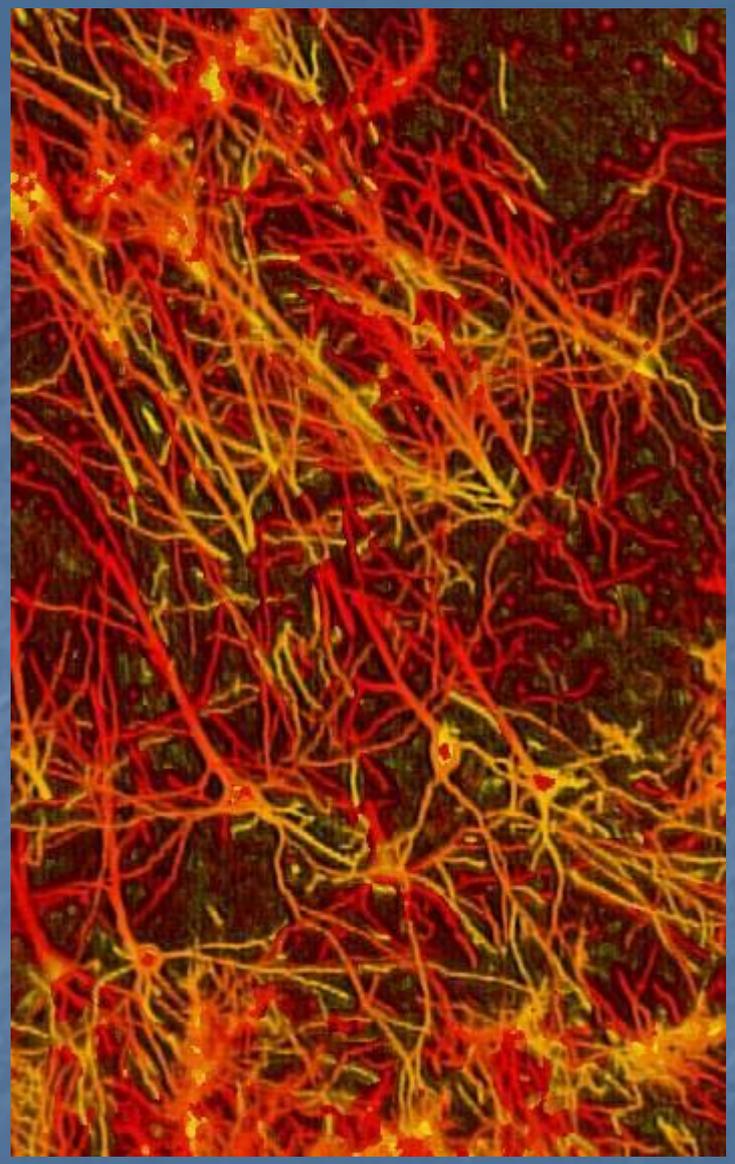
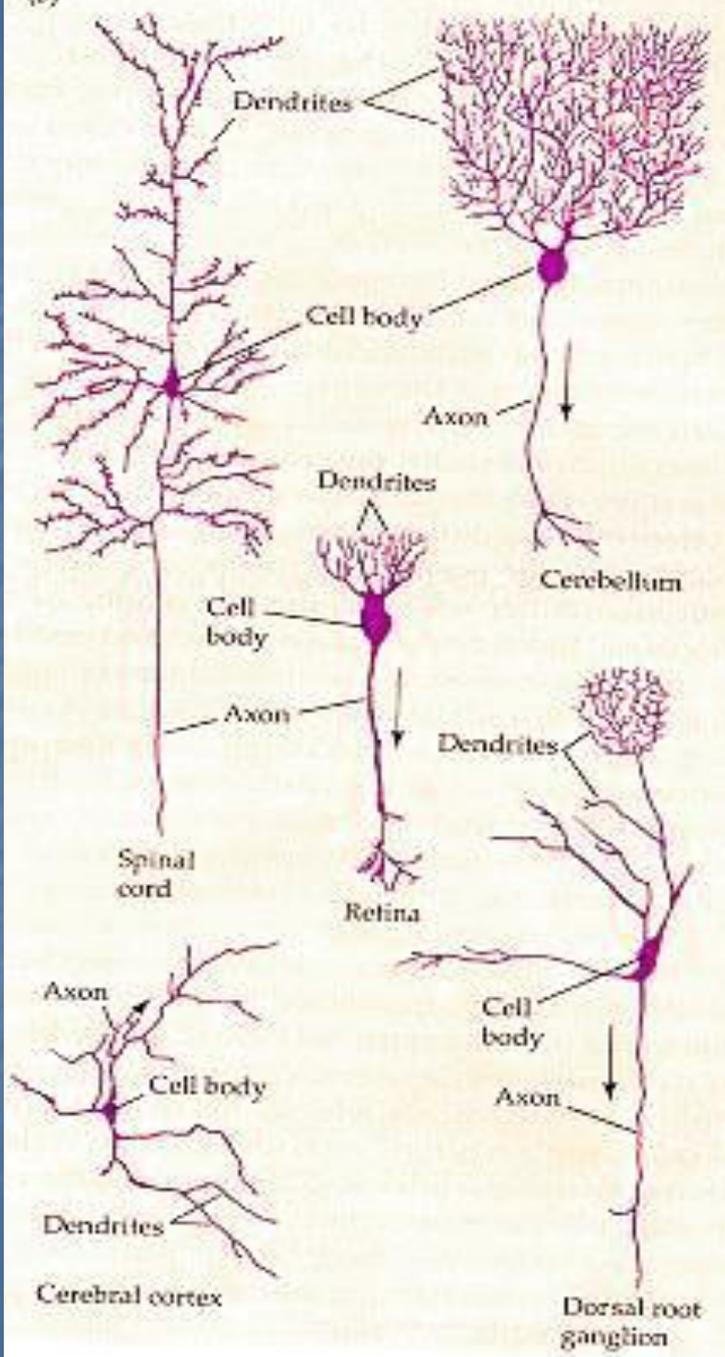
Myelin sheath

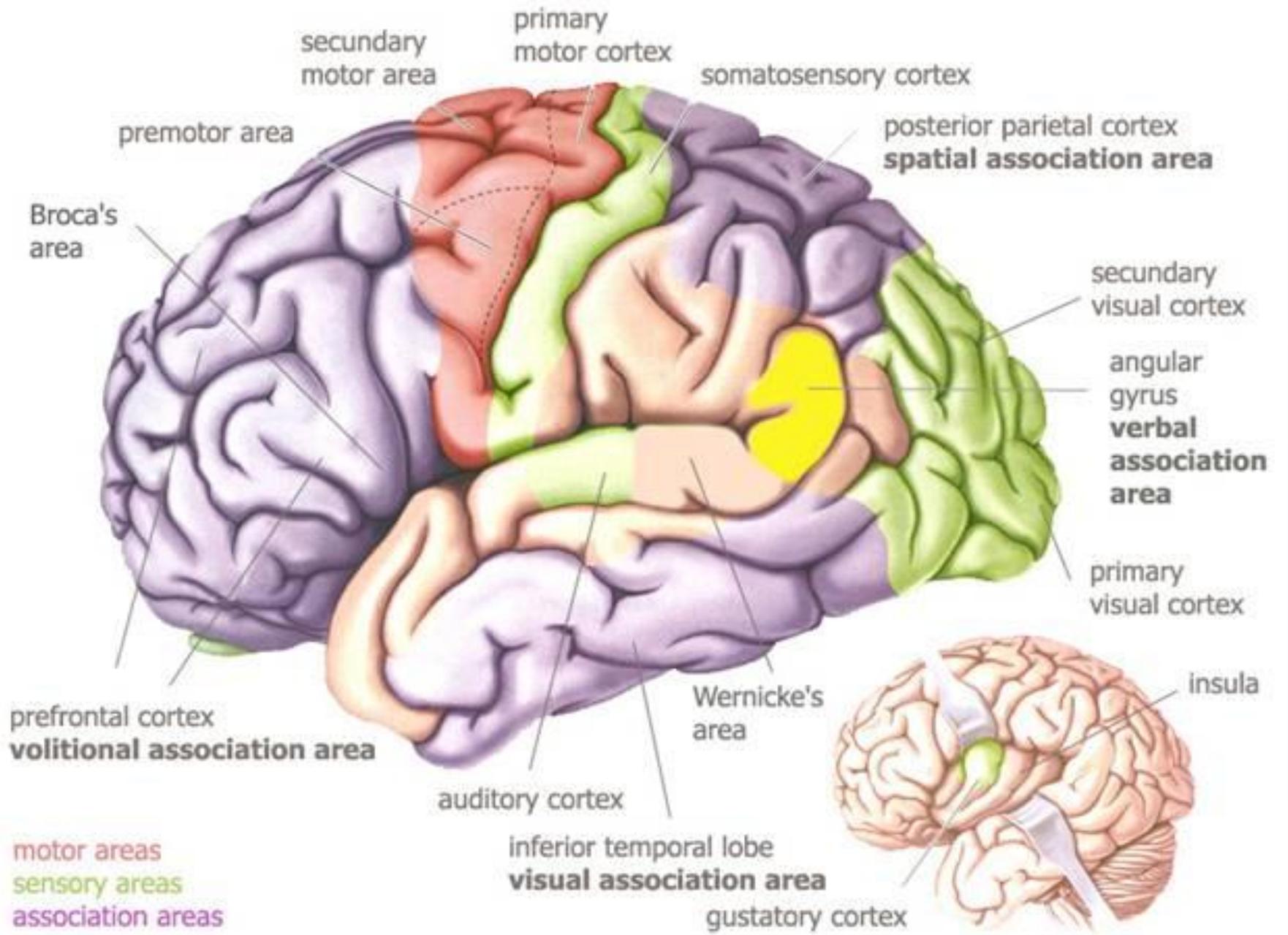




Here is a view of the middle of the brain, showing some of the insanely complex wiring between different brain areas.

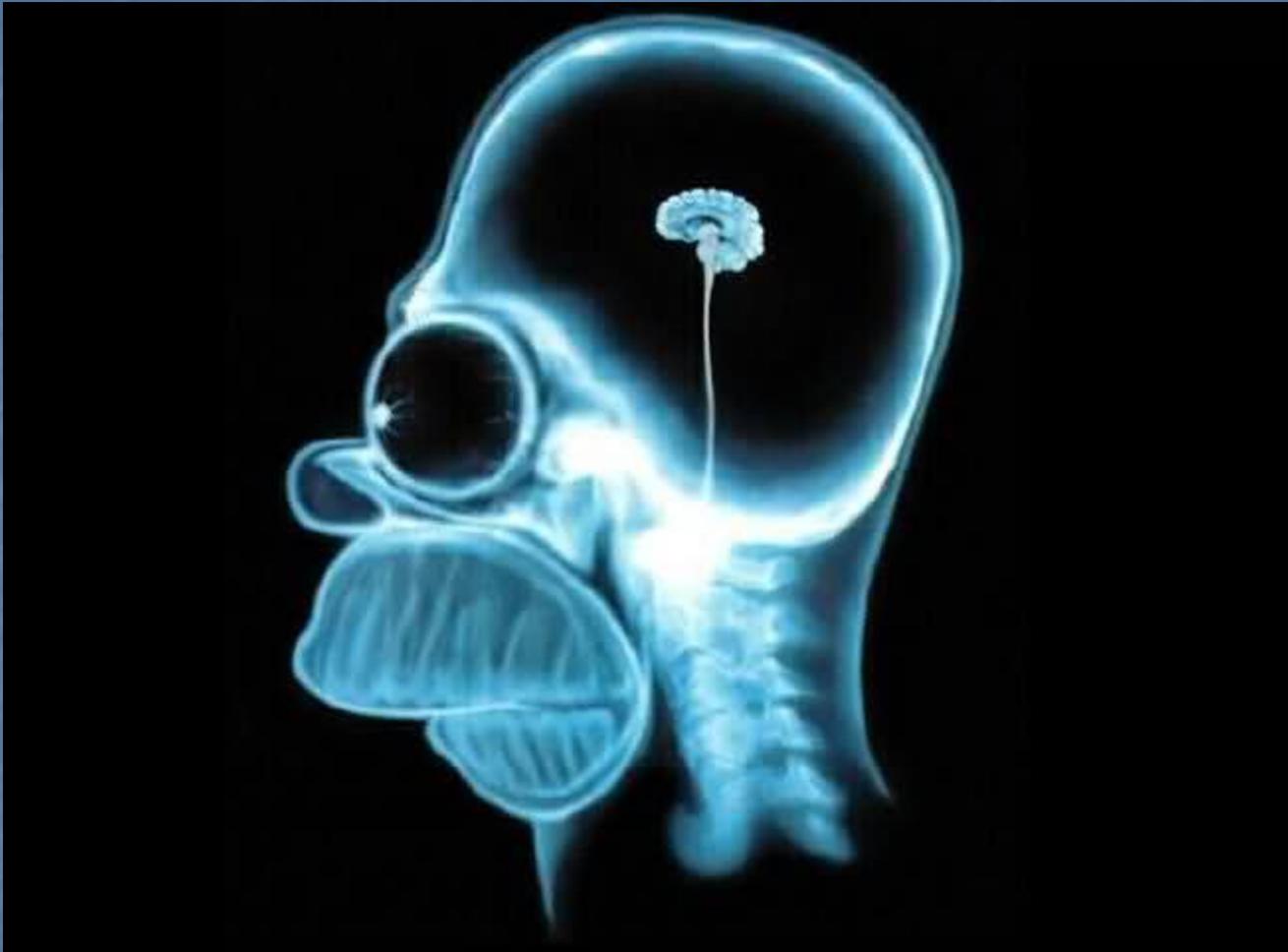
(b)





Synapses

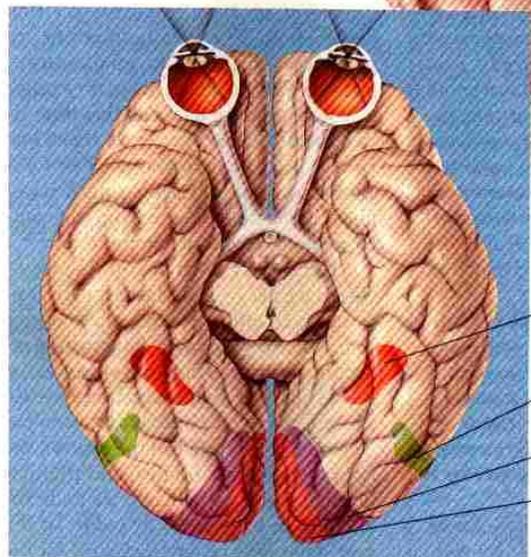
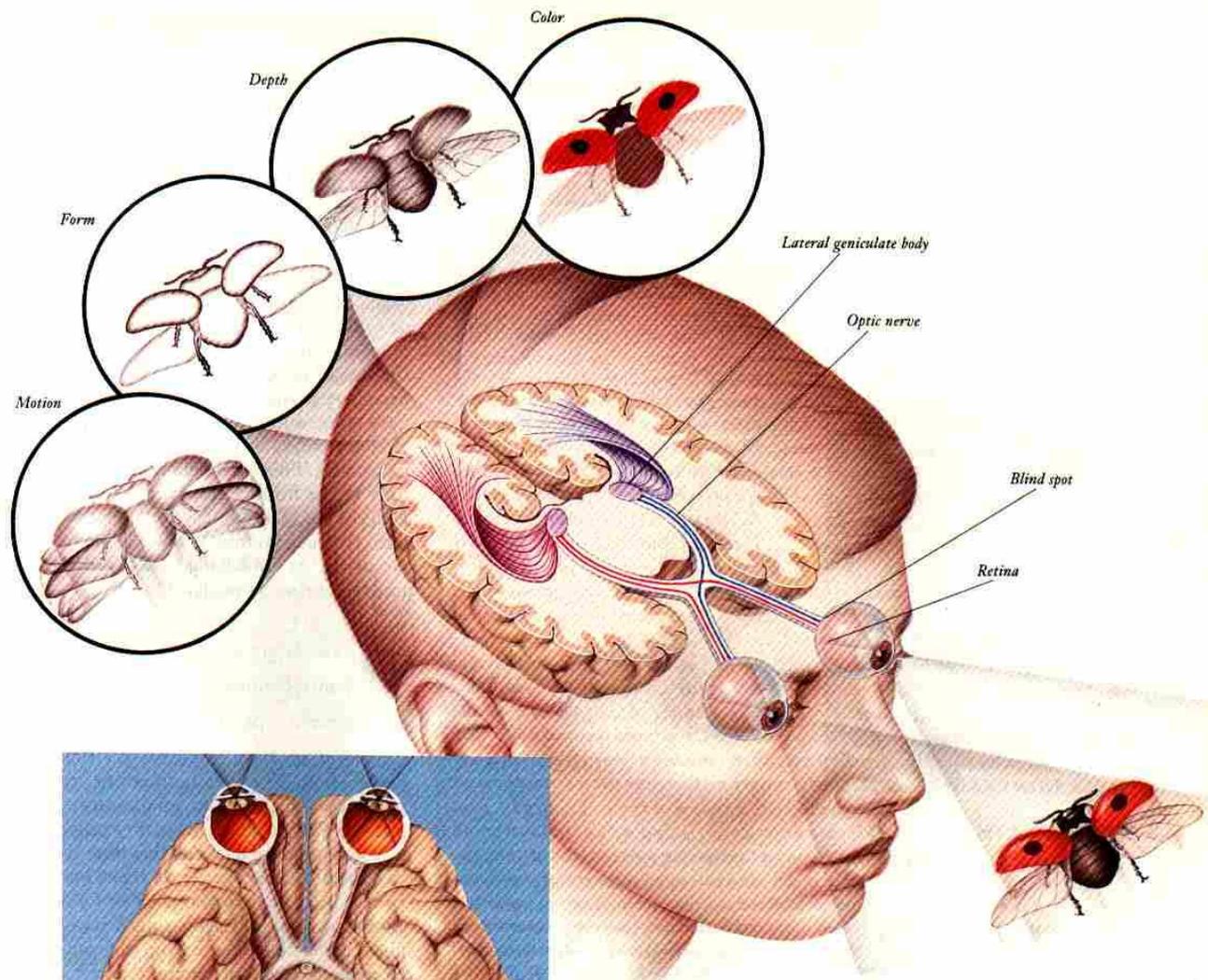
- Overgrowth of synapses during early childhood provides raw material for thinking.
- As life experiences are processed, recorded, and acted upon, certain brain pathways are used over and over.
- The well-used pathways are preserved, while unused ones wither away.



Get it?

Old: Critical Periods
**(abrupt end to the window of
opportunity)**

New: Sensitive Periods
(gradual beginning and end)



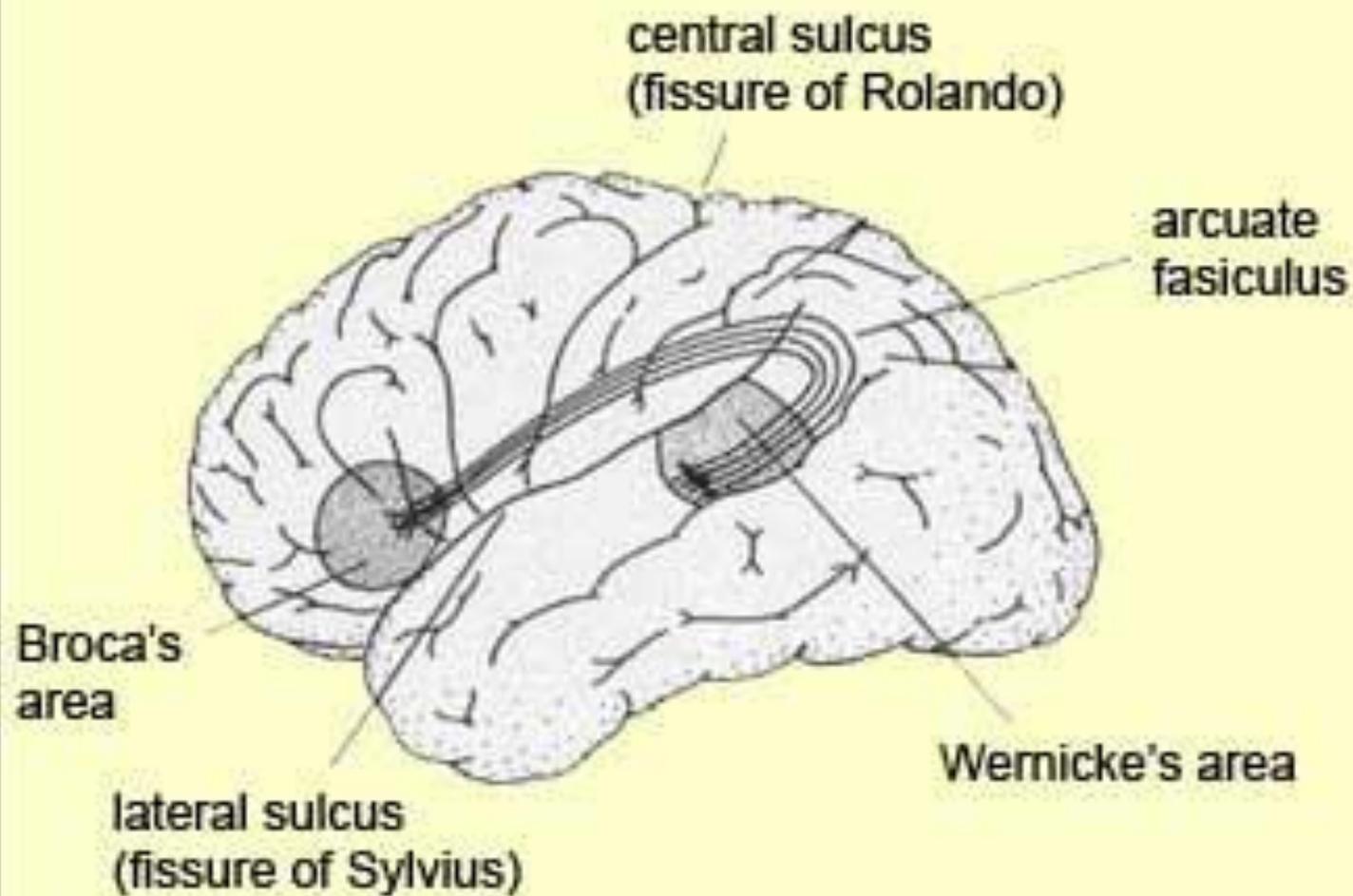
Color/Form

Motion/Depth

V2

V1





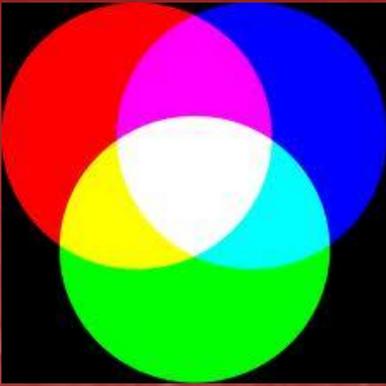


EINSTEIN NEVER USED FLASH CARDS

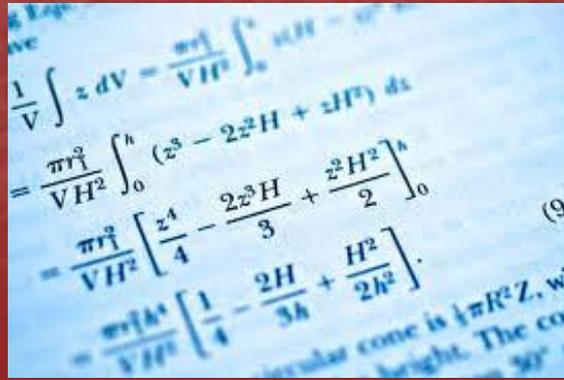


HOW OUR CHILDREN REALLY LEARN—
AND WHY THEY NEED TO PLAY MORE
AND MEMORIZE LESS

KATHY HIRSH-PASEK, PH.D., AND
ROBERTA MICHNICK GOLINKOFF, PH.D.,
WITH DIANE EVER, PH.D.



experience-expectant vs. experience-dependent paradigm



Chill Out!

- **Academics are NOT on the brain's "sensitive periods" list**
- **Many things are learned more easily later in life**
- **Four year span of "developmental differences" by age six !**

Sensitive Periods

What is required? “Middle-class Mothering”



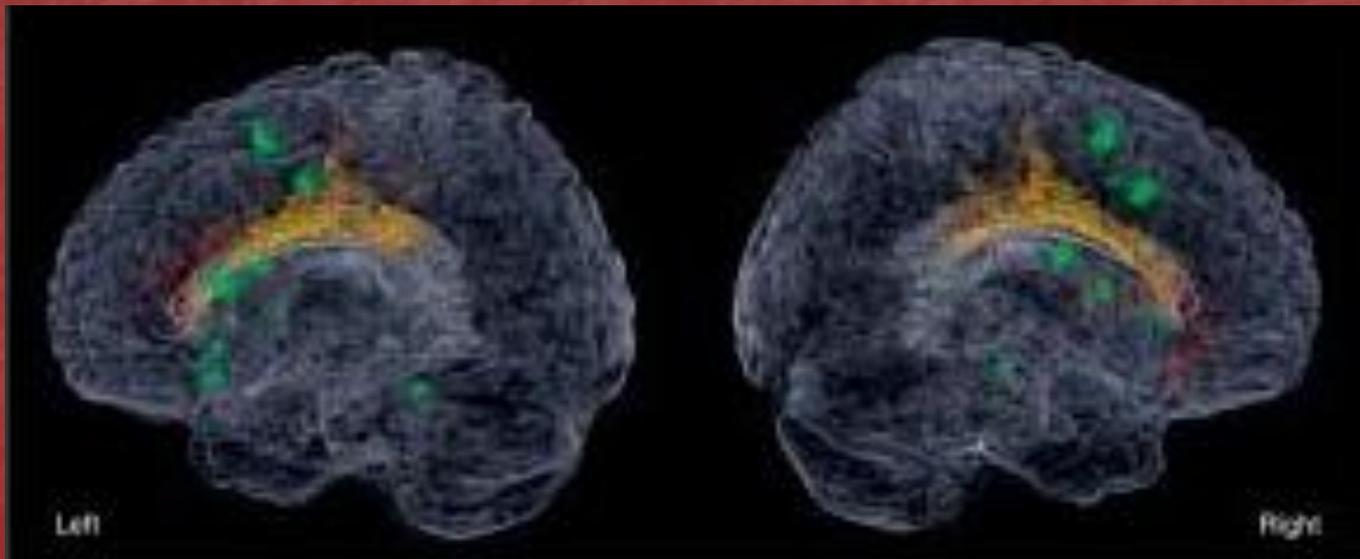
Sensitive Periods

Two special cases:

Music

Multiple “first languages”

Multilingual brains are different



Are Bilinguals Smarter?

“Early exposure to more than one language may foster the inhibition and working memory skills necessary for cognitive flexibility in a variety of problem-solving situations.

The behavioral and brain evidence thus far supports the notion that language switching might be a subset of more generalized executive and behavior-selection processes rather than an isolated linguistic process.”

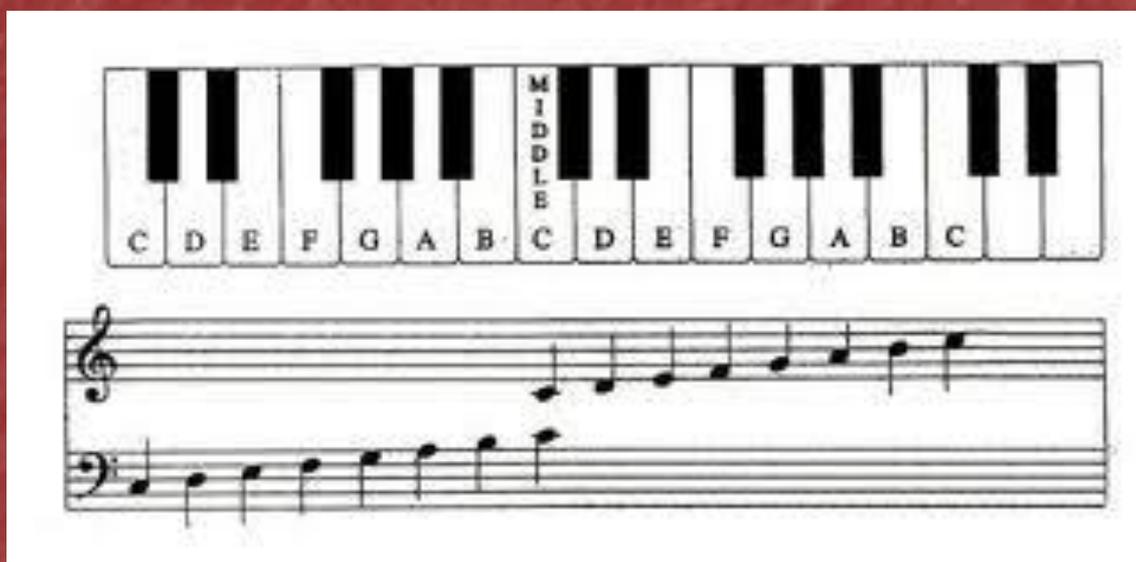
Developmental Science 2008

Can Bilinguals Hear Better?

“Relative to monolinguals, bilingual babies show an increased sensitivity to a greater range of phonetic contrasts, and an extended developmental window of sensitivity for perceiving these phonetic contrasts relative to monolingual children. This fascinating finding is under further study, as it suggests the possibility that bilingual phonetic perception in early life can function as a kind of ‘perceptual wedge’ to keep open a child’s capacity to discriminate phonetic units, while the same capacity attenuates dramatically for the monolingual quickly in early life.”

Dartmouth College, 2004

Perfect Pitch



European-style Middle-class Mothering



Mutter-Kind
tradition
Parkplatz

Is My Child “Normal”?



Autism Spectrum Disorder

- One in 82 children, five times more boys
- Signs present in toddlers, diagnosed by 5
- Strongly suspected to be genetic, with other factors determining whether or how soon a carrier will develop autism
- Three major areas of dysfunction:
 - communication**
 - social development**
 - obsessive behaviors**

ASD Red Flags

- language skills are slow to develop, or develop then regress
- selective hearing, to the point that the child appears to be deaf at times
- doesn't smile, make eye contact, or wave "bye-bye"
- lacks imaginative play with toys, instead engaging in repetitive, organizational-type activities with them
- flaps arms, rocks body, or walks on his toes
- is overly active, uncooperative, resistant, or throws violent tantrums

Auditory Processing Disorder

- Ears work fine, Brain does not
- 5% of children
- Poor recognition or ordering of speech sounds
- Can cause speech and reading problems

APD Red Flags

The child:

- is unusually upset by loud or sudden noises
- has trouble with information provided orally, doing better with visual instructions
- cannot follow multi-step instructions, needing to hear one step at a time
- confuses similar sounding words, or perceives less words than were actually said
- has trouble with reading, writing, spelling
- has behavioral issues

Attention Deficit/Hyperactivity Disorder

- Impulsivity, over-activity, and/or inattentiveness beyond the normal range for the child's age
- 10% of children, boys diagnosed four times the rate of girls
- Possible causes include genetics, infections, pesticides, premature birth

Attention Deficit/Hyperactivity Disorder

- Symptoms caused by low levels of the neurotransmitter dopamine
- Hyperactivity may compensate for the low arousal state
- Stimulants frequently prescribed

Learning Disabilities or Learning Differences?

“One of the hardest things for people to understand is that bright children are not necessarily on the fastest train.”

Jane Healy, Ph.D.

Three “Brain” Virtues



Freedom



Joy



Love

Freedom is Good for Brains

“Therefore, cheer up your hearts, and remember that ye are **free** to act for yourselves.” (2 Nephi 10:23)

Each person comes with unique strengths and weaknesses, and is on a unique developmental time-table.

When we are free to “act for (ourselves)” we pursue activities that our brain is “online” for.

"It is, in fact, nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of inquiry...which stands mainly in need of freedom.... It is a very grave mistake to think that the enjoyment of seeing and searching can be promoted by means of coercion and a sense of duty." -- Albert Einstein

“Enrich the Environment”

Tiny children: Concrete stage
NEW THINGS!



“(Self-directed activities) are not random and have a pattern and organization in keeping with the child’s level of mental ability. Allowing the child time and **freedom** to complete these activities to her personal satisfaction nourishes that child’s power of concentration and attention. Left to her own devices, an infant or young child can spend a long time on an activity in which she is deeply immersed. We run the risk of impairing these powers if we don’t respect and value the young child’s self-initiated activity.” *The Power of Play*, David Elkind, Ph.D.

“Enrich the Environment”

Little children: Mental-image stage
NEW SITUATIONS!



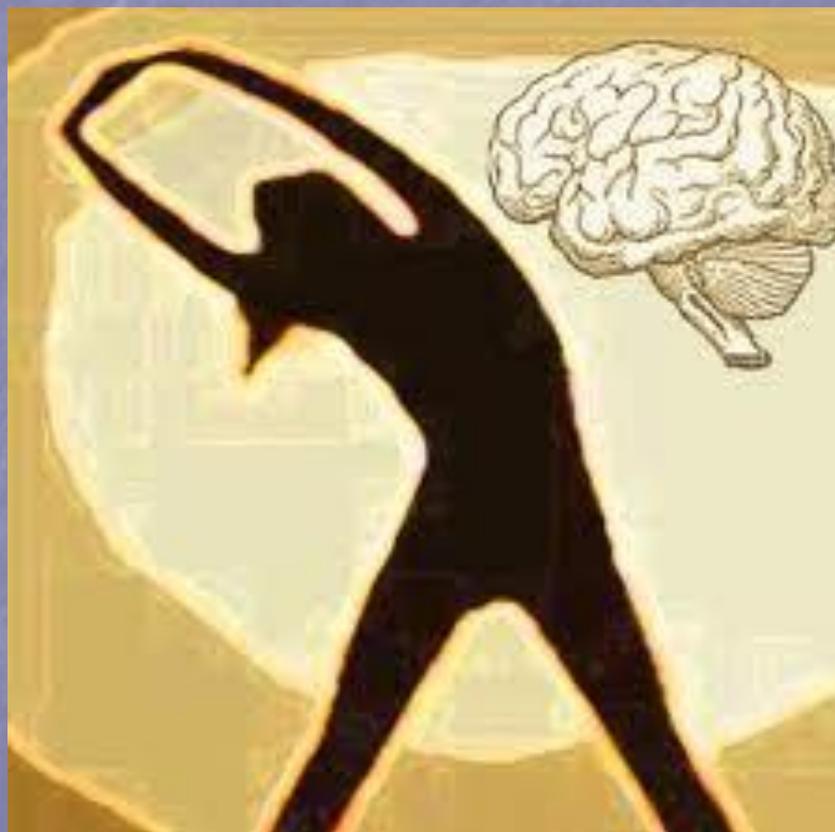
“Enrich the Environment”

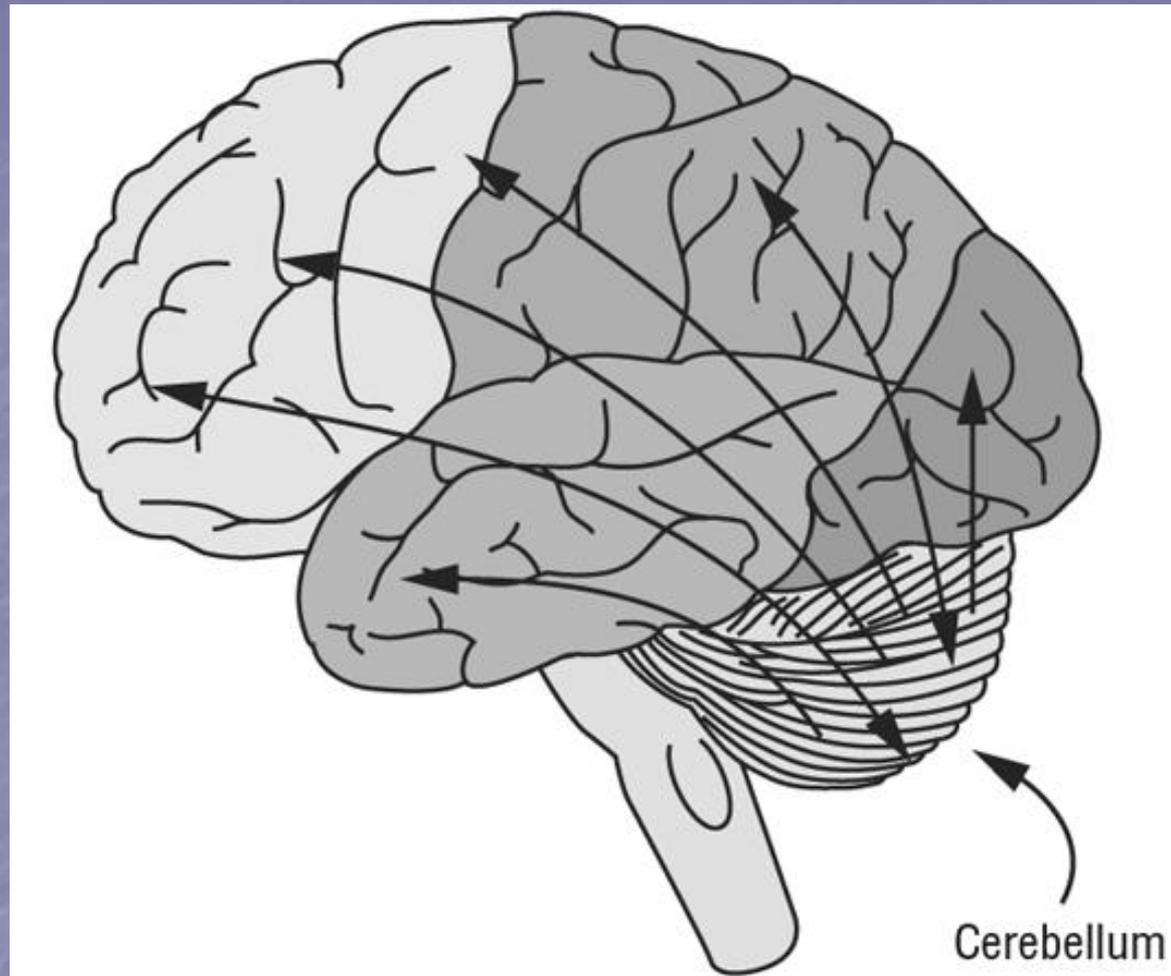
Older Children: Abstract Stage

NEW IDEAS



Movement and the Brain





Information travels to and from the cerebellum, the brain's center of motor control, and other parts of the brain involved in learning, but most of the neural circuits are outbound.

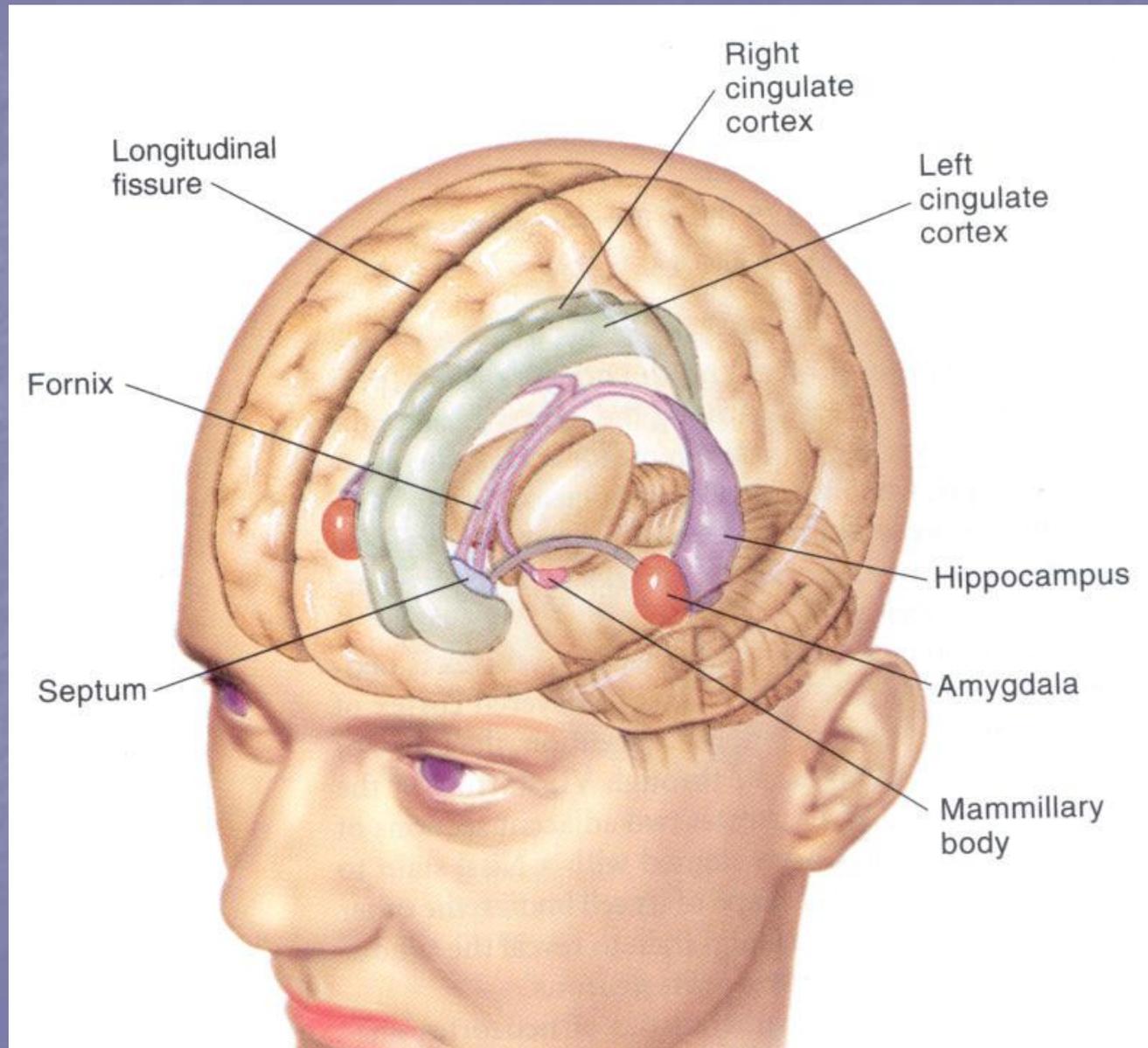
**Movement and Learning are NOT enemies –
they go “hand in brain”**

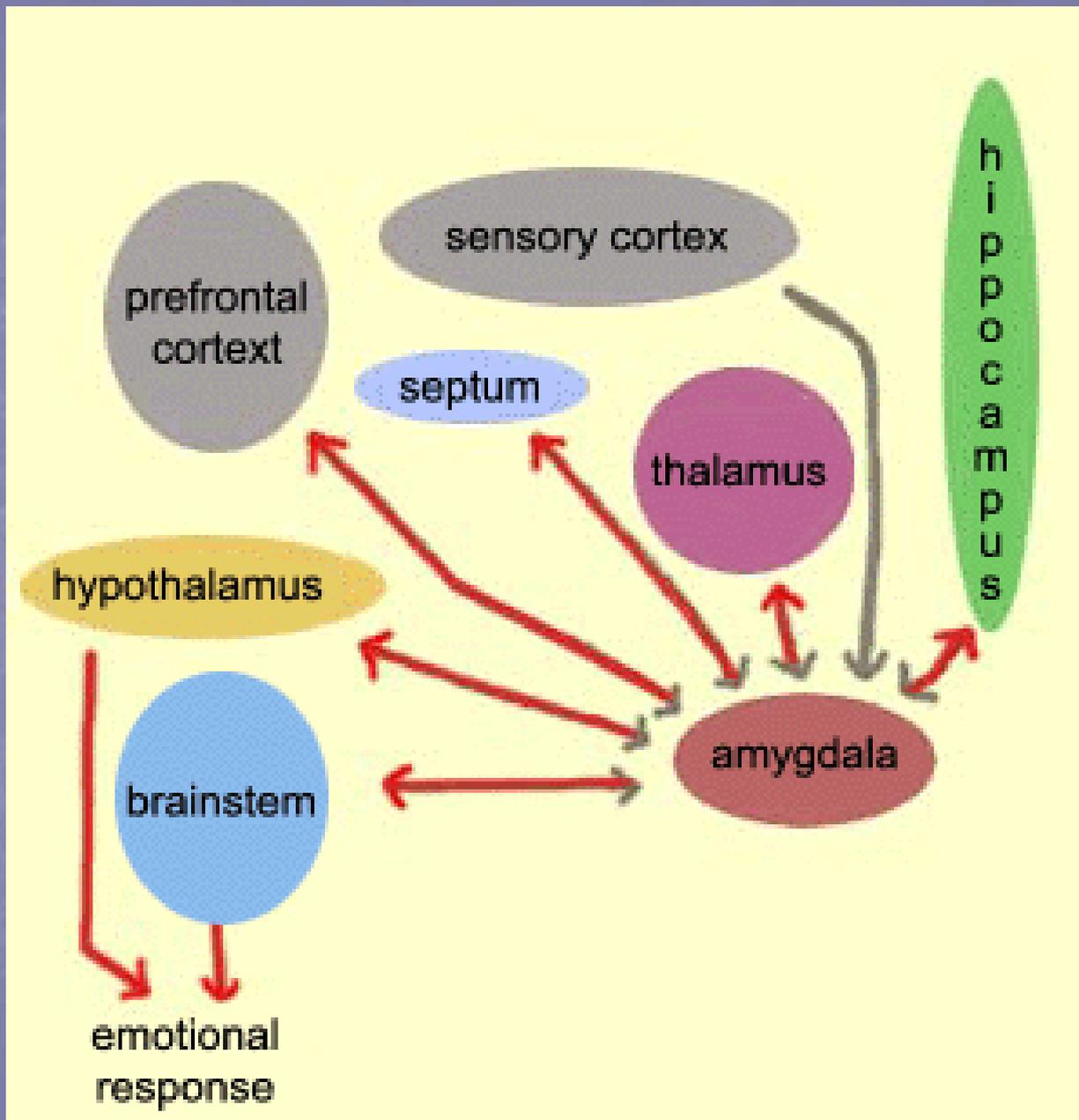


Joy is Good for the Brain



Emotion Centers of the Brain





Joy is Good for the Brain

...“Men are that they might have joy”
(2 Nephi 2:25) especially when it’s time to
learn!

Attitude Determines Altitude

Intrinsic Rewards

internally motivated by interest in the task

VS.

Extrinsic Rewards

motivated by anticipation of a reward
separate from the task

Love is Good for the Brain

A new commandment I give unto you, that ye love one another (John 13:34)

Love is manifested by attention, and the more you love someone and are anxious for their welfare, the closer you will pay attention to them.

“Follow the Child”

Lev Vygotsky's “Zone of Proximal Development”

- ZPD is the difference between what a learner can do *without help* and what he or she can do *with help*.
- Each of us has a ZPD for practically everything, but kids cannot articulate that.
- A child must be observed closely if you wish to find out exactly where his ZPD is for each academic skill.

Discovery Learning

- Instead of direct instruction, the teacher offers intriguing questions and provides some materials to experiment with.
- The questions/activities need to be within the child's ZPD, so that his brain can begin to work toward an answer.
- Short term less progress, long term greater retention and motivation to continue.
- Common Core state learning standards will attempt to implement this great idea in the schools (good luck to them).

The question of how the ebb and flow of a highly developed mind can be catered to by a physical brain, and the related question of how the one impacts the other, are the hardest-ever challenges to human ingenuity and imagination.

Susan Greenfield (from *The Private Life of the Brain*, 2000)