

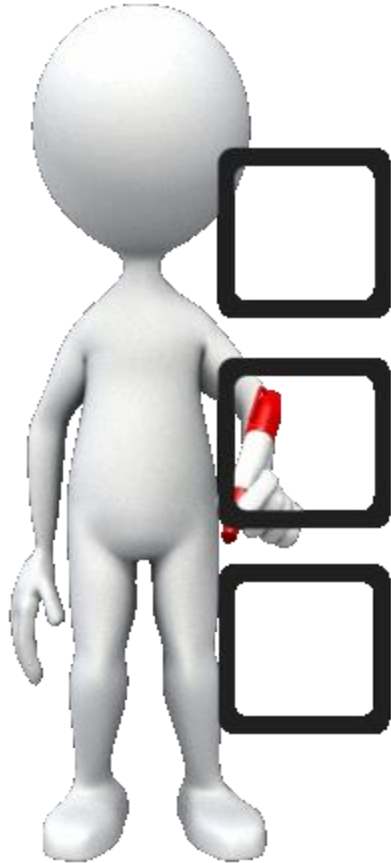
Strengths of the Young Female Brain

*How a Girl Can Accelerate her Learning of
Math and Science in School*

Nathalie Gosset, BSEE, MS, MBA

Alfred E. Mann Institute for Biomedical Engineering
at the University of Southern California

GOSSET@USC.EDU



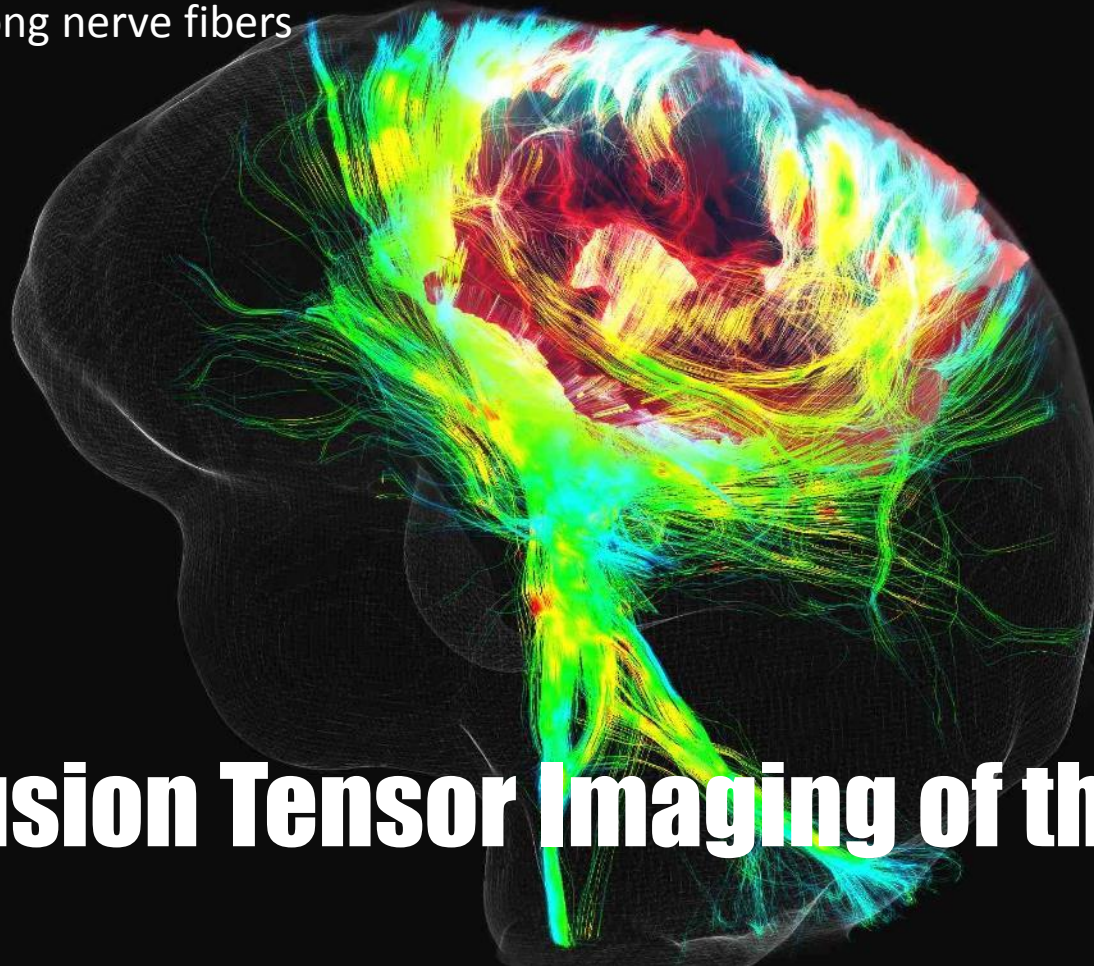
SCIENTIFIC RESEARCH

PEER REVIEWED

APPLIED

New revolution in brain
imaging brings fresh
information

magnetic resonance imaging that measures restricted diffusion of water that moves along nerve fibers



Diffusion Tensor Imaging of the Brain

Source: The Human Connectome Project

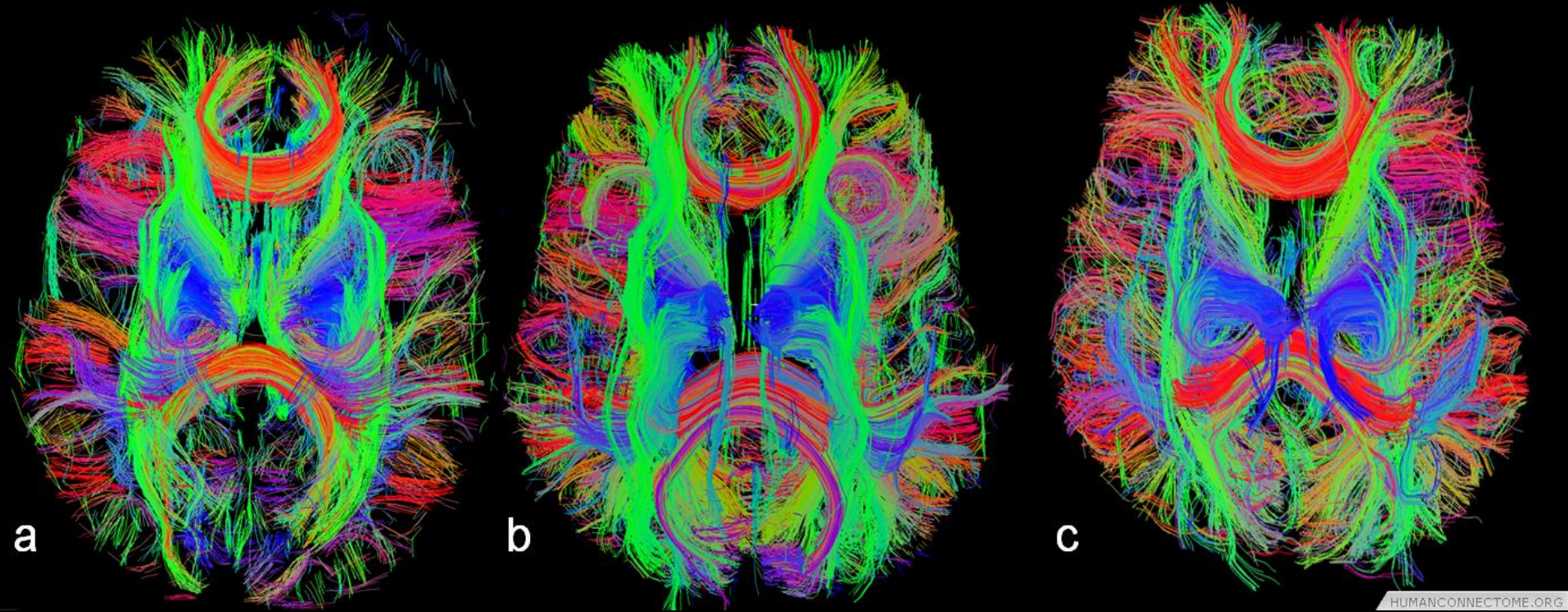


Source: *The Human Connectome Project*

25.3 min

11.5 min

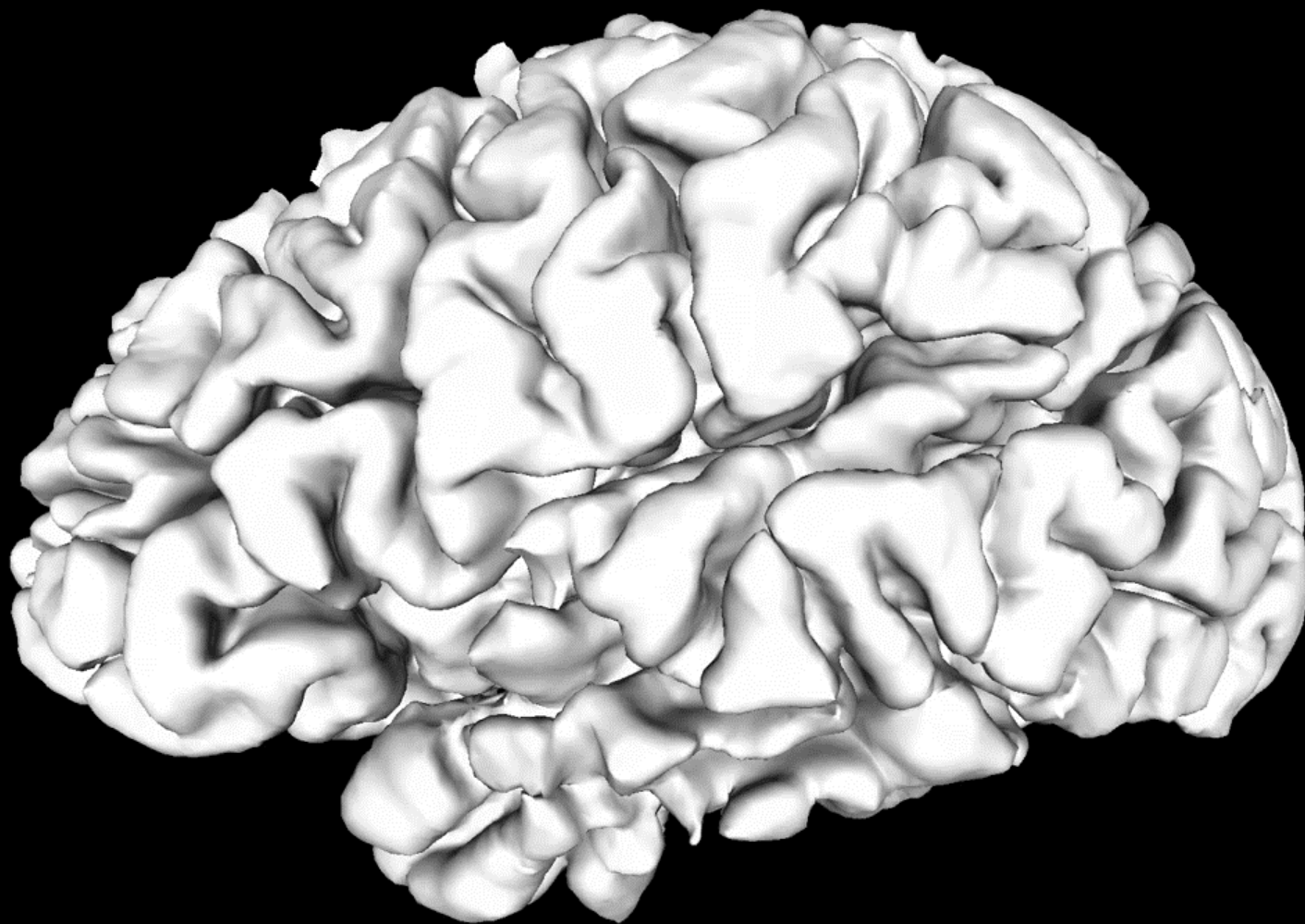
8.4 min



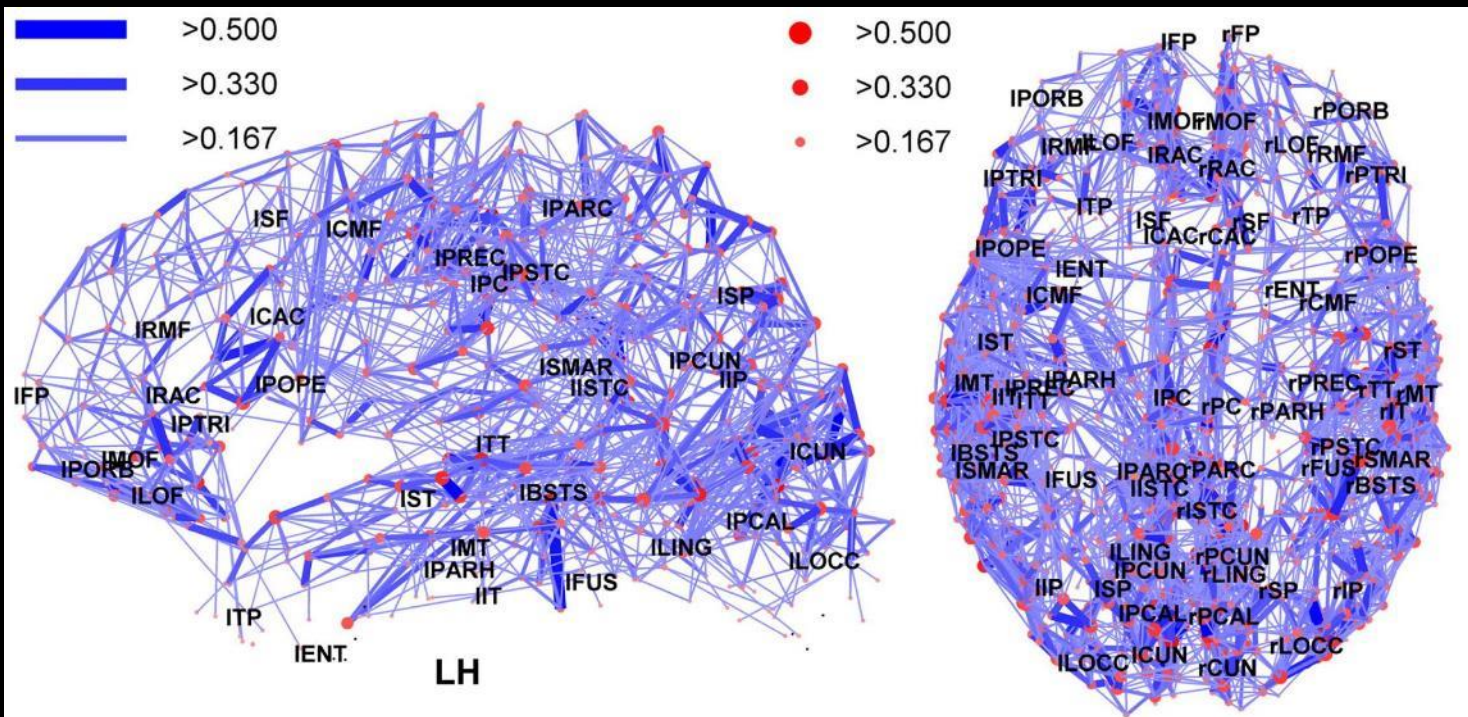
HUMANCONNECTOME.ORG

We use a lot more than 10% of our brain

Source: *The Human Connectome Project*



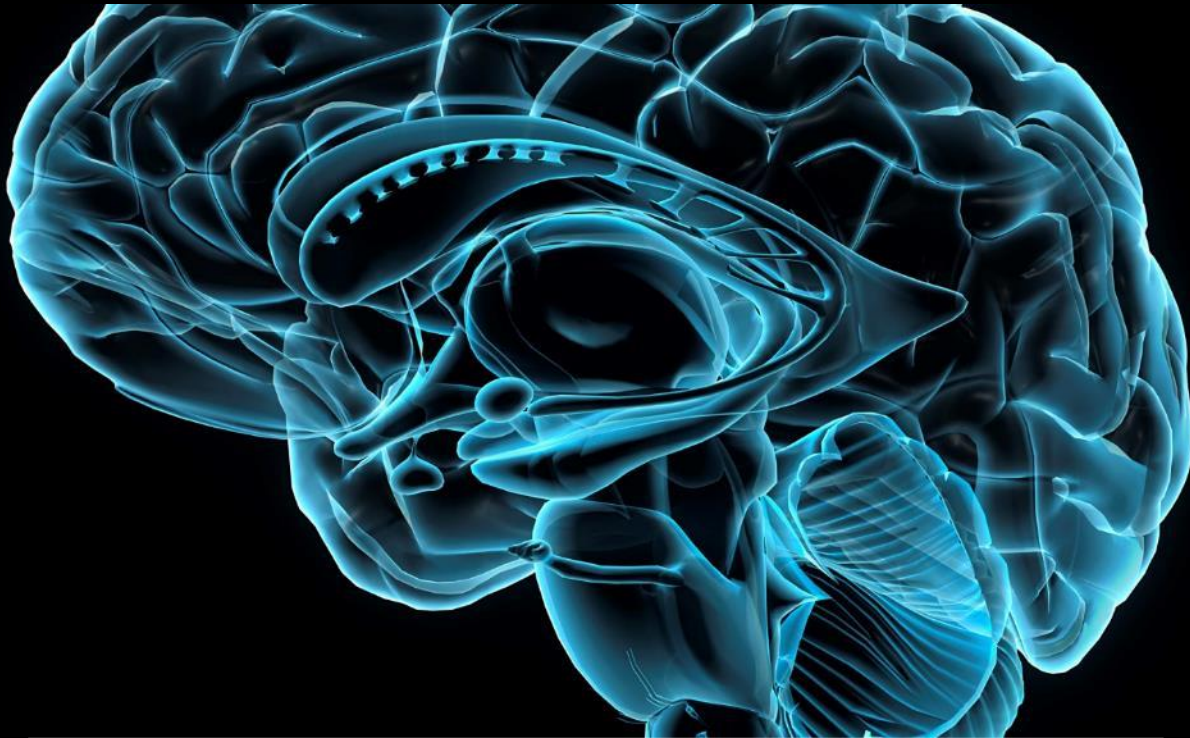
Inside the Connectome



Brain Connectivity Maps

We are starting to answer
some of the big questions

DO WE USE ONLY 10% OF OUR BRAIN?



10% LOADED

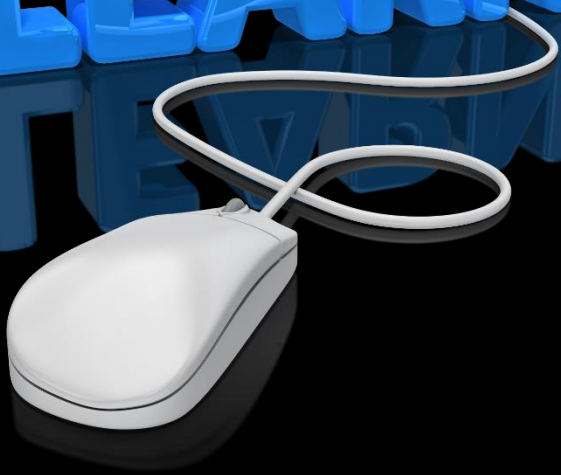
ERROR: UNABLE TO LOAD MORE

NO

**CAN WE ACCELERATE
LEARNING?**

**Such as
STEM Education**

LEARN



YES

IS THERE A RECIPE TO BRAIN LONGEVITY



ERROR: TUNE UP NEEDED

YES



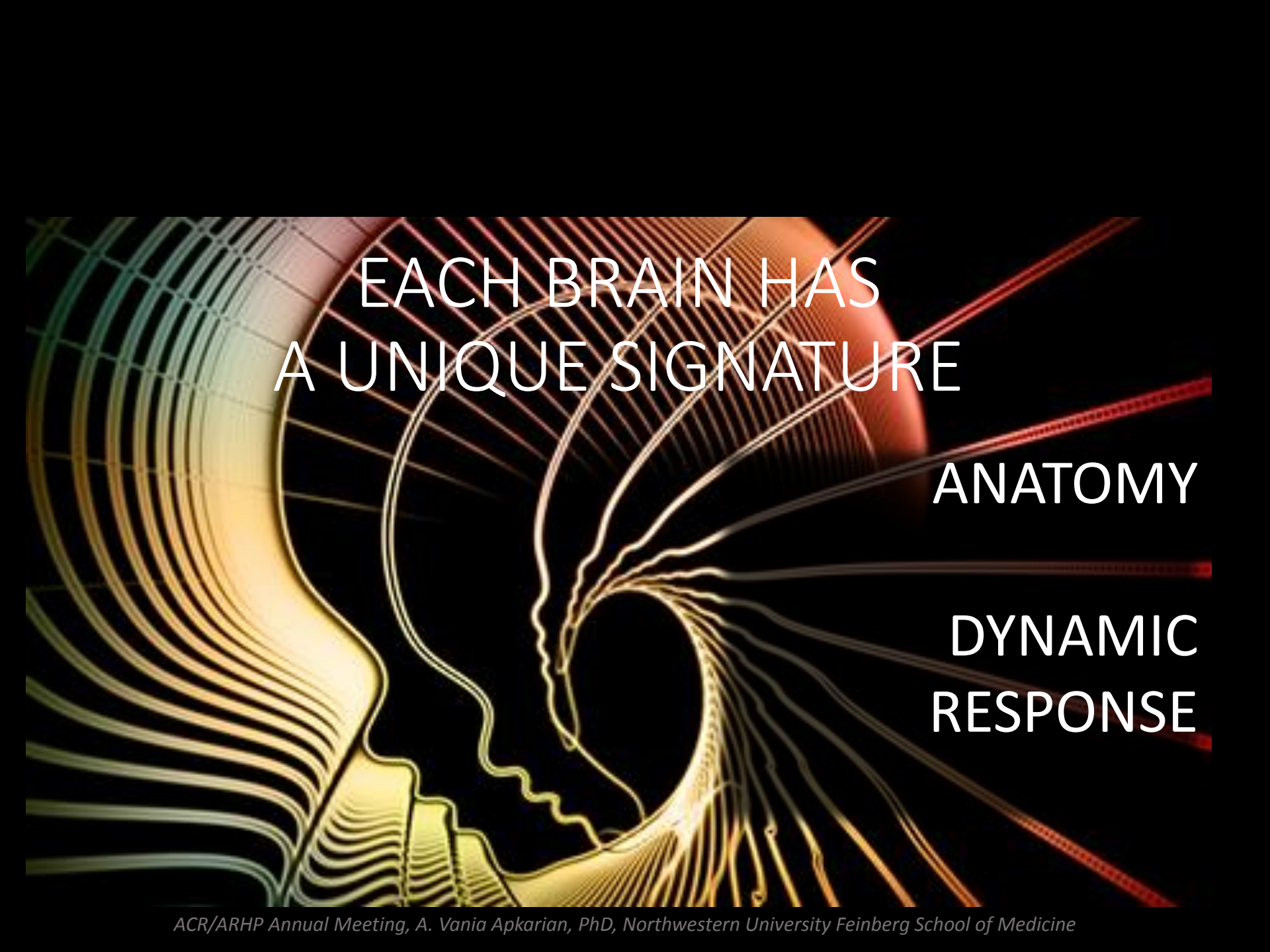
IS THERE A GENDER ADVANTAGE ?

YES



**NEURO INSPIRED
LEADERSHIP?**

YES



EACH BRAIN HAS A UNIQUE SIGNATURE

ANATOMY

DYNAMIC
RESPONSE

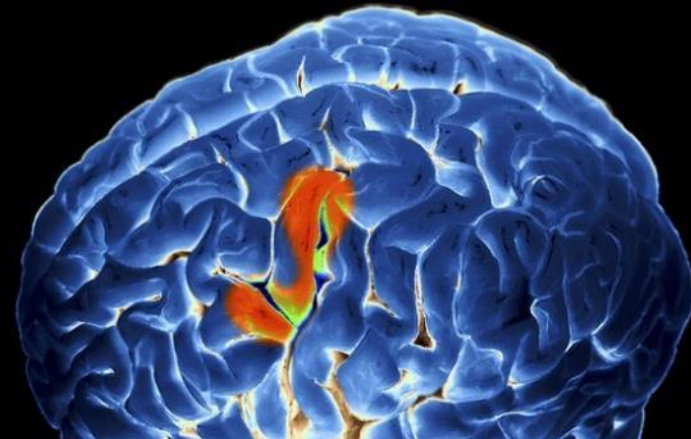
THE BRAIN IS MOST BUSY WHEN WE SLEEP

DURING SLEEP

during the slow oscillations of slow-wave sleep



WHEN AWAKE



SPL

ONE MEMORY IS STORED IN THOUSANDS OF PLACES





FEELINGS ENABLE BEST MEMORY STORAGE & RETRIEVAL

PHYSICAL SENSES DEEPEN THE GROOVE

1



2



3



4



5





ANATOMY
ACTIVITY
MATURITY
VULNERABILITY

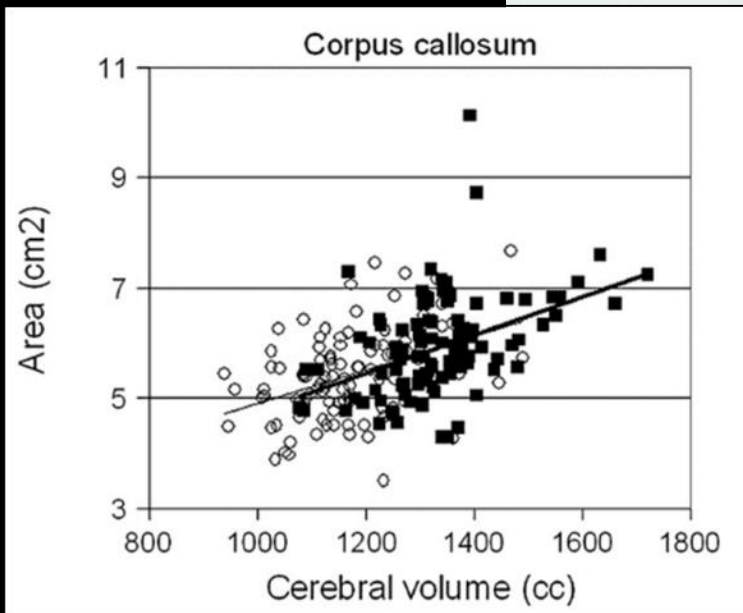


Striking Gender

Differences

*(Reported by Penn Medicine, Proceedings of
National Academy of Sciences, 2013)*

ANATOMY: MALE BRAIN IS LARGER

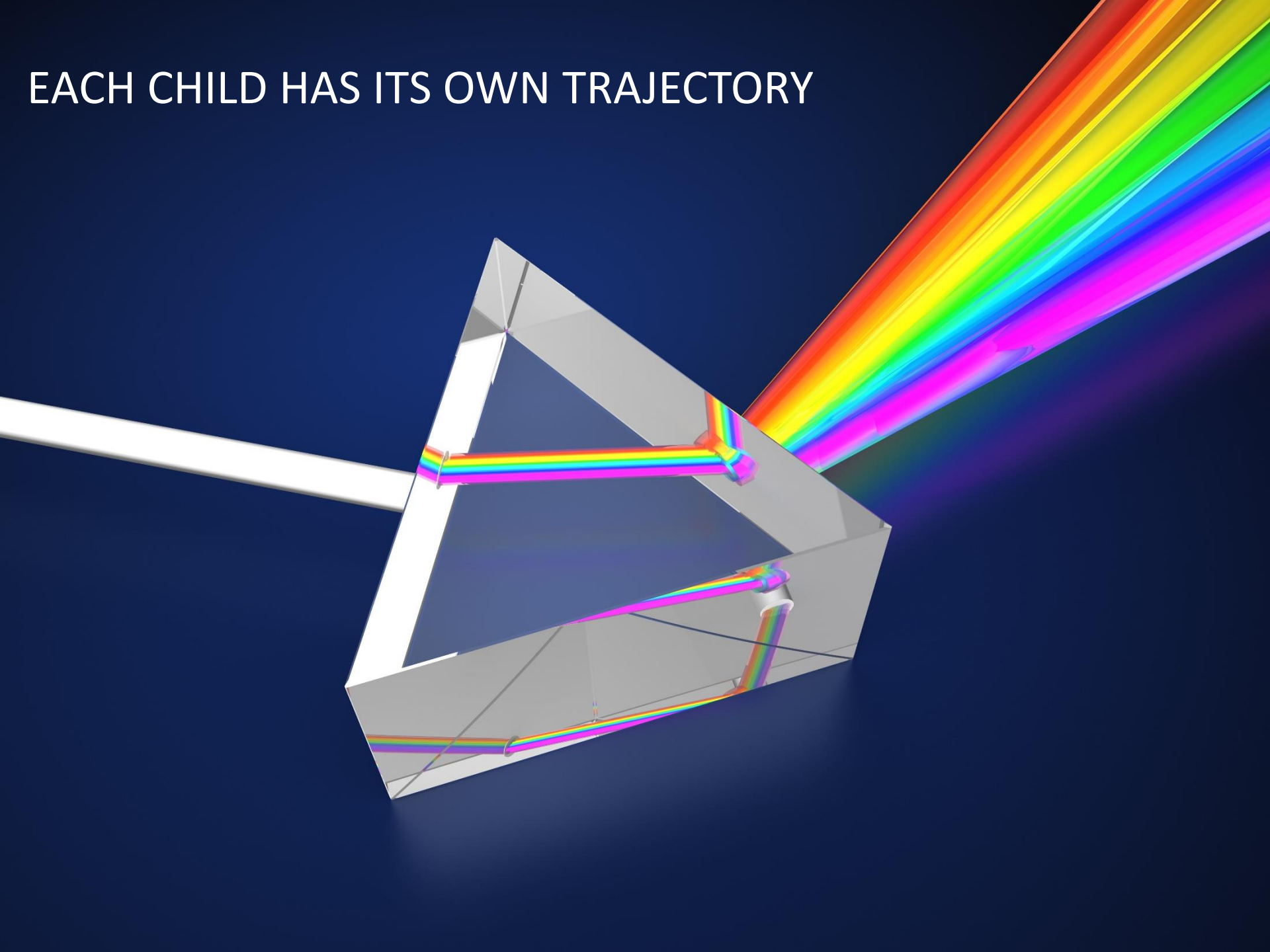


**AVERAGE IQ IS THE
SAME BETWEEN
GENDERS**

THE BRAIN OF THE YOUTH

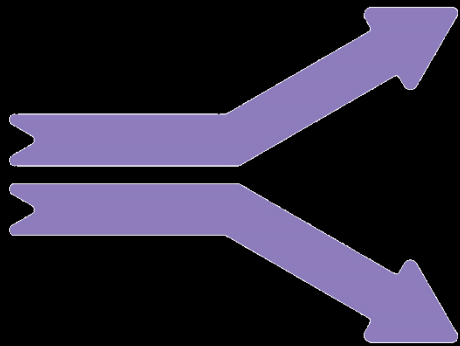


EACH CHILD HAS ITS OWN TRAJECTORY

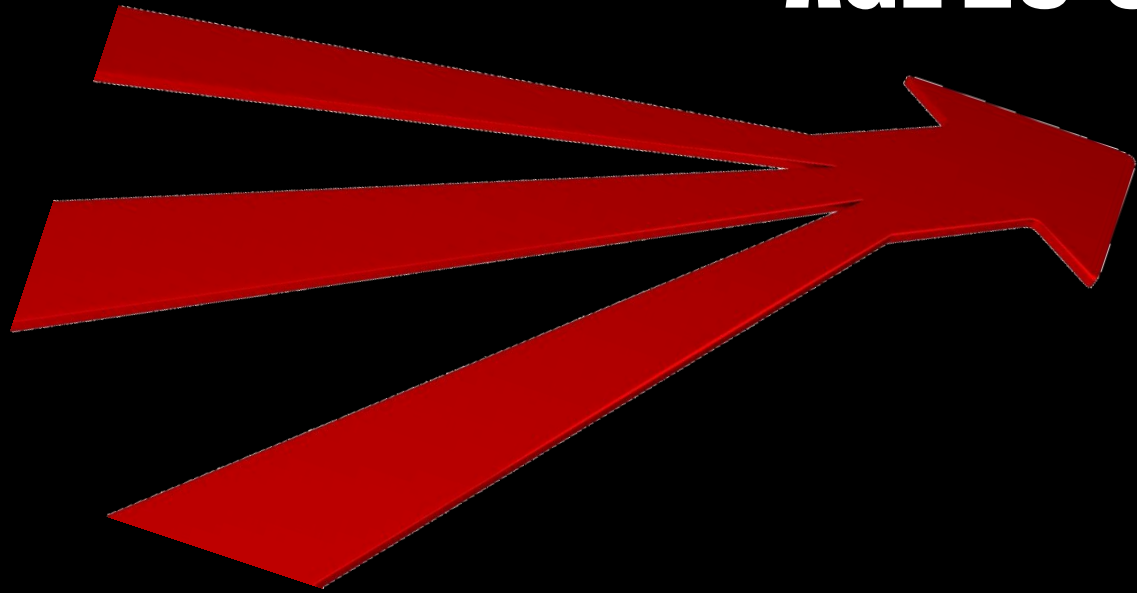


SAME ARRIVAL POINT - DIFFERENT LEARNING TRAJECTORIES FOR BOYS AND GIRLS

~ EARLY AGE



~ AGE 25-30





LEFT & RIGHT BRAINS



LEFT

LOGICAL
SEQUENTIAL
RATIONAL
ANALYTICAL
OBJECTIVE
LOOKS AT DETAILS



RIGHT

RANDOM
INTUITIVE
HOLISTIC
SYNTHESIZING
SUBJECTIVE
BIG PICTURE

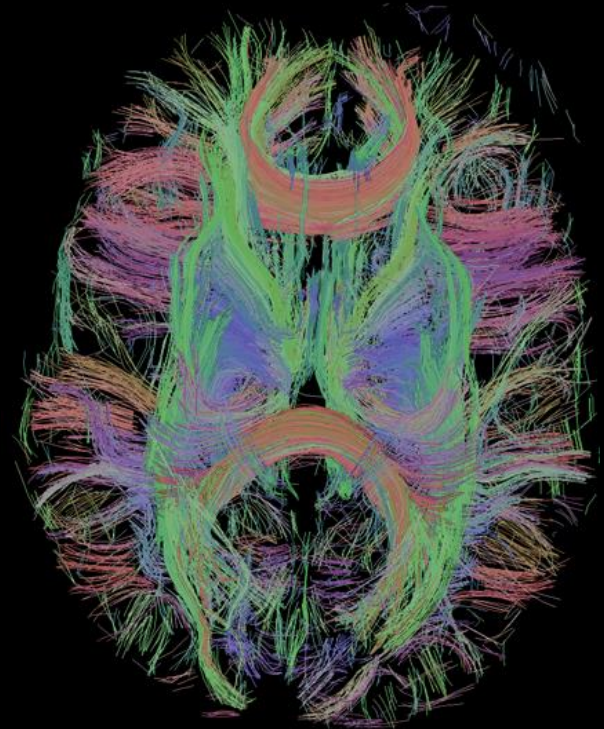
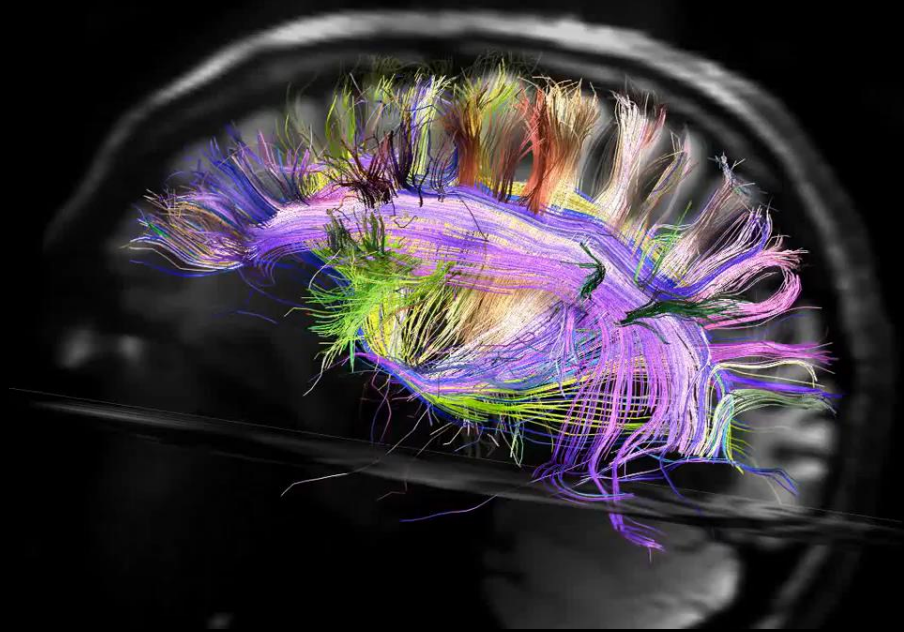
Differentiation established by American psycho-biologist Roger W Sperry, 1060's

EXPERT THINKING
MANAGEMENT

STRATEGIC THINKING
LEADERSHIP

Teen Female Brain

WIRED TO GO BACK AND FORTH LEFT-RIGHT EARLY IN LIFE



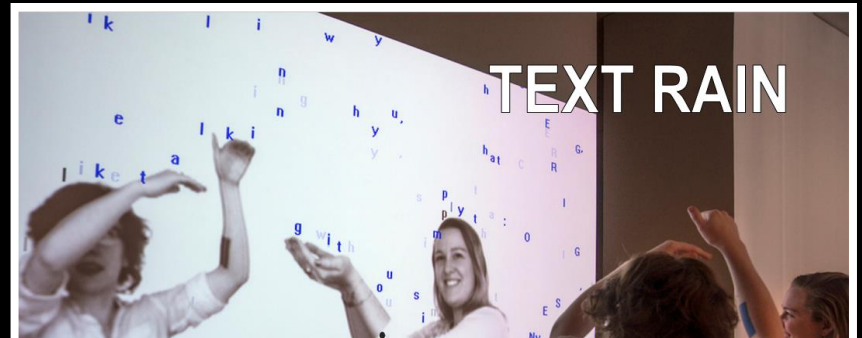
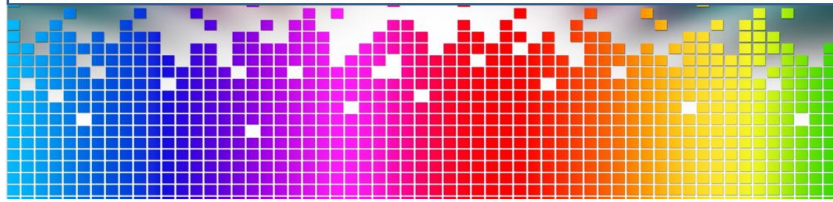
WIDER BRIDGE

360 CORRELATION OF DATA
ELOQUENCE
PERCEIVED MATURITY



Color The Beat

Teach your computer to recognize colors and trigger fun sounds with each color



TEXT RAIN

Teach your computer to interact with you – Catch raining letters and form words



GLOVING THE BEAT


Learn how to create a lighted glove



Learn how to create lighted clothes or objects

LIGHTED WEARABLES

Teen Female Brain has an accelerator for learning



Mirror Neurons

EMOTION READER
GREATER EMPATHY

ACCELERATOR
OBSERVE → THEN DUPLICATE

Teen Female Brain Understands Consequences Earlier

FRONT
DEVELOPS FASTER

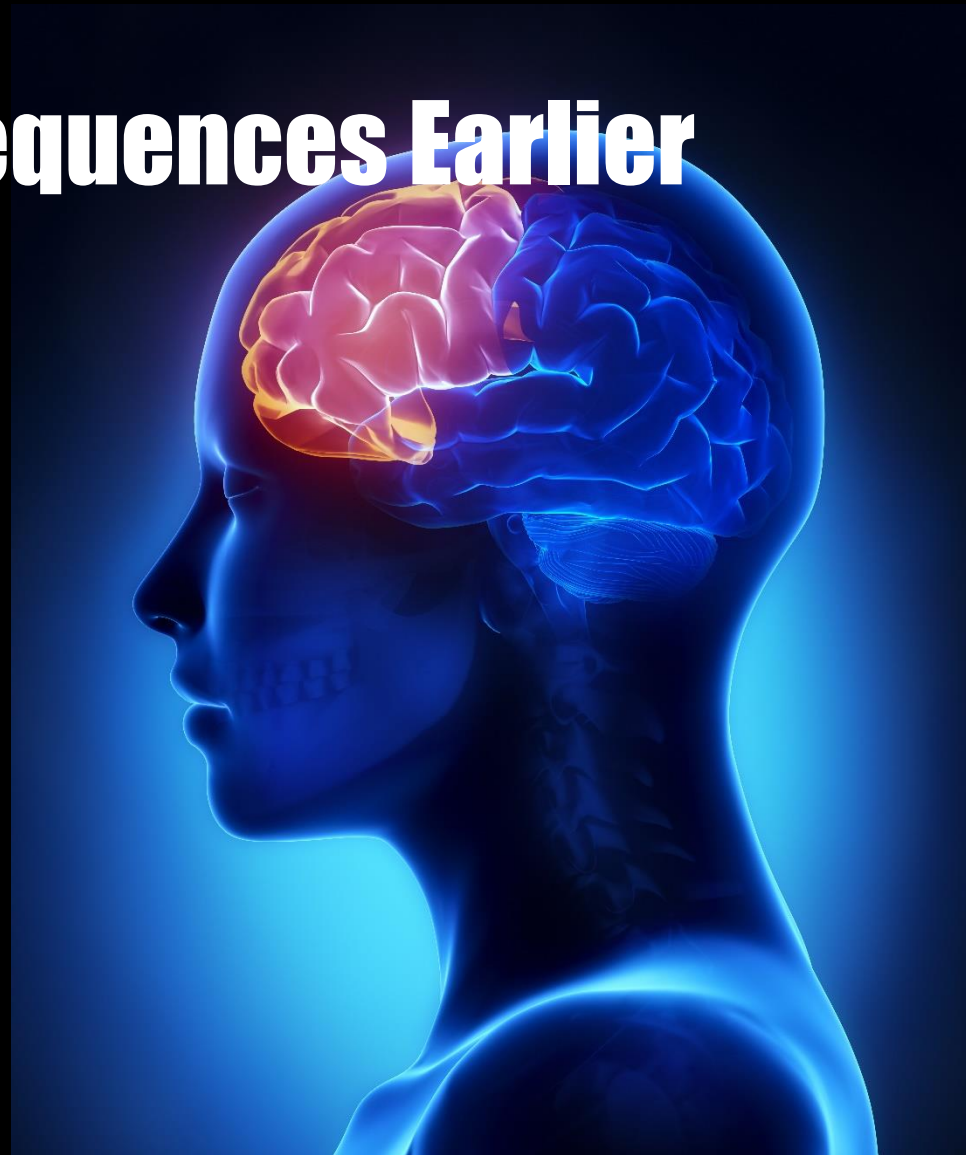
ADVANCED SKILLS

ELOQUENCE

MATURITY

CONTROL

STRATEGIC



Teen Male Brain

Has Visual-Spatial Intuition Earlier



THE BACK

DEVELOPS FASTER

VISUAL-SPATIAL

ADVANCED SKILLS IN

LOGICAL

RATIONAL MATTERS

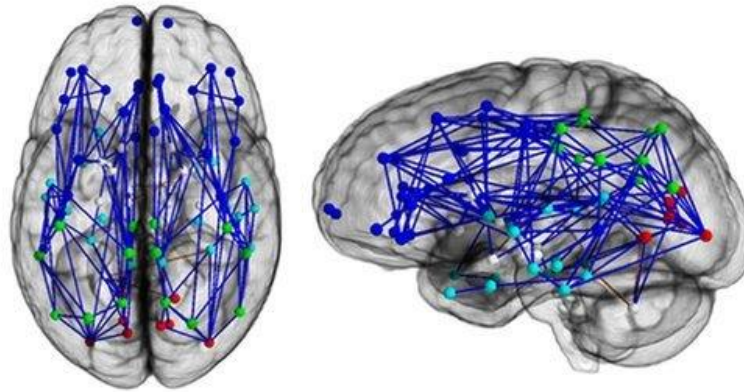
Larry Cahill , UC Irvine, 2014

Daniel Amen, MD, Amen Clinic, 2011

Teen Male Brain

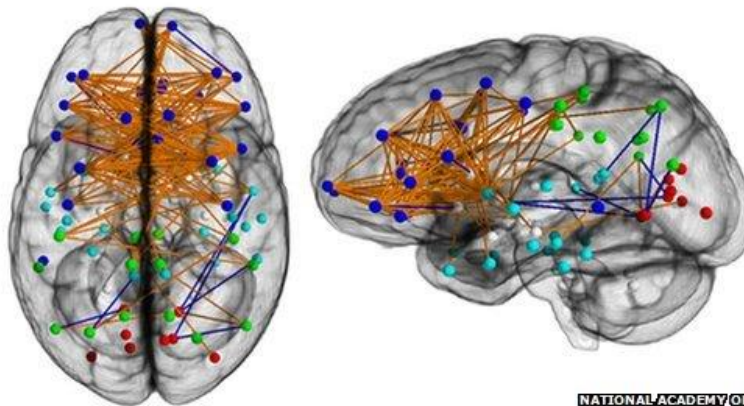
DEEPENS LEARNING WITHIN AN HEMISPHERE

BOY



VISUAL-SPATIAL

GIRL



CAUSE & EFFECT

NATIONAL ACADEMY OF SCIENCES

Male and Female Connectomes
Source: National Academy of Sciences

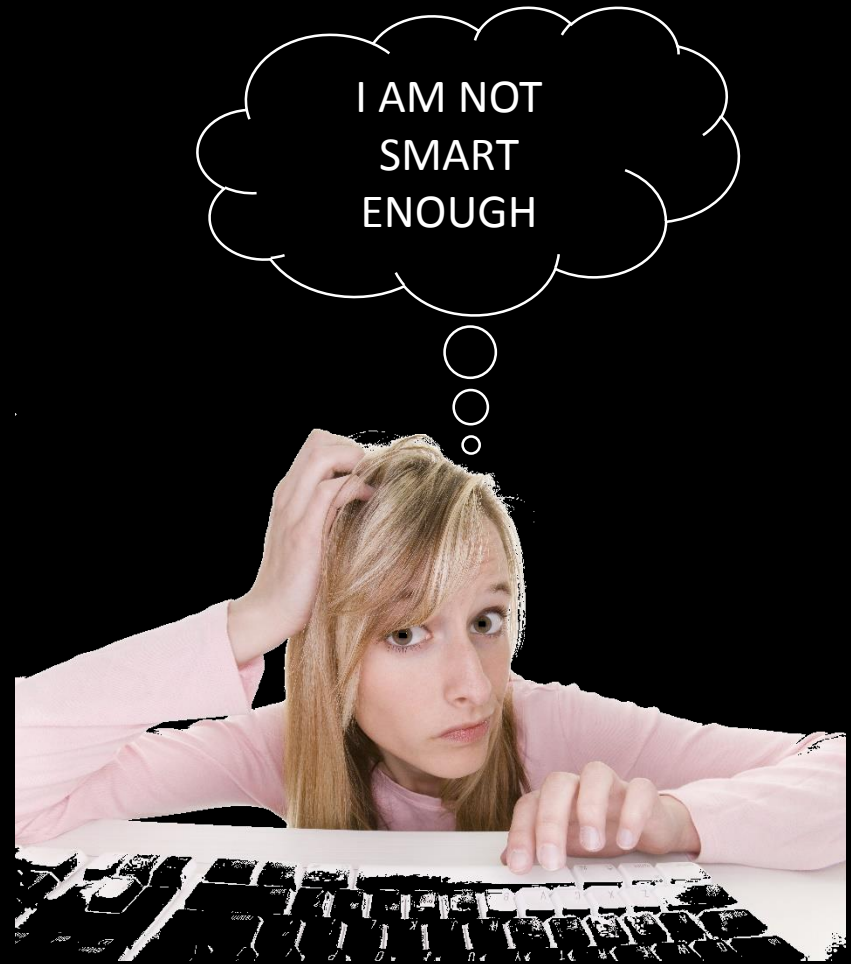
THE FEMALE NEURO ADVANTAGE

READY FOR **STRATEGIC THINKING** AND
LEADERSHIP ~ 4 YEARS EARLIER THAN BOYS.

→ INTRODUCE STRATEGIC THINKING,
CORRELATIVE ANALYSIS AND **LEADERSHIP** TO
GIRLS MUCH EARLIER

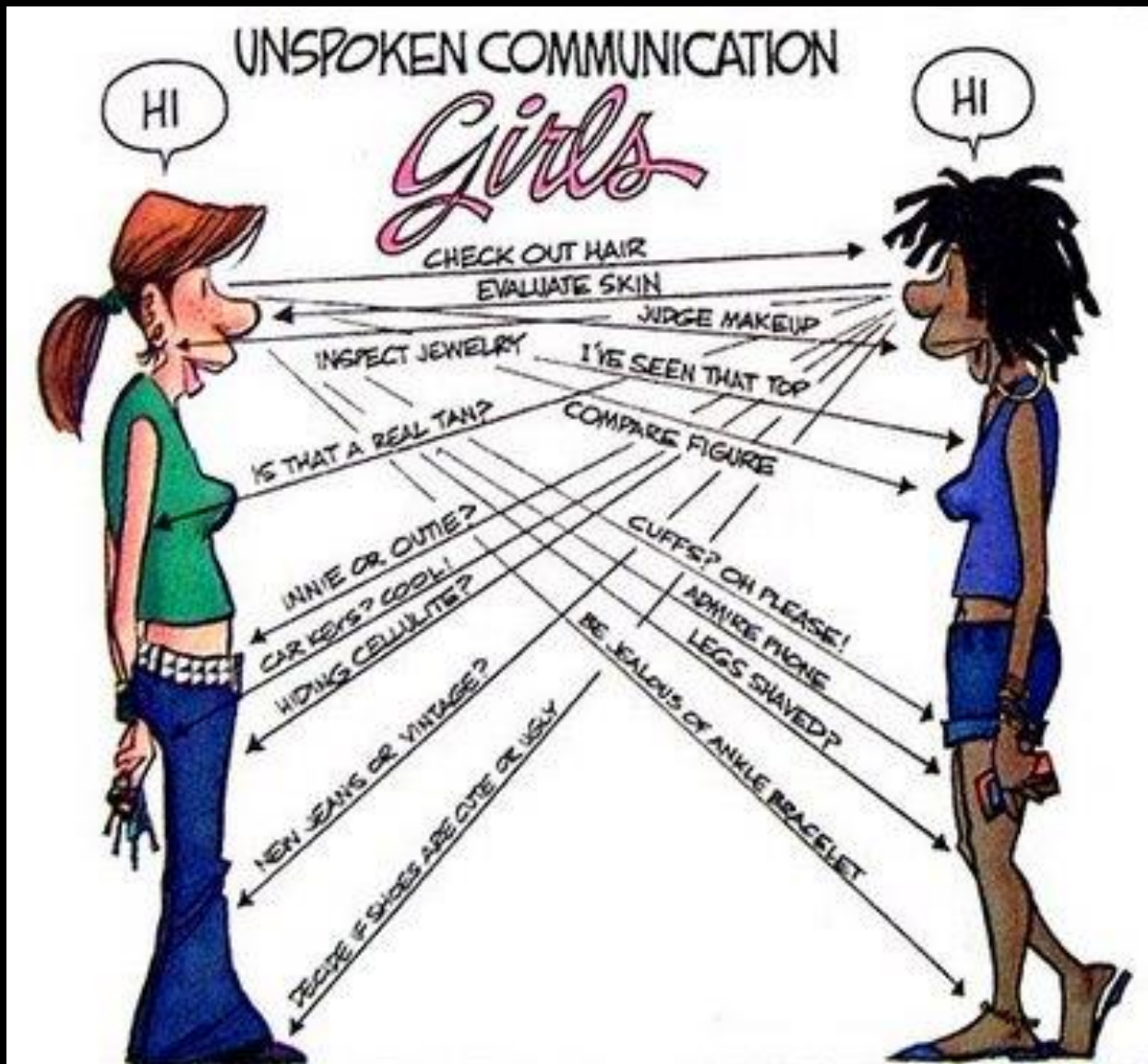
→ INTRODUCE SPACIAL CONCEPTS AND MATH
THROUGH RIGHT BRAIN EXPERIENCES

WATCH FOR TRANSITIONS - Early Teens



HORMONES CAUSE DROP IN SELF ESTEEM

NEURAL TRAFFIC ACROSS THE BRIDGE

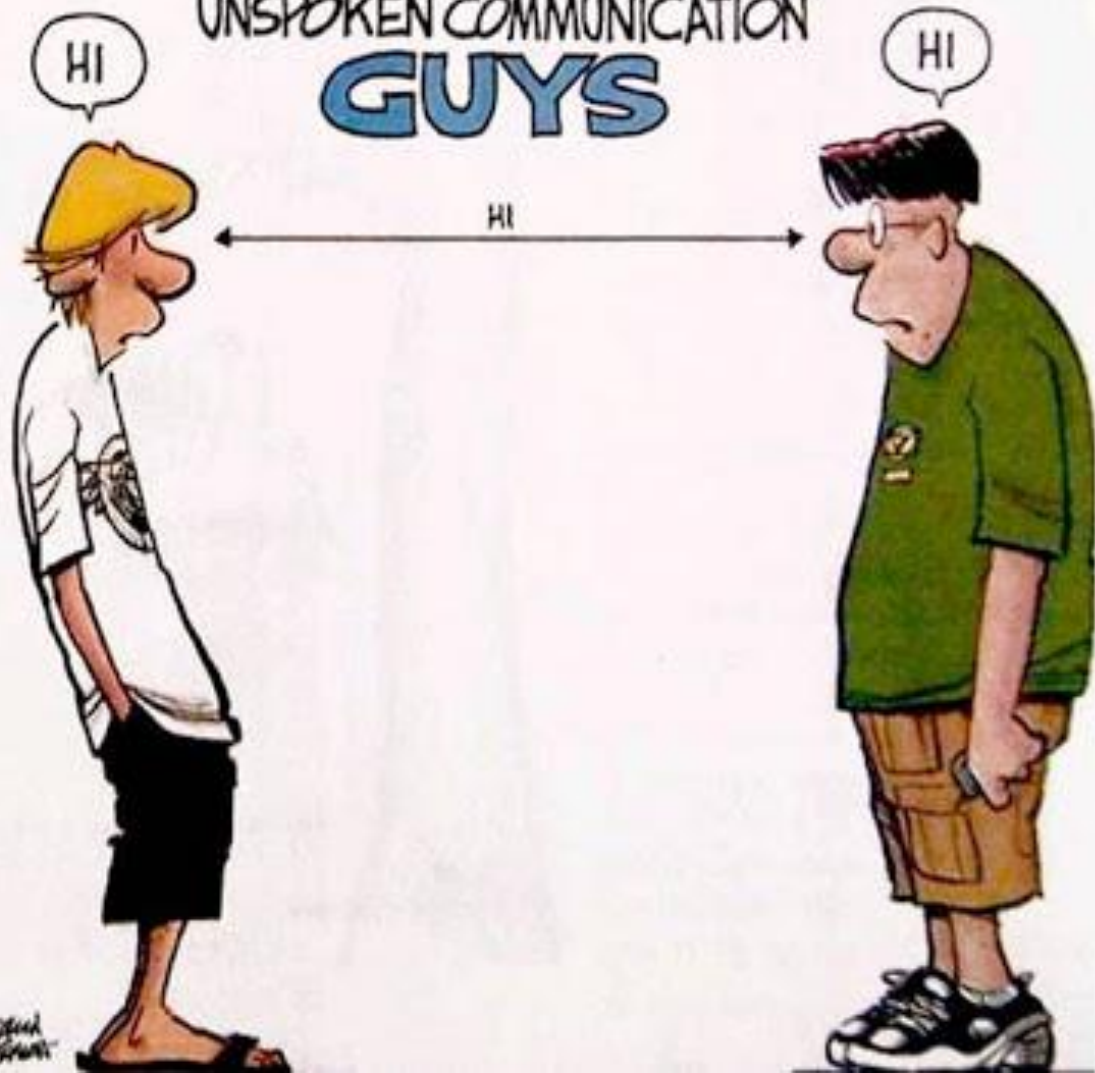


my mom IS TRYING TO

RUIN my LIFE



UNSPOKEN COMMUNICATION GUYS



©2008 2173 Paramount. Created by King Features Syndicate

Scott and Bob

My Observations



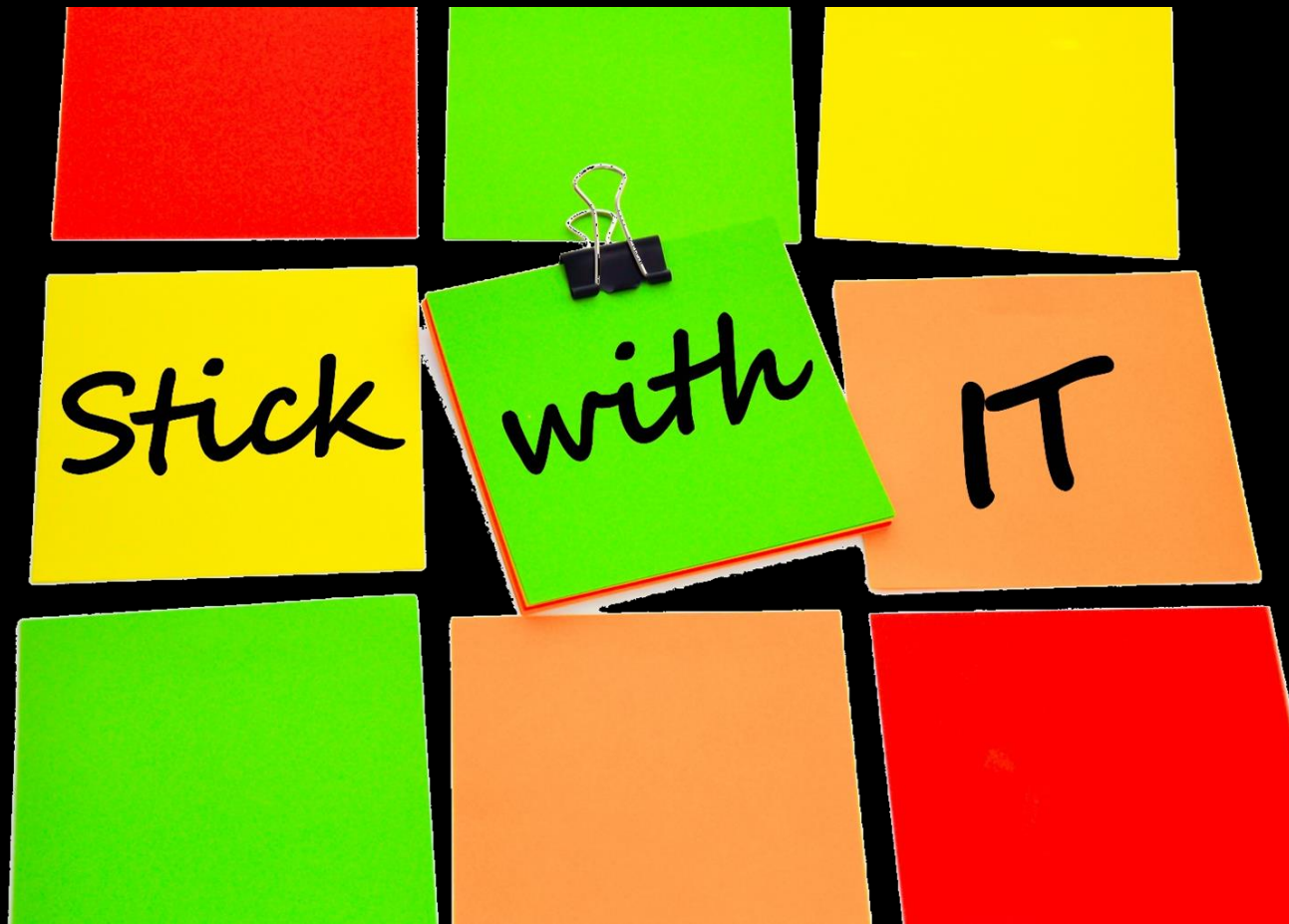
IN FEMALE TEENS LACK OF CONFIDENCE
CAN DERAIL EDUCATION TRAJECTORY



ONE-SIZE-FITS ALL EDUCATION IS NOT
EFFICIENT and NEGATES OPPORTUNITIES
TO ACCELERATE STEM EDUCATION

WE FAIL STUDENTS BECAUSE WE IGNORE
THE CURVES OF BRAIN MATURITY

WE NEED TO SHOW STUDENTS HOW TO DEVELOP STAMINA



BEYOND AGE 25-30

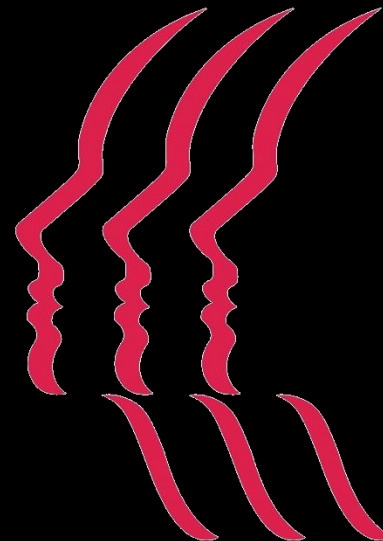


2Q DEEP DIVE
LOGIC / RATIONAL
THINKING



VISUAL-SPATIAL
STRENGTH

4Q BROAD THINKING
LEFT \leftrightarrow RIGHT
HIGH TRAFFIC



HIGH VOLUME OF
MIRROR NEURONS

DEEPEN MEMORY RETENTION



INVOLVE FEELINGS AND
TRIGGER EMOTIONS



TURN THE LESSON INTO
A SENSORIAL EXPERIENCE

MIT Sensory Lab

ACCELERATED **STEM LEARNING** IN SCHOOL



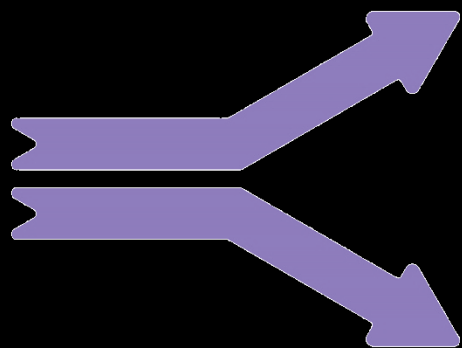
MODEL THE EXPERIENCE
FOR THE GIRLS - TEACH STEM AS
STRATEGIES



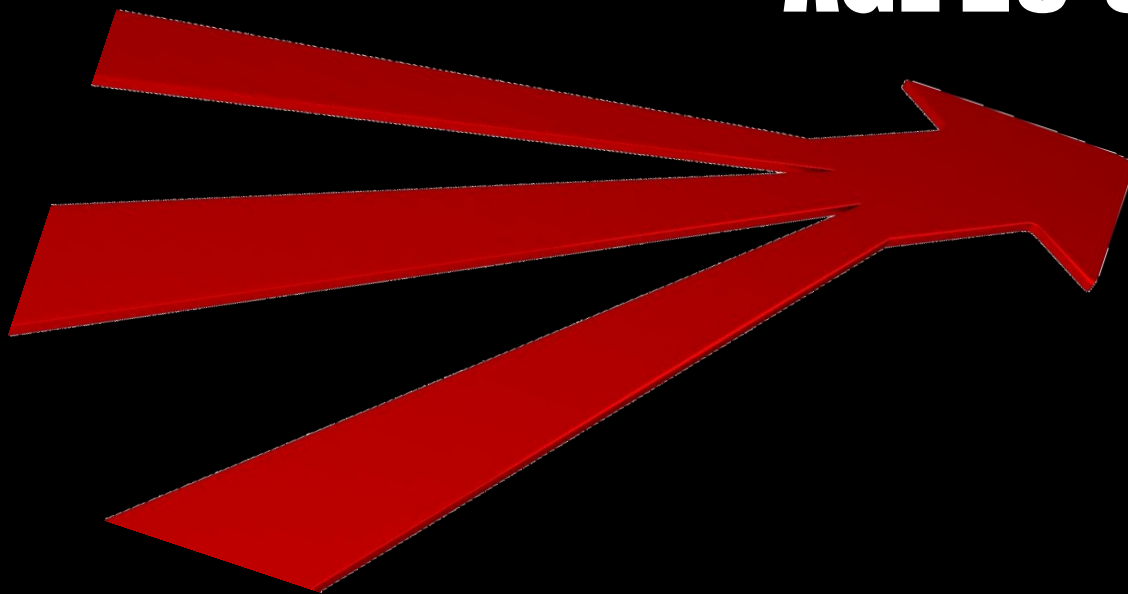
LET BOYS **PLAN** AND **LIVE**
THE EXPERIENCE - TEACH THROUGH
OBSERVATION

SAME ARRIVAL POINT

~ EARLY AGE



~ AGE 25-30



DID YOU KNOW?
EVERY BRAIN STARTS FEMALE

BOYS BECOME MALE
8 WEEKS AFTER
CONCEPTION



Ref: Louann Brizendine, MD, 2006