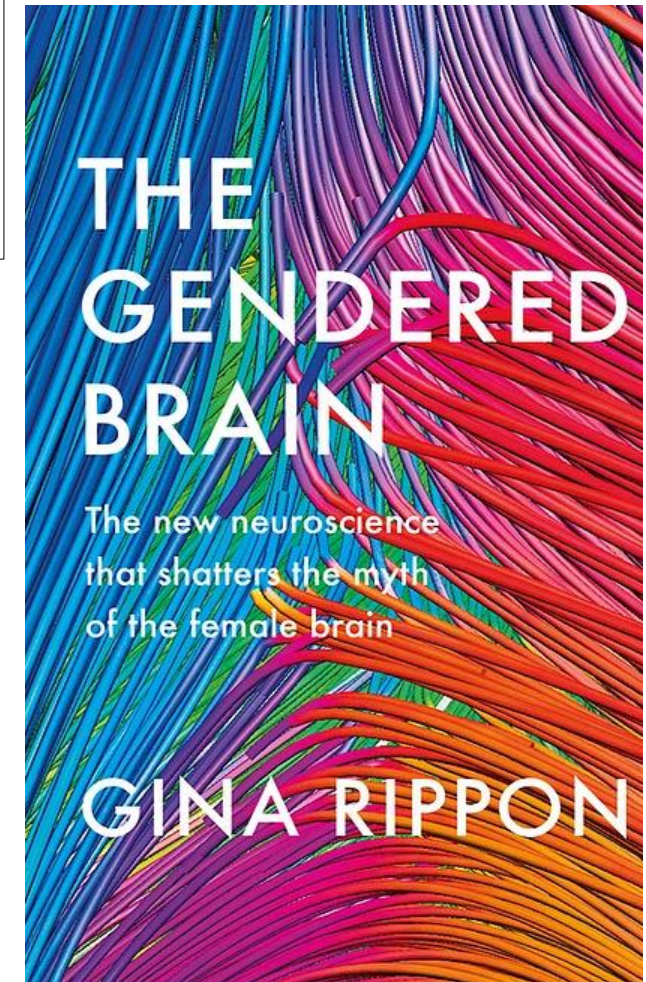


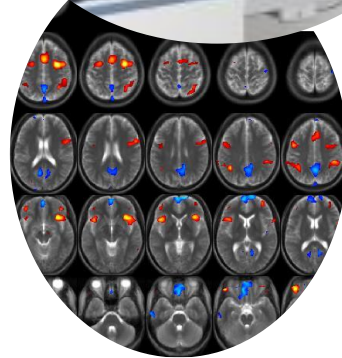
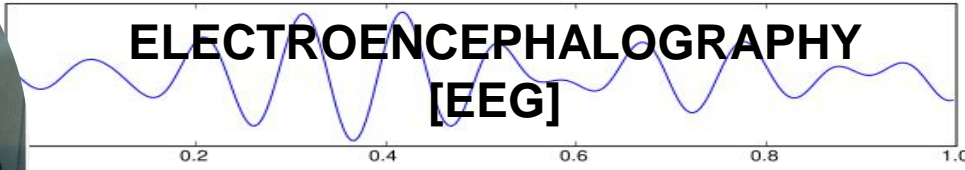


# THE GENDERED BRAIN WOMEN AND SCIENCE: WHY PLASTIC BRAINS AREN'T BREAKING THOUGH GLASS CEILINGS

Professor Gina  
Rippon,  
Aston Brain Centre,  
Aston University.

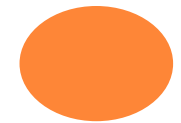
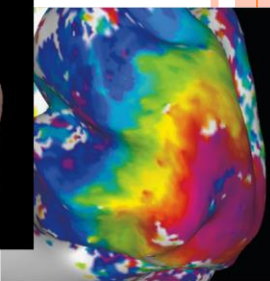
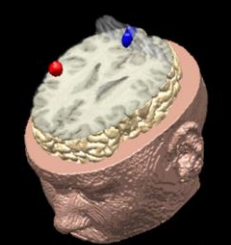
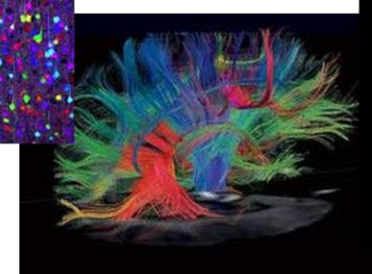
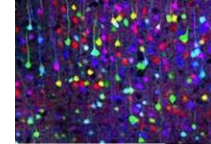
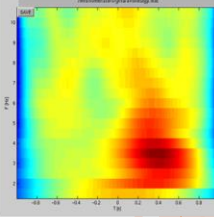
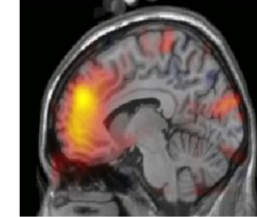
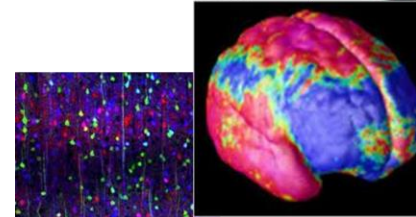
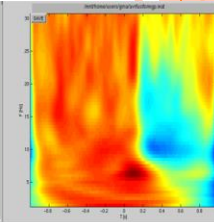
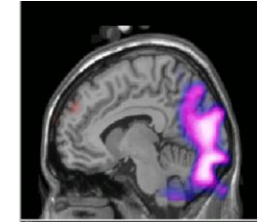
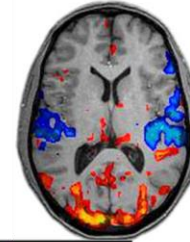
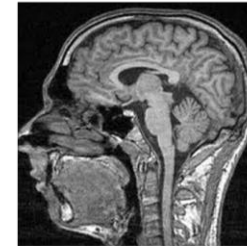


# ASTON BRAIN CENTRE

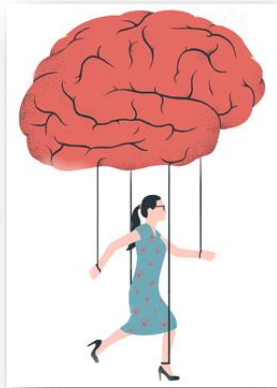
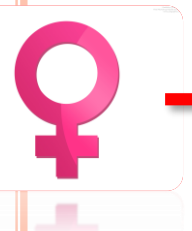


**MAGNETO-  
ENCEPHALOGRAPHY  
[MEG]**

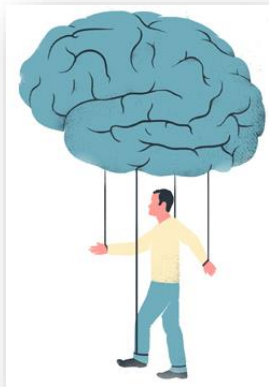
**FUNCTIONAL  
MAGNETIC  
RESONANCE IMAGING  
[fMRI]**



# TWO TYPES OF BODY = TWO TYPES OF BRAIN



**EMPATHY**



A	
B	
C	
D	



# YOUR BRAIN ON TRAMLINES ; FIXED, INEVITABLE, INVARIANT.



# THE BIG QUESTIONS: SEX DIFFERENCES IN THE BRAIN

## ○ Are there any?

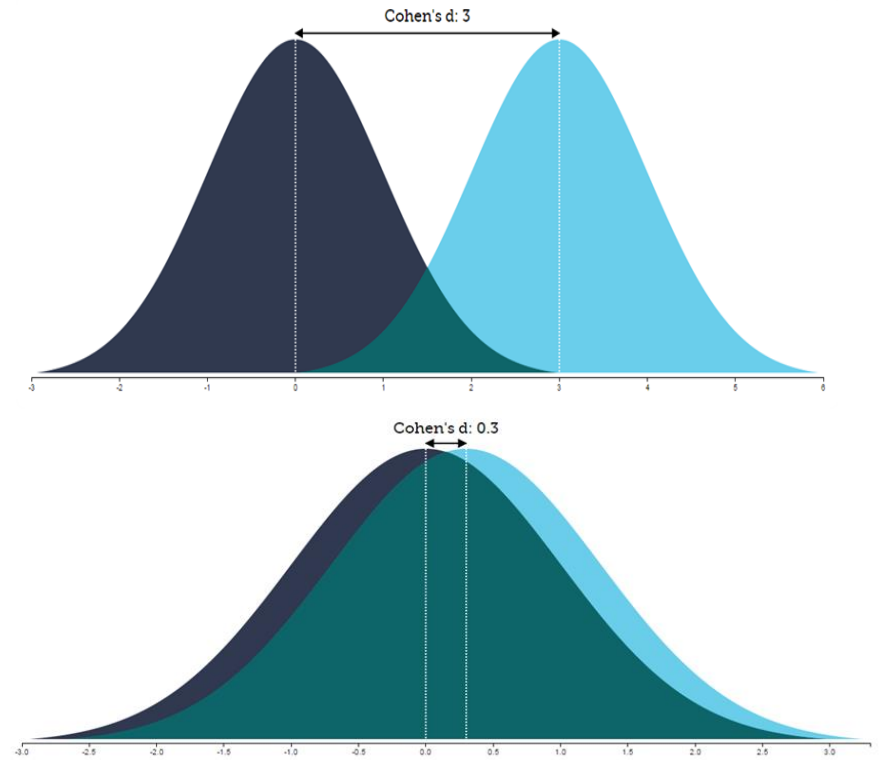
- Pink, Blue or Fifty Shades of Grey Matter?
- The Female Brain and The Male Brain

## ○ Where Do They Come From?

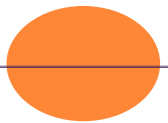
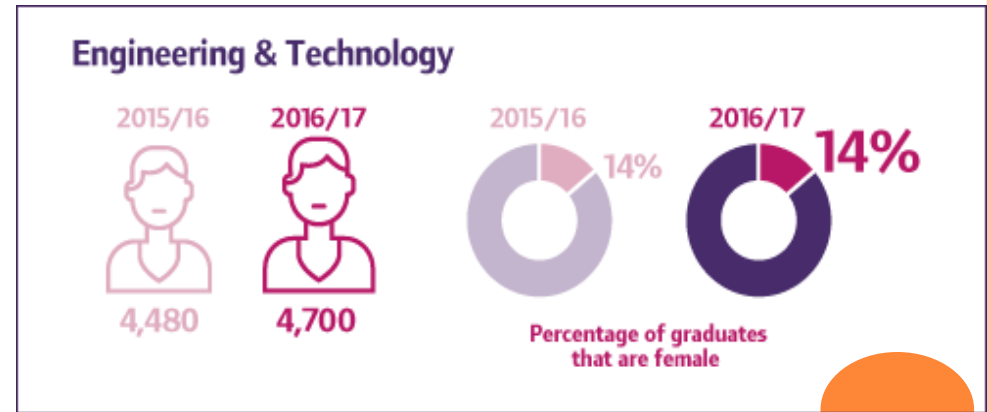
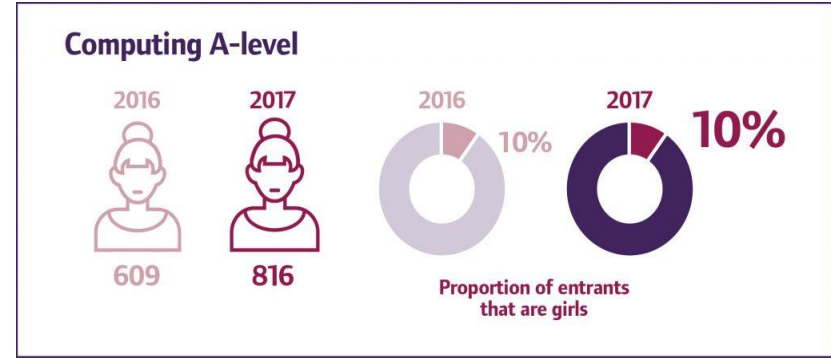
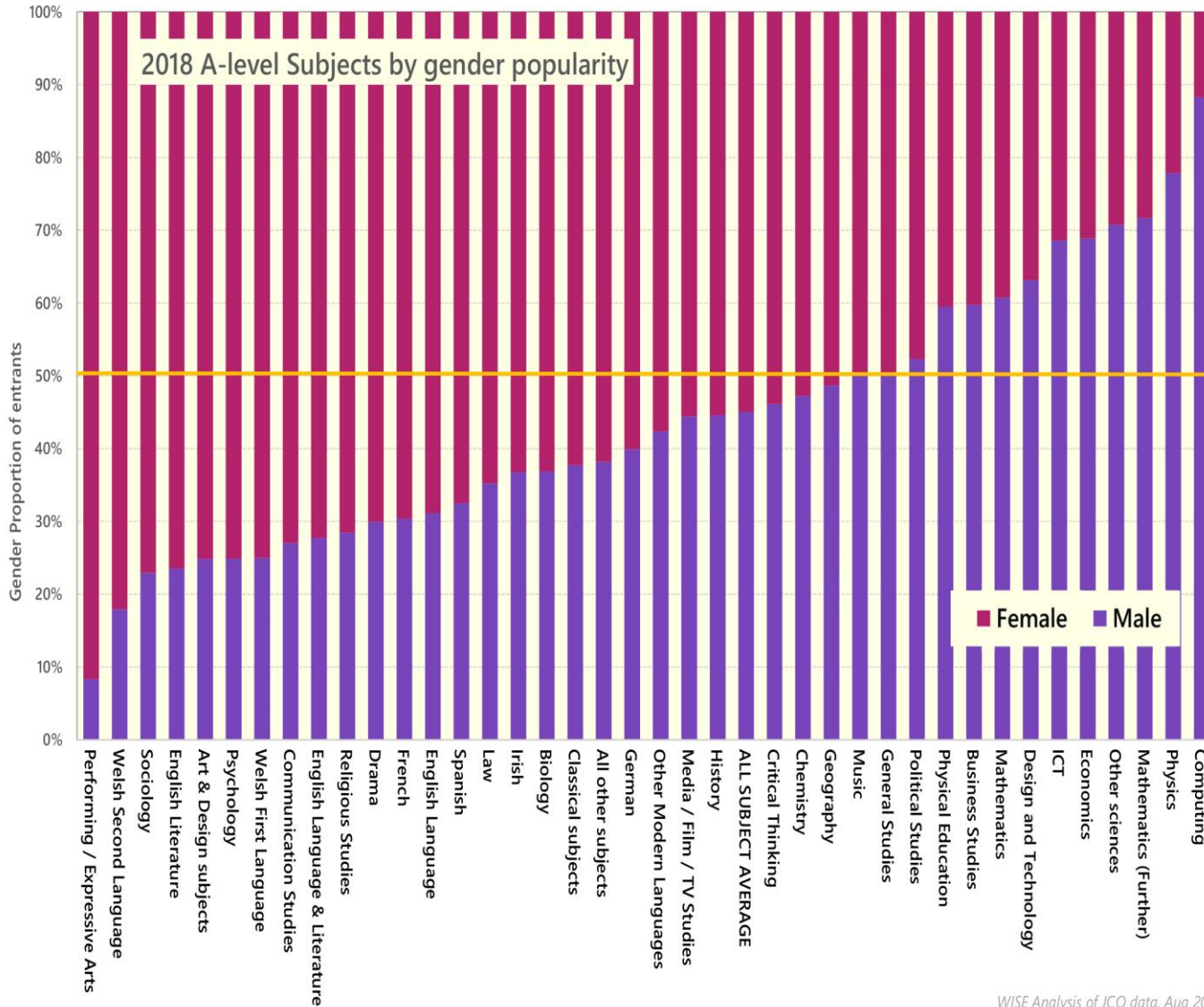
- “Nature” or “Nurture?”
- “All culture and no biology”?

## ○ What do they mean for the brains' owners?

- Empathising or Systemising? Mars or Venus? People or Things? MapReading or MultiTasking?
- **Gender Gaps**

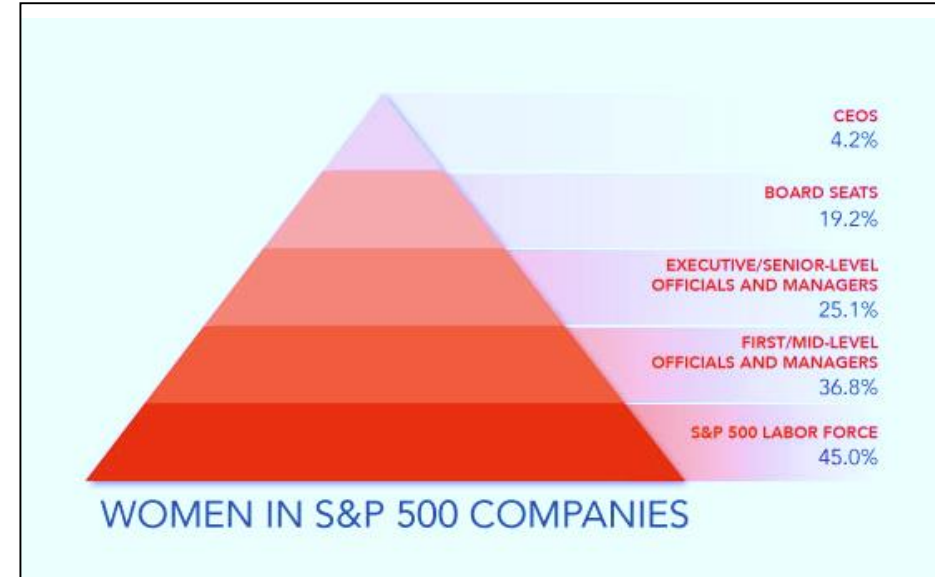


# A WORLD OF GENDER GAPS



# A WORLD OF GENDER GAPS

- **700,000** – additional STEM technicians needed to meet employer demand in decade to 2024.
- **28.8%** - global science researchers are female (UNESCO Institute of statistics, 2018)
- **12.2%** - female board members in STEM industry
- **450,000** women STEM workforce in UK –gender parity – **1.2** million.



## Fewer women leading FTSE firms than men called John

Among chief executives and chairs of FTSE 100 companies, there are 17 men called John (or Jean) - more than the total of seven female bosses

# OUR SOCIAL SATNAV



Insular cortex  
*(hidden within frontal, parietal and temporal lobes)*

Anterior cingulate cortex

Striatum

Dorsolateral prefrontal cortex

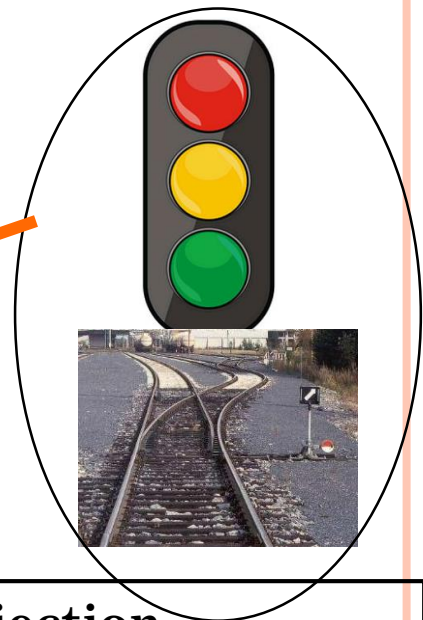
Posterior cingulate cortex

Medial prefrontal cortex

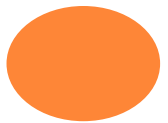
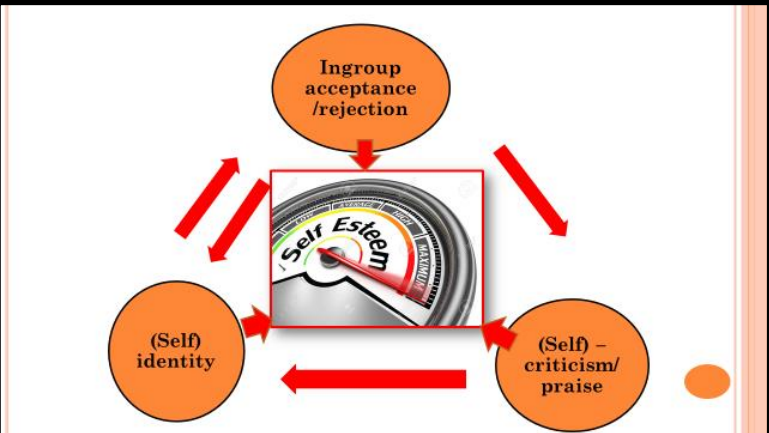
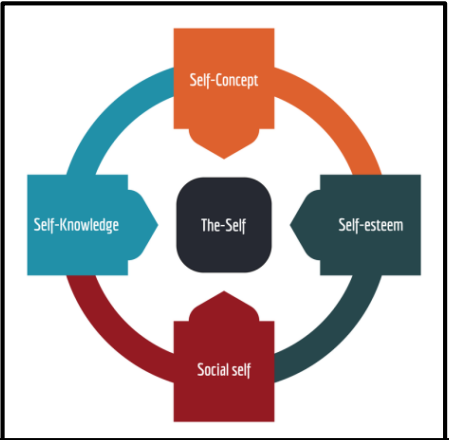
Ventromedial prefrontal cortex

Amygdala

Hippocampus

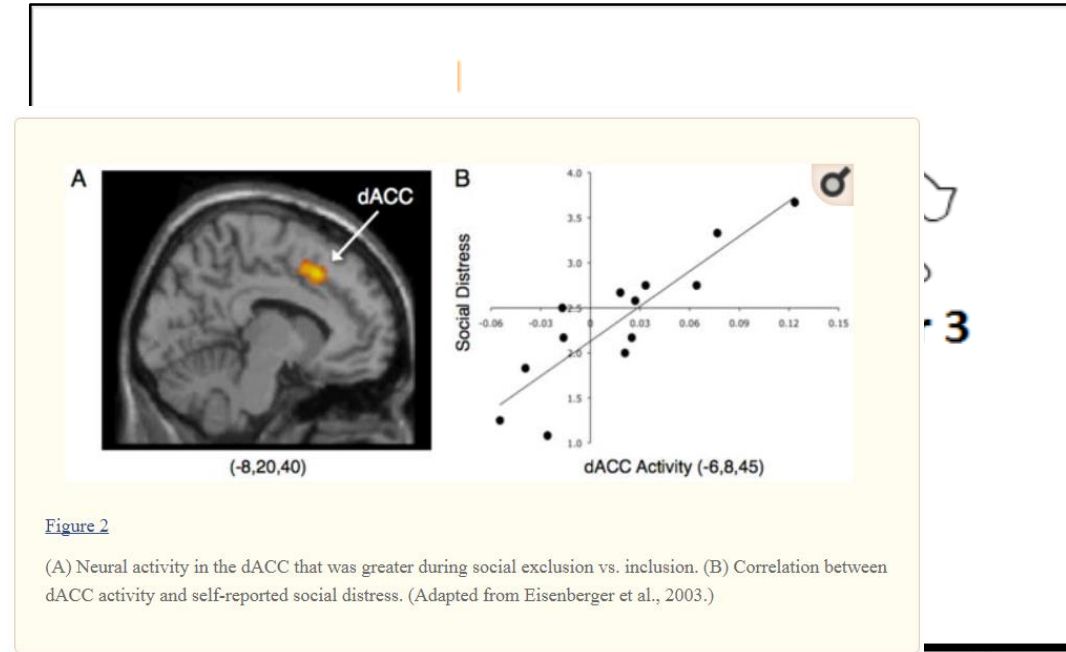


- Rejection sensitivity
- Self-criticism
- Self-silencing

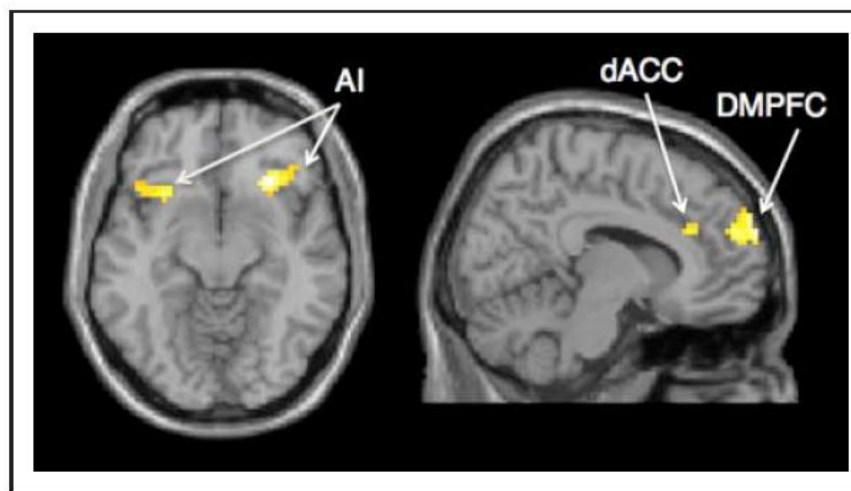




# THE 'PAIN' OF SOCIAL REJECTION



ANNOYING	EMOTIONAL
ARROGANT	FRIENDLY
BORING	FUN
CARING	INSECURE
COMPETITIVE	INTELLIGENT
CONFIDENT	INTERESTING



**Figure 2.** Neural regions that correlated negatively with self-reported state self-esteem (based on parametric modulation).

MULUS	ACTION
	Subject decides, "Would I like this person?"
	Subject response displayed to the left of the face
No	Feedback from target individual displayed on the right



# SELF AND STEREOTYPE THREAT -

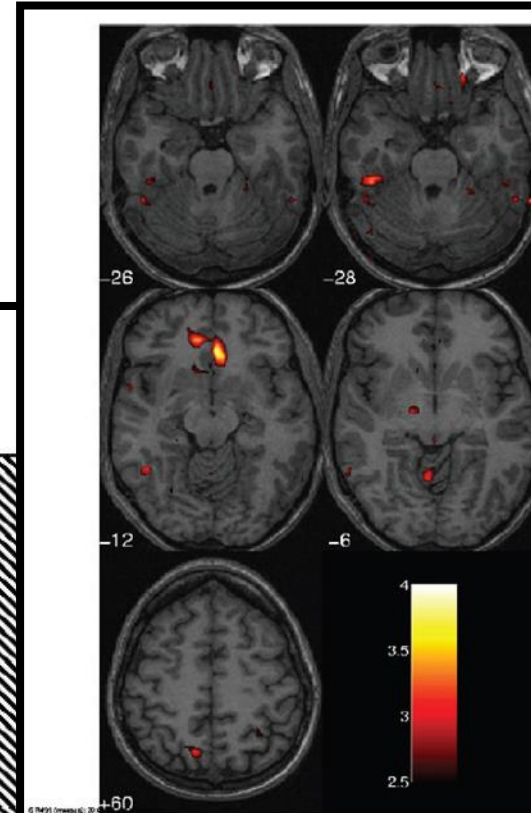
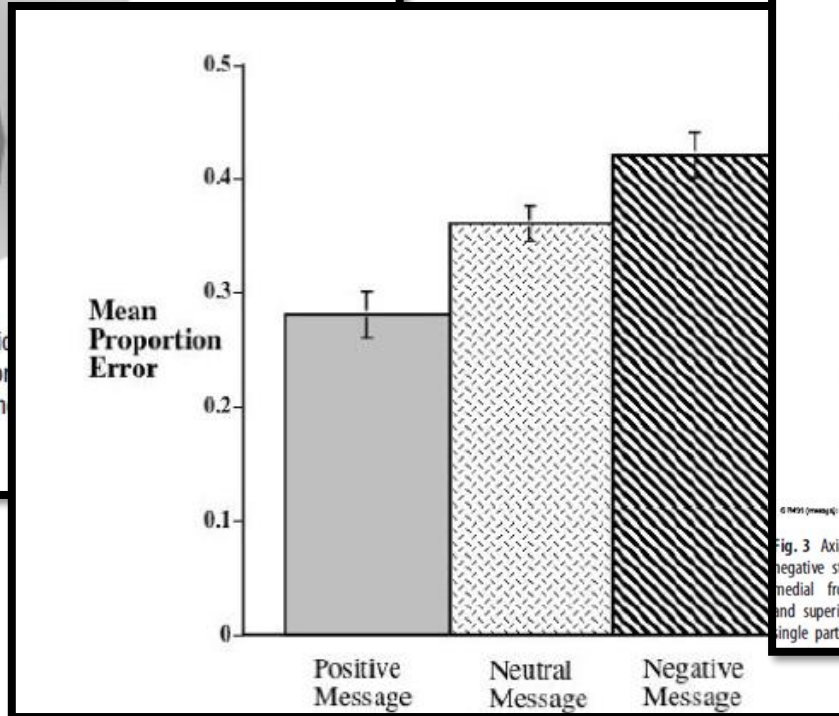
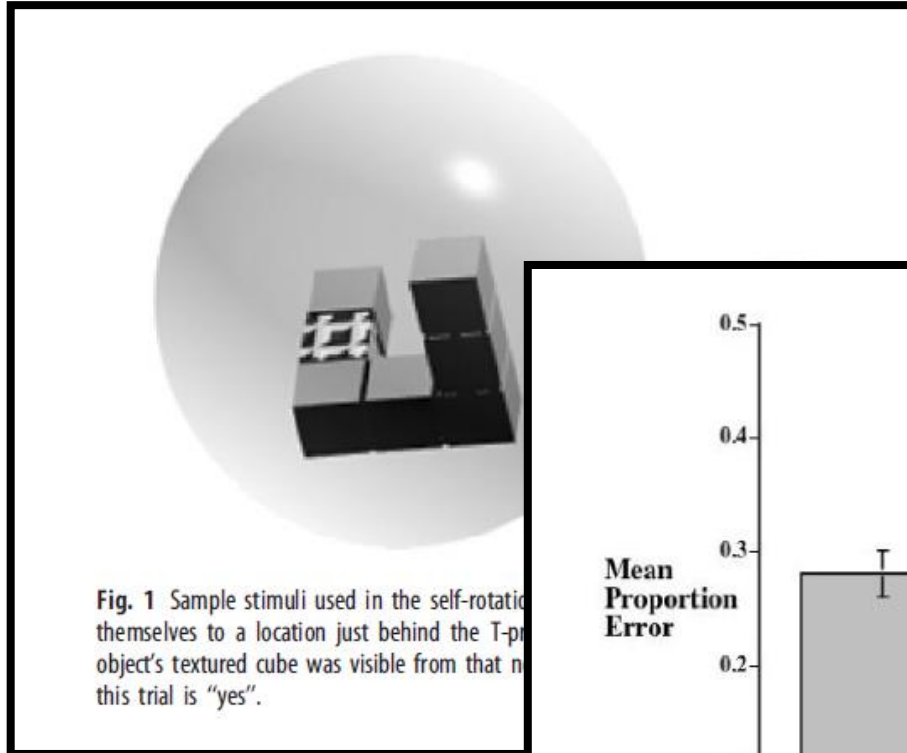


Fig. 3 Axial images ( $z = -26$  to  $+60$ ) depicting brain activations resulting from the negative stereotype-control group contrast. Areas depicted include the orbital and medial frontal gyrus, the rostral-ventral anterior cingulate, fusiform gyrus, and superior parietal lobule. Activation is superimposed onto a brain image of a single participant.

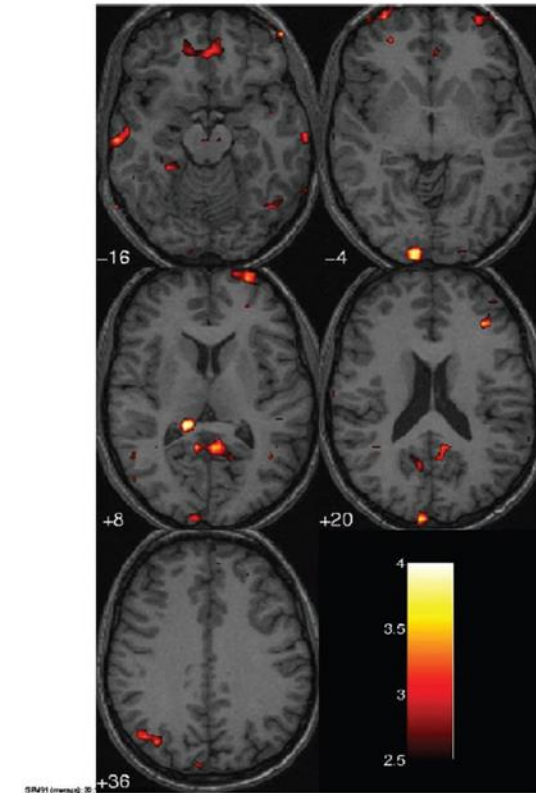
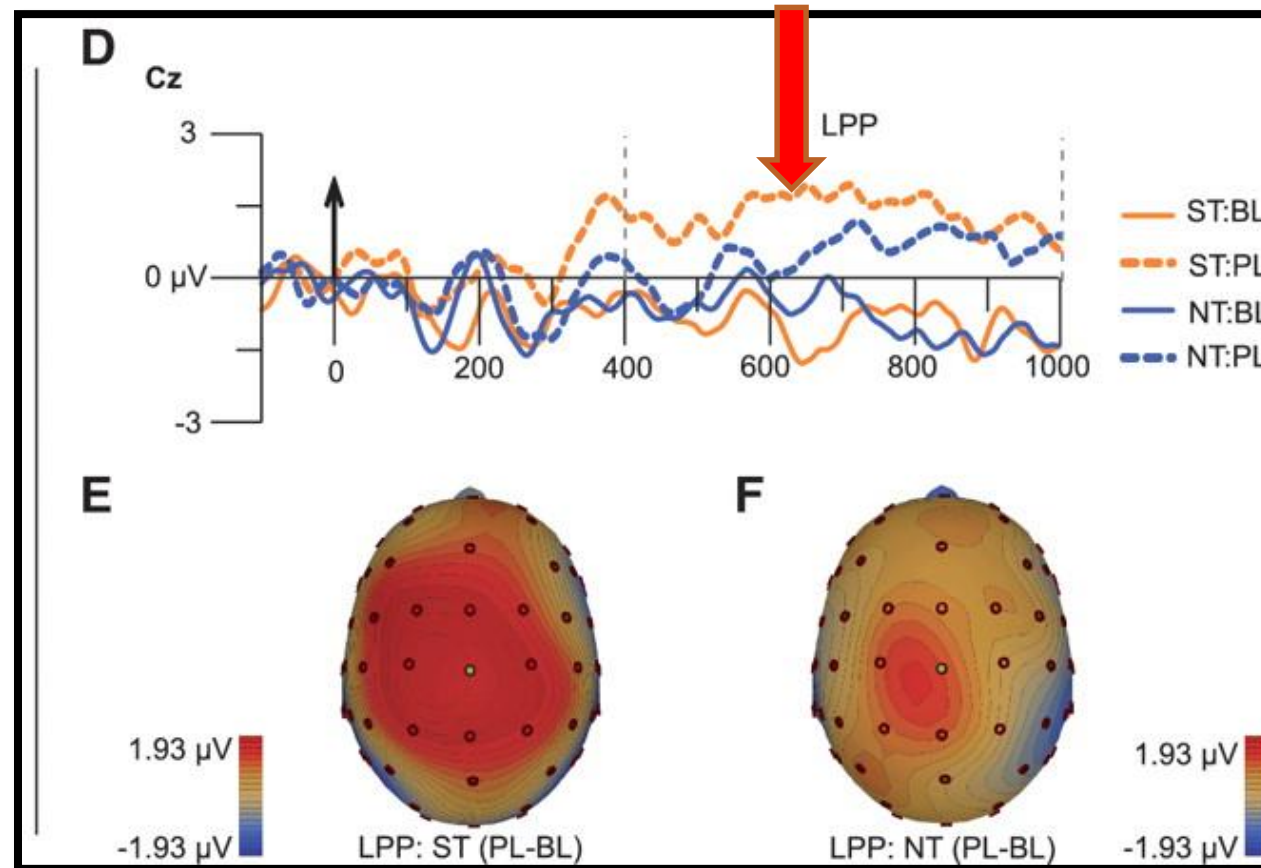


Fig. 4 Axial images ( $z = -16$  to  $+36$ ) depicting brain activations resulting from the positive stereotype-control group contrast. Areas depicted include visual processing areas, middle temporal gyrus, ventral portions of anterior PFC, and cingulate gyrus. Activation is superimposed onto a brain image of a single participant.

# STEREOTYPE THREAT – FOCUS ON THE NEGATIVE

“we will be comparing your score to other students for the purpose of studying gender differences in math”

“we want to examine psychological processes associated with effortful problem solving”

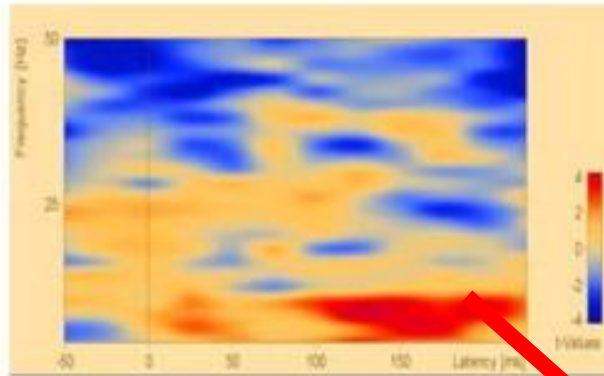


# STEREOTYPE THREAT – SELF-FULFILLING PROPHECIES.

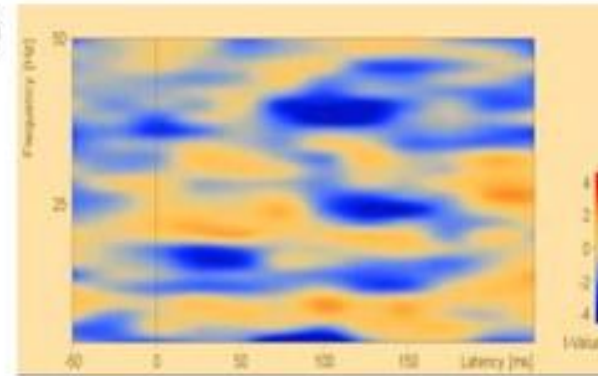
WRONG

CORRECT

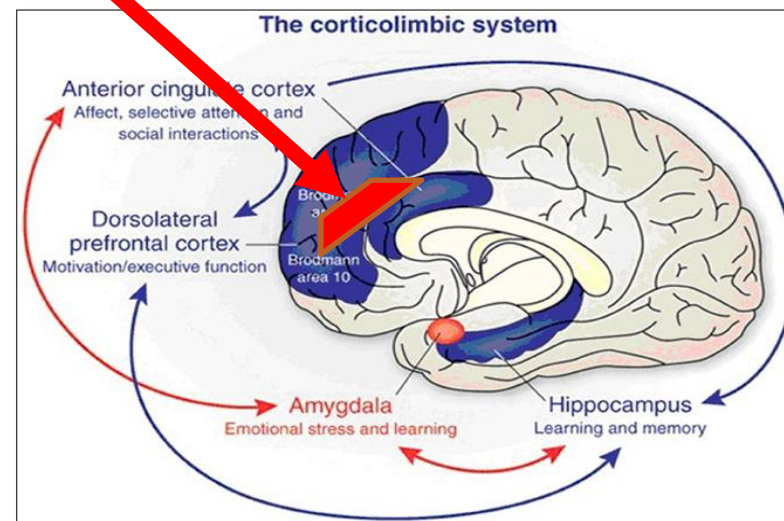
a)



b)



“This task is diagnostic of your math intelligence”

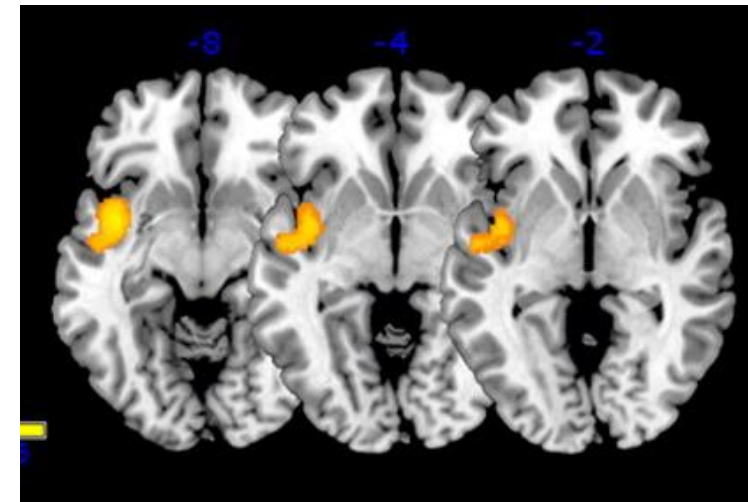
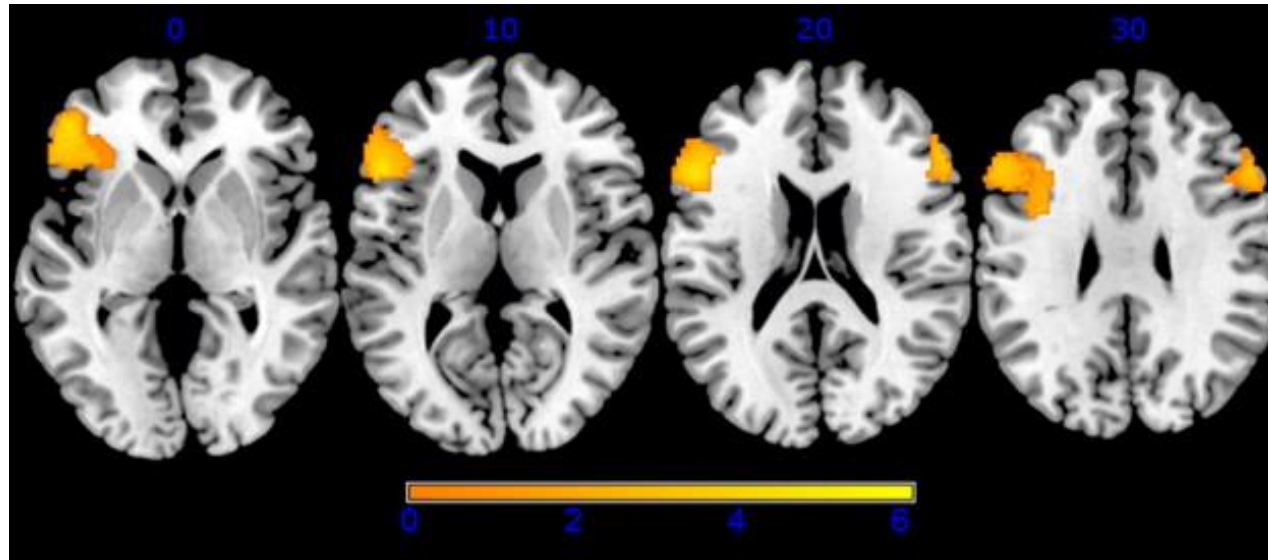


“This task is diagnostic of the type of problem solving strategies you prefer”



# ACC AND SELF-CRITICISM

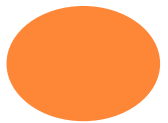
“You have just received a letter of rejection for your job application. Imagine a self-critical response”



Olivia Longe, Frances A. Maratos, Paul Gilbert, Gaynor Evans, Faye Volker, Helen Rockliff, Gina Rippon  
Having a word with yourself: Neural correlates of self-criticism and self-reassurance



# THE WORLD AS A BRAIN INFLUENCER: THE POWER OF STEREOTYPES



# THE WORLD AS A BRAIN INFLUENCER: GENDERED EDUCATION, GENDERED EXPECTATIONS

**No More Boys And Girls: Can Our Kids  
Go Gender Free?**



- **Teacher bias score**
- **6 year old girls not ‘really, really clever’**
- **9 year old girls – maths is a boy thing**



# GENDERED ACHIEVEMENT, GENDERED EXPECTATIONS

## Expectations of brilliance underlie gender distributions across academic disciplines

Sarah-Jane Leslie<sup>1,\*†</sup>, Andrei Cimpian<sup>2,\*†</sup>, Meredith Meyer<sup>3</sup>, Edward Freeland<sup>4</sup>

## Light Bulbs or Seeds? How Metaphors for Ideas Influence Judgments About Genius

Kristen C. Elmore, Myra Luna-Lucero

## The Matilda Effect in Science Communication: An Experiment on Gender Bias in Publication Quality Perceptions and Collaboration Interest

Silvia Knobloch-Westerwick, Carroll J. Glynn, Michael Hugel

### BEING CLEVER IS A BOY THING - LIGHTBULB OR GRAFTER?

**MR. GEORGE ANTHEIL**  
invented a communications system that prevented radio messages from being intercepted.

In 1941, he had a bright idea for a signal that would jump across multiple frequencies. He described his idea as appearing in his mind like a light bulb that had suddenly turned on.

His idea was called "spread-spectrum" technology, and he argued that moving the signal across frequencies in an unpredictable sequence would avoid unwanted detection.

This technology formed the basis of the wireless networks we use for phones and computers today.

**MS. HEDY LAMARR**  
invented a communications system that prevented radio messages from being intercepted.

In 1941, she had the seed of an idea for a signal that would jump across multiple frequencies. She described her idea as taking root in her mind like a growing seed that had been nurtured over time.

Her idea was called "spread-spectrum" technology, and she argued that moving the signal across frequencies in an unpredictable sequence would avoid unwanted detection.

This technology formed the basis of the wireless networks we use for phones and computers today.





# A LIFE OF LOW EXPECTATIONS: INCOMPETENT, INVISIBLE, INFERIOR



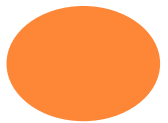
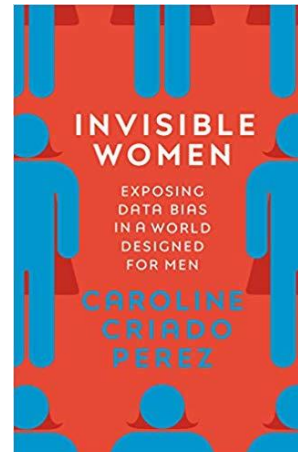
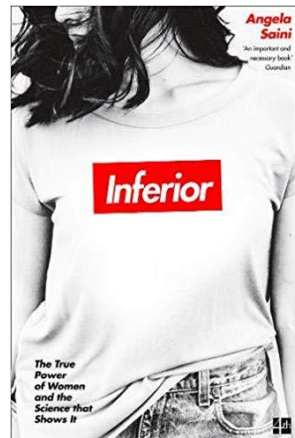
- Larry Summers - 2005 speech which he suggested the underrepresentation of women and engineering could be "different: availability, aptitude, high end."

## Alessandro Strumia: the data doesn't lie — women don't like physics

Alessandro Strumia was fired by the Cern research centre for his views on female scientists. But he says the statistics back him up



*"I'm simply stating that the distribution of preferences and abilities of men and women may differ **in part due to biological causes** and that these differences may explain why we don't have equal representation of women in tech and leadership."*





## **GOOD GIRLS DON'T: WE TEACH OUR BOYS TO BE BRAVE AND OUR GIRLS TO BE PERFECT.**

- **Self-Regulation** – sitting still; the ‘don’t’ message
- **Faint praise** – “always nicely turned out”; well-behaved; work always nicely presented
- **Person Praise/Process Praise** – 4/5 year olds //9-11 year olds
- **Rejection Sensitivity and Self-Silencing**
- **Over-active Inner Critic**





## People vs. Things

Journal of Vocational Behavior 21, 259–287 (1982)

### Dimensions Underlying Holland's Hexagon: Missing Link between Interests and Occupations?

DALE J. PREDIGER

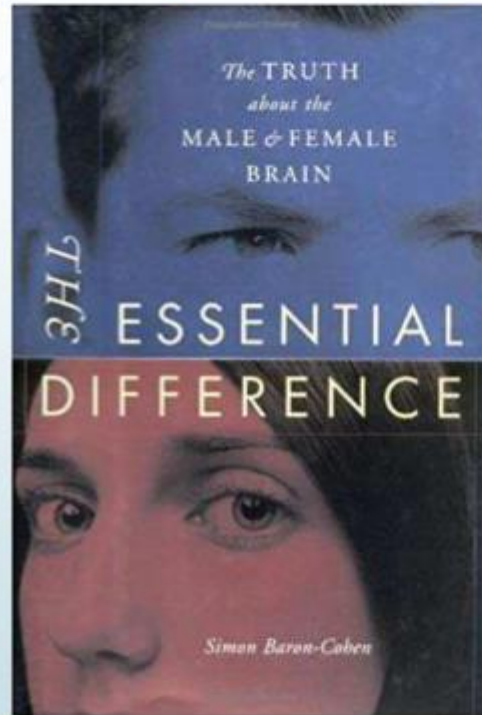
*American College Testing Program*

**“Things tasks:** Nonpersonal tasks involving machines, materials, tools, biological mechanisms, and so forth” (p. 22). Bricklayers, laboratory technicians, and bus drivers work mainly with things.

**“People tasks:** Interpersonal tasks such as caring for, persuading, entertaining, or directing others (including animals treated as if they were human)” (p. 22). Elementary school teachers, social workers, and vocational counselors work mainly with people.



## Empathising vs Systemising



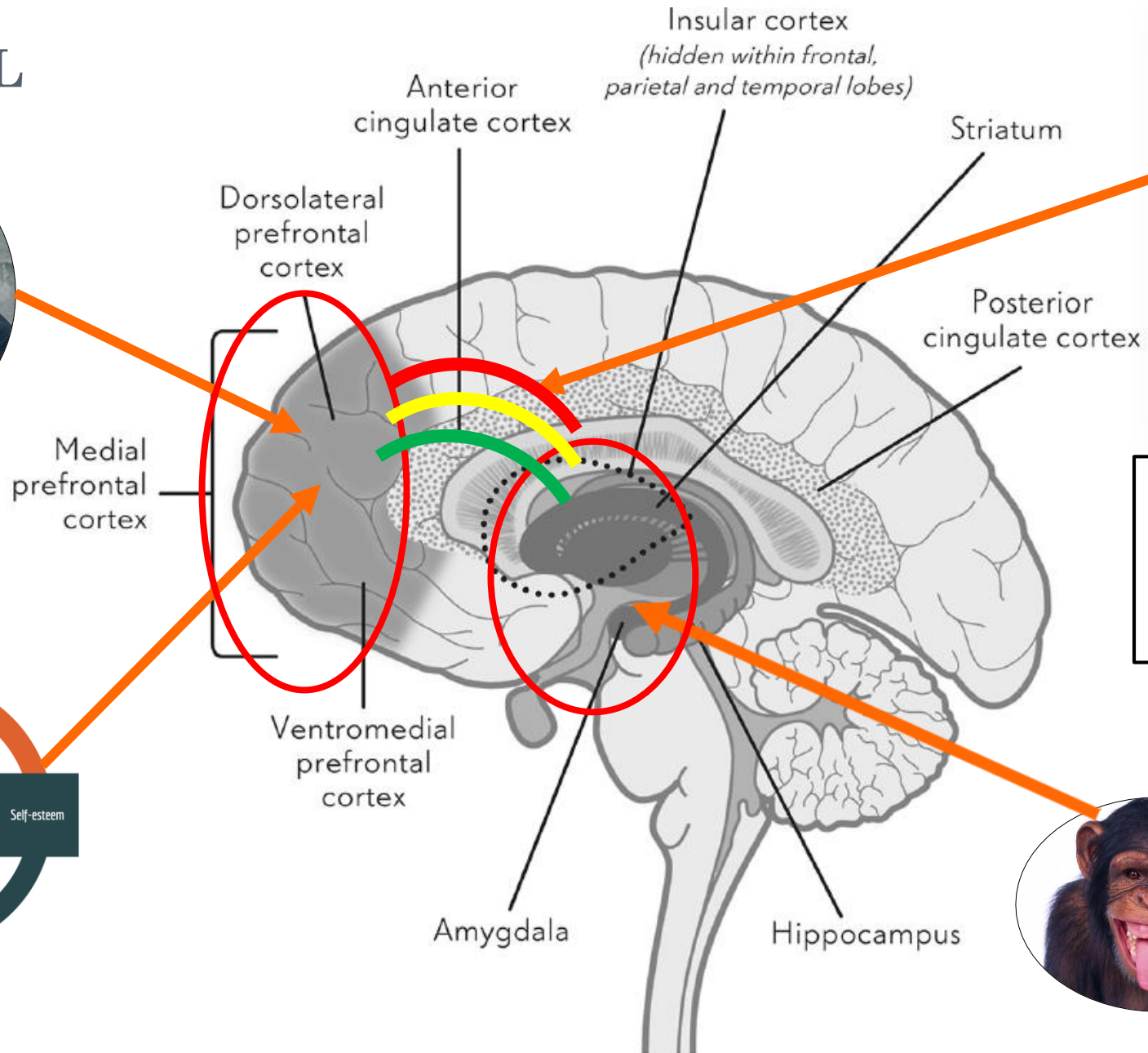
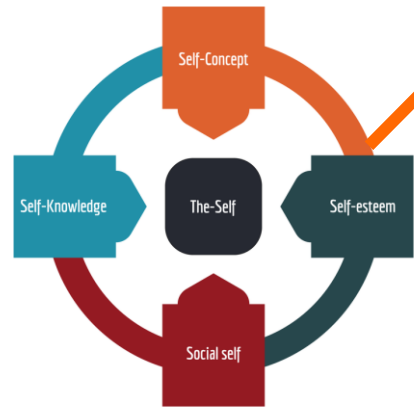
- ▶ The female brain is predominantly **hard-wired** for empathy
- ▶ The male brain is predominantly **hard-wired** for understanding and building systems.
  
- ▶ “your sex does not dictate your brain type – not all men have the male brain, and not all women have the female brain.”

Cognitive style predicts entry into physical sciences and humanities:  
Questionnaire and performance tests of empathy and systemizing

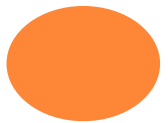
Jac Billington\*, Simon Baron-Cohen, Sally Wheelwright



# OUR SOCIAL SATNAV



- **Rejection sensitivity**
- **Self-criticism**
- **Self-silencing**



Research Article

ASSOCIATION FOR  
PSYCHOLOGICAL SCIENCE

# The Gender-Equality Paradox in Science, Technology, Engineering, and Mathematics Education



**Gijsbert Stoet<sup>1</sup>** and **David C. Geary<sup>2</sup>**


<sup>1</sup>School of Social Sciences, Leeds Beckett University, and <sup>2</sup>Department of Psychological Sciences, University of Missouri

Psychological Science  
2018, Vol. 29(4) 581–593  
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DOI: 10.1177/0956797617741719  
www.psychologicalscience.org/PS



The differences emerge from a seemingly rational choice to pursue academic paths that are a personal strength....





**Unstable Identity Compatibility: How  
Gender Rejection Sensitivity Undermines  
the Success of Women in Science,  
Technology, Engineering, and  
Mathematics Fields**

**Sheana Ahlqvist<sup>1</sup>, Bonita London<sup>1</sup>, and Lisa Rosenthal<sup>2</sup>**

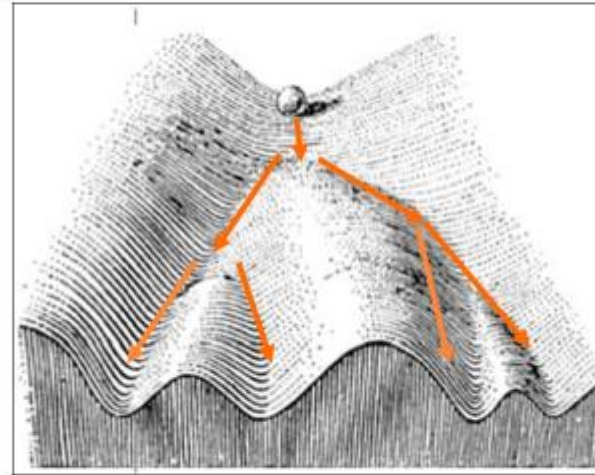
<sup>1</sup>Stony Brook University and <sup>2</sup>Yale University



## YOUR BRAIN ON TRAMLINES ; FIXED, INEVITABLE, INVARIANT?

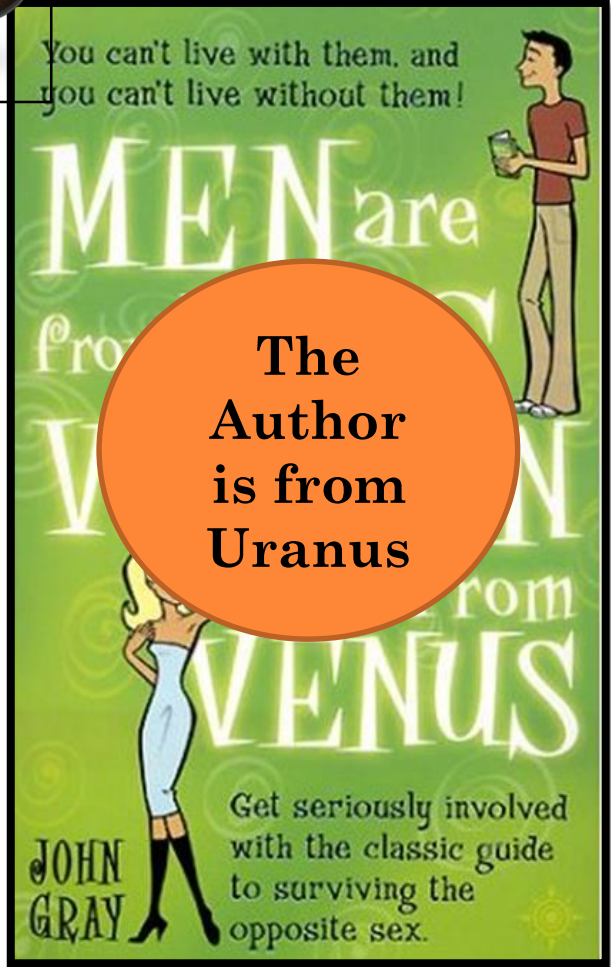
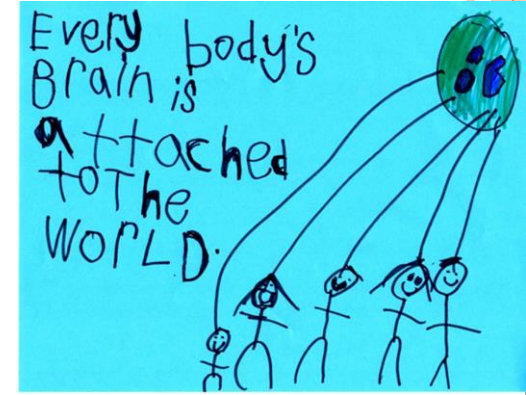


## NOT A ONE WAY-STREET - LIFE'S CORRUGATED LANDSCAPE

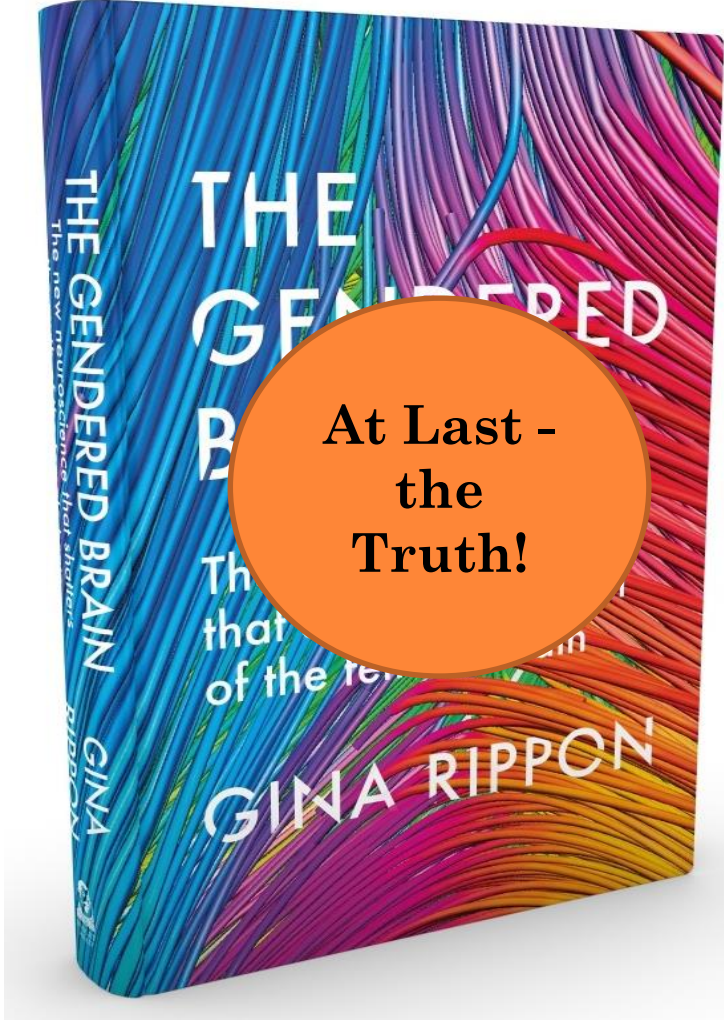




# THE CHOICE IS YOURS



The Author is from Uranus



At Last - the Truth!

