

INTRODUCTION TO NEUROPSYCHOLOGY OF PSYCHOLOGICAL WELL-BEING

“There is no meaningful way to separate cognitive from emotional learning.”

(Louis Cozolino, 2013)

Session outline

Section 1: Introductory session

- Changing views of the mind, brain and body
- Neurons and neuroplasticity
- Functions of the parts of the brain
- Brain development

Section 2: Preview of further sessions: Protective brain systems

- Introduction to the emotional brain
- The brain's perception of safe and dangerous stimuli
- Section 2: Preview of next session: Anxiety and the brain
- Supporting emotional equilibrium

Mind and brain

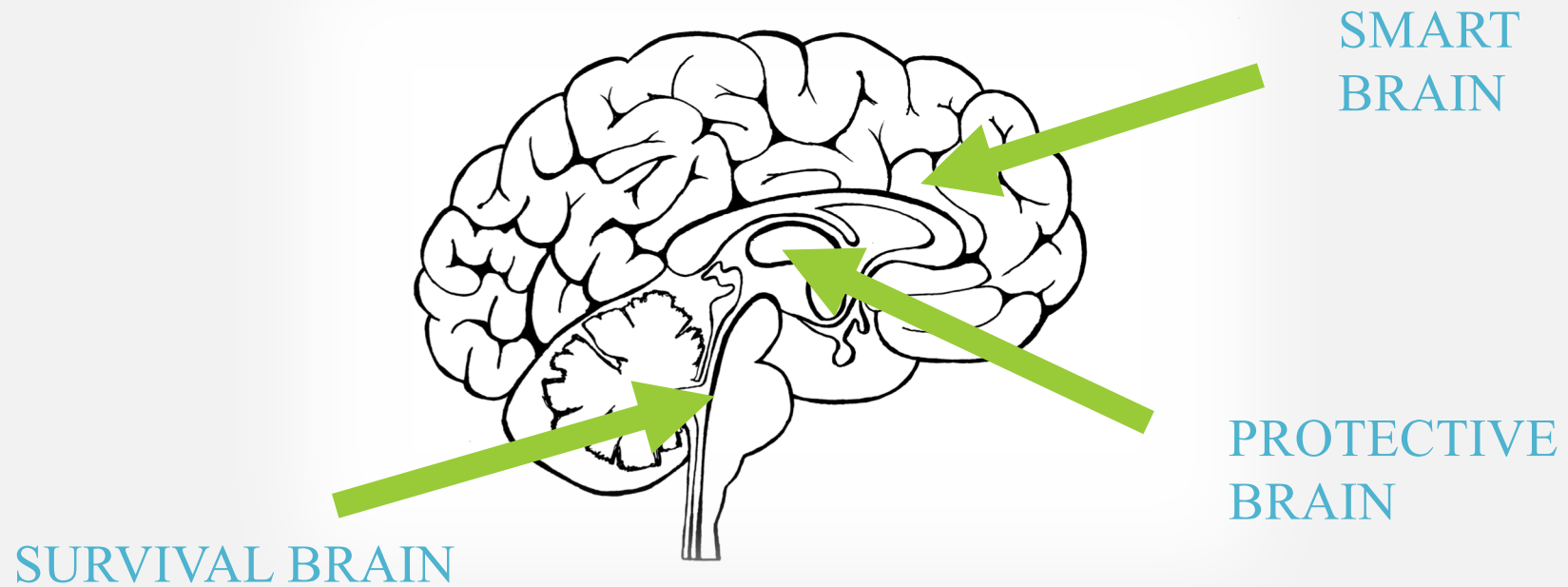
Narratives and neuroscience

Optimising mind and brain through
positive experience

Challenges to long-held assumptions

- Brain rigidity vs plasticity
- Notion of fixed potential vs fluid development (e.g. Feuerstein)
- Individual development vs social learning
- Hopelessness of recovery vs possibilities of recovery in enriched environments
- Lives reside in dynamic systems, stories are negotiable.

The Triune Brain

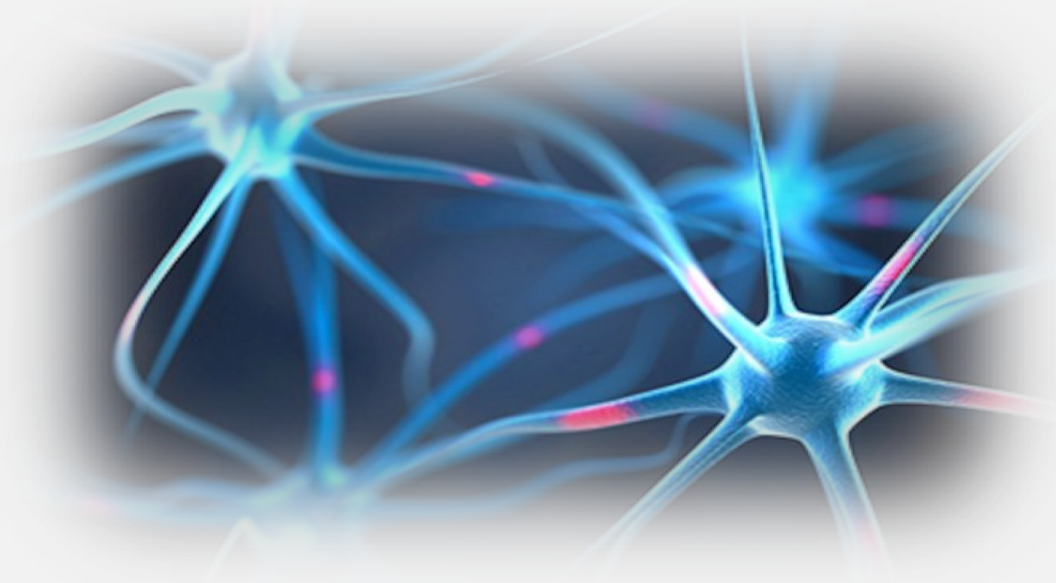


Neurons in the brain



- More than 100 billion neurons in the brain
- Newborn generates 250k neurons per minute
- Rate drops at around 3 years.
- Development to around 25 years of age
- Rate drops to around 800 per day at 25 years
- Cerebellum holds 80% of the brains' neurons.

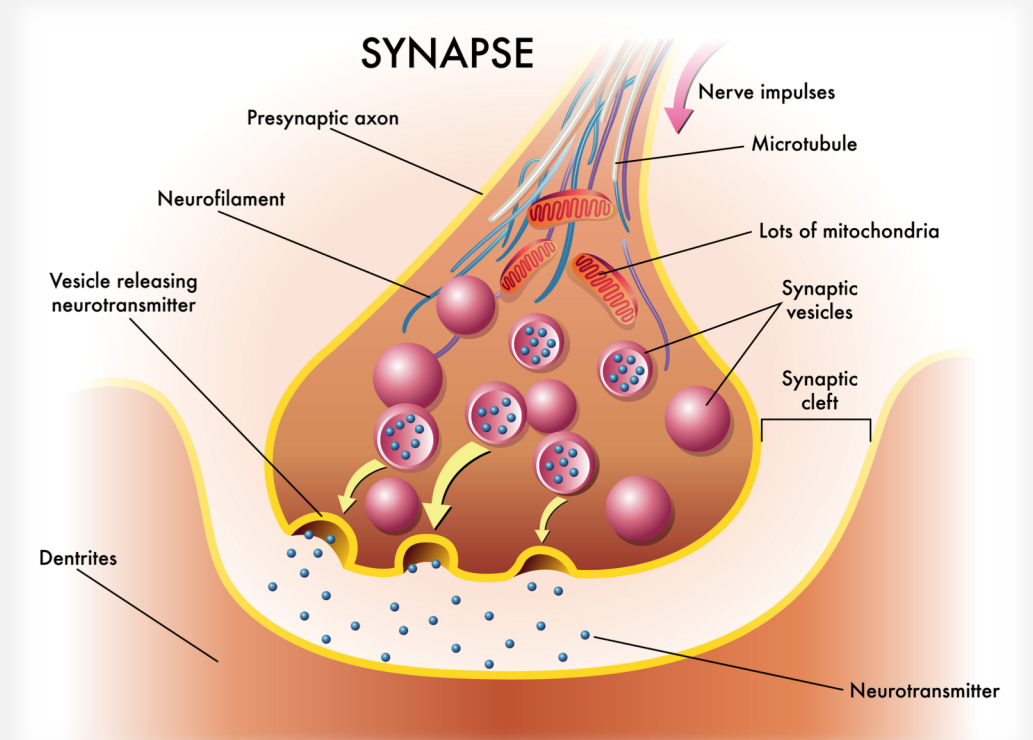
Neurons that fire together, wire together.



- Neurons are attracted to those they know best
- Pathways used frequently strengthen (Hebb, 1949)
- Pathways used infrequently weaken
- Neurons not used are pruned.
- Mirror neurons – fire with actions and observed actions

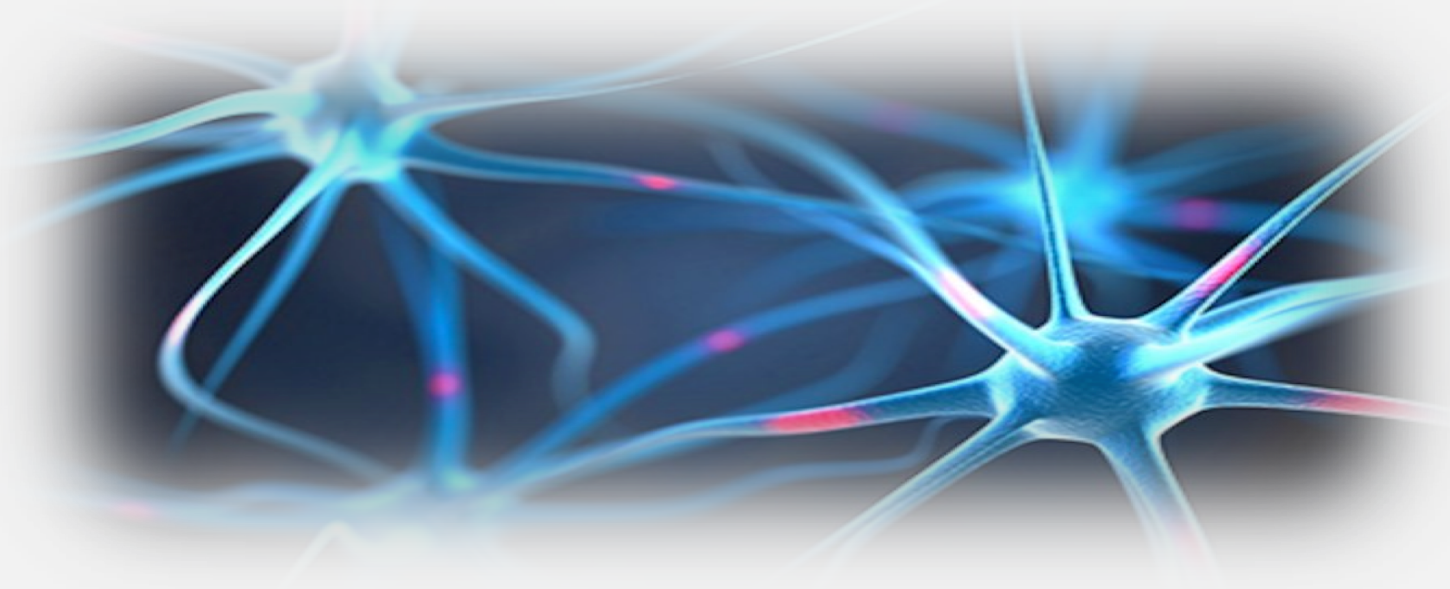
Neuron connections

- Neurons connect at the synapse
- Neurotransmitters flow to receptors
- Glial cells regulate connectivity and circuit formation
- Role of synapse in memory formation and storage (Kandel 2000 Nobel Prize)



NEUROPLASTICITY

The brain continues to grow new connections as long as the structures and neurochemicals remain.

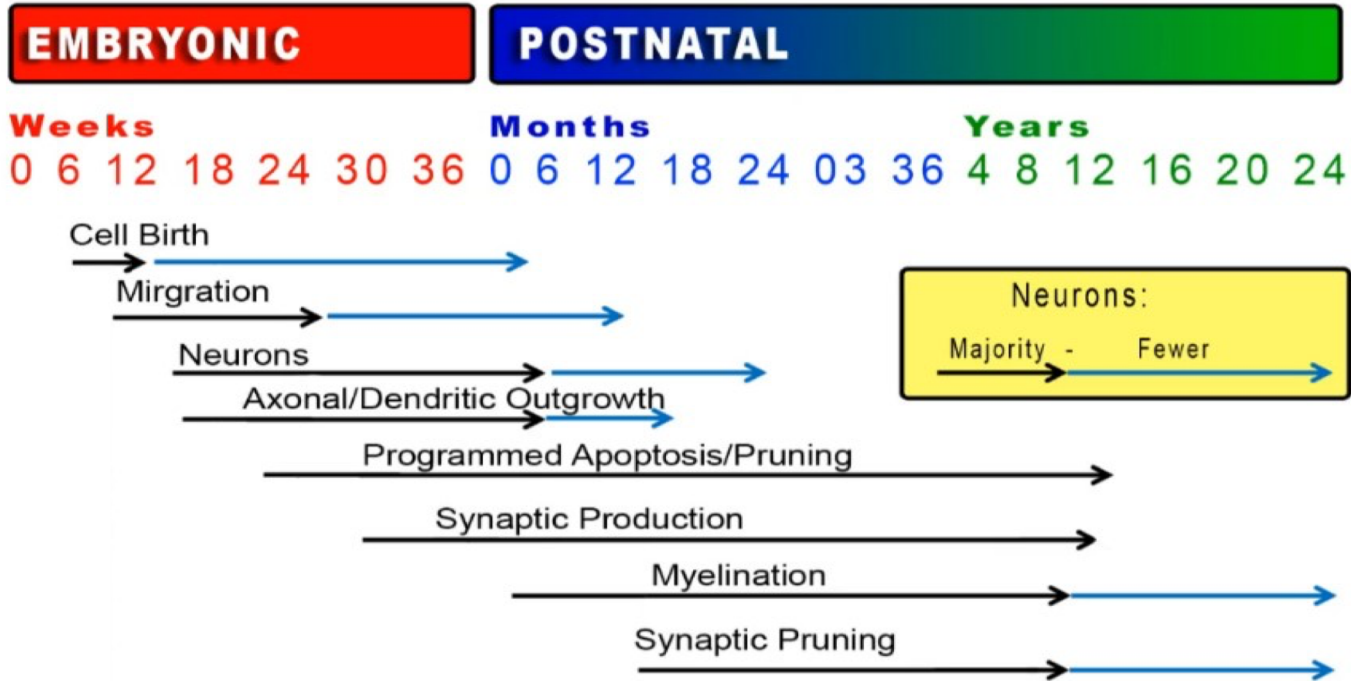


Implications of neuroplasticity for learning and well-being

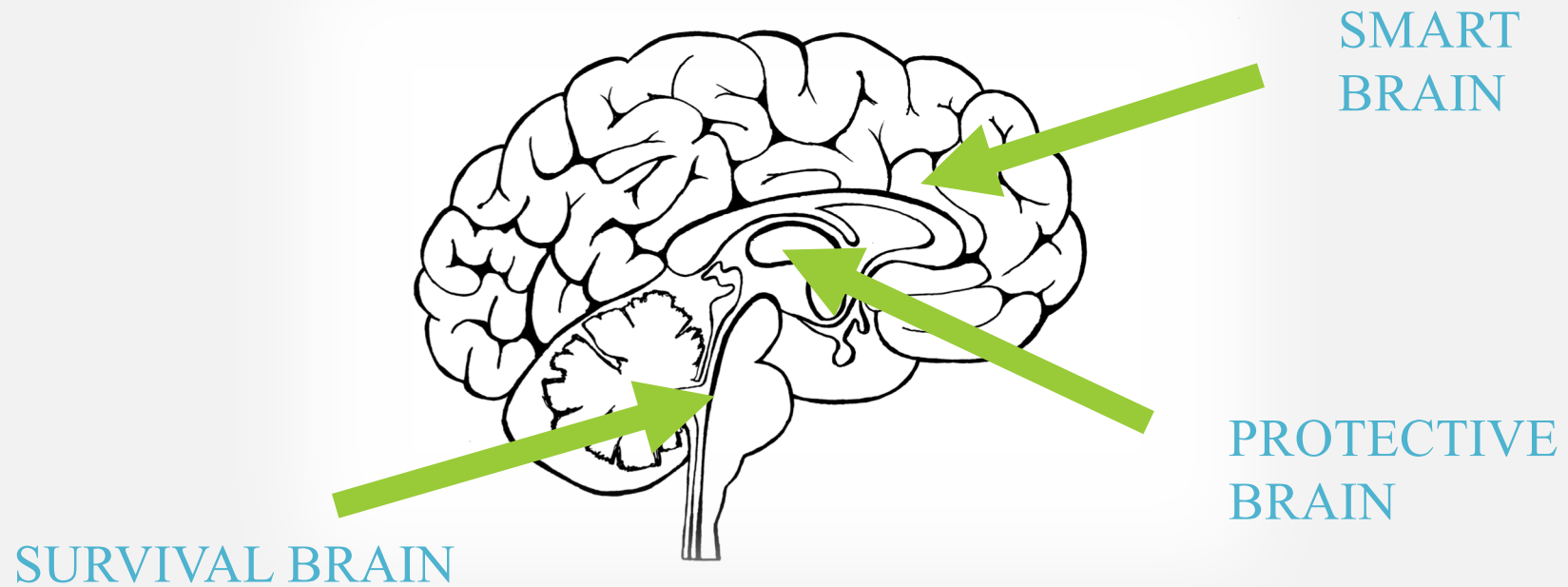
- Repeated, positive experience
- Frequent firing that strengthens positive connections
- The power of single traumatic and ongoing adverse events
- Early connections: first and second years and other sensitive periods
- New learning irrespective of age



Brain Development Timeline



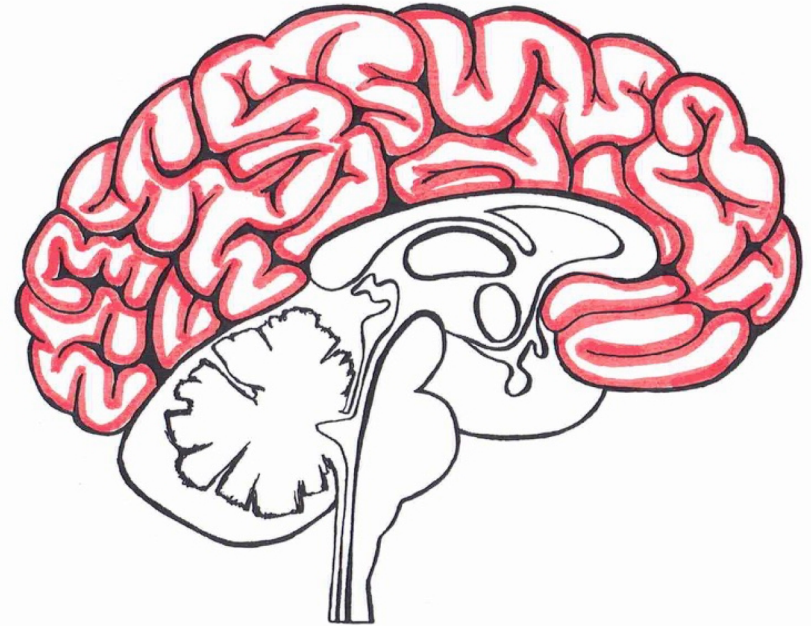
The Triune Brain



The Smart Brain (Neocortex, Neomammilian)

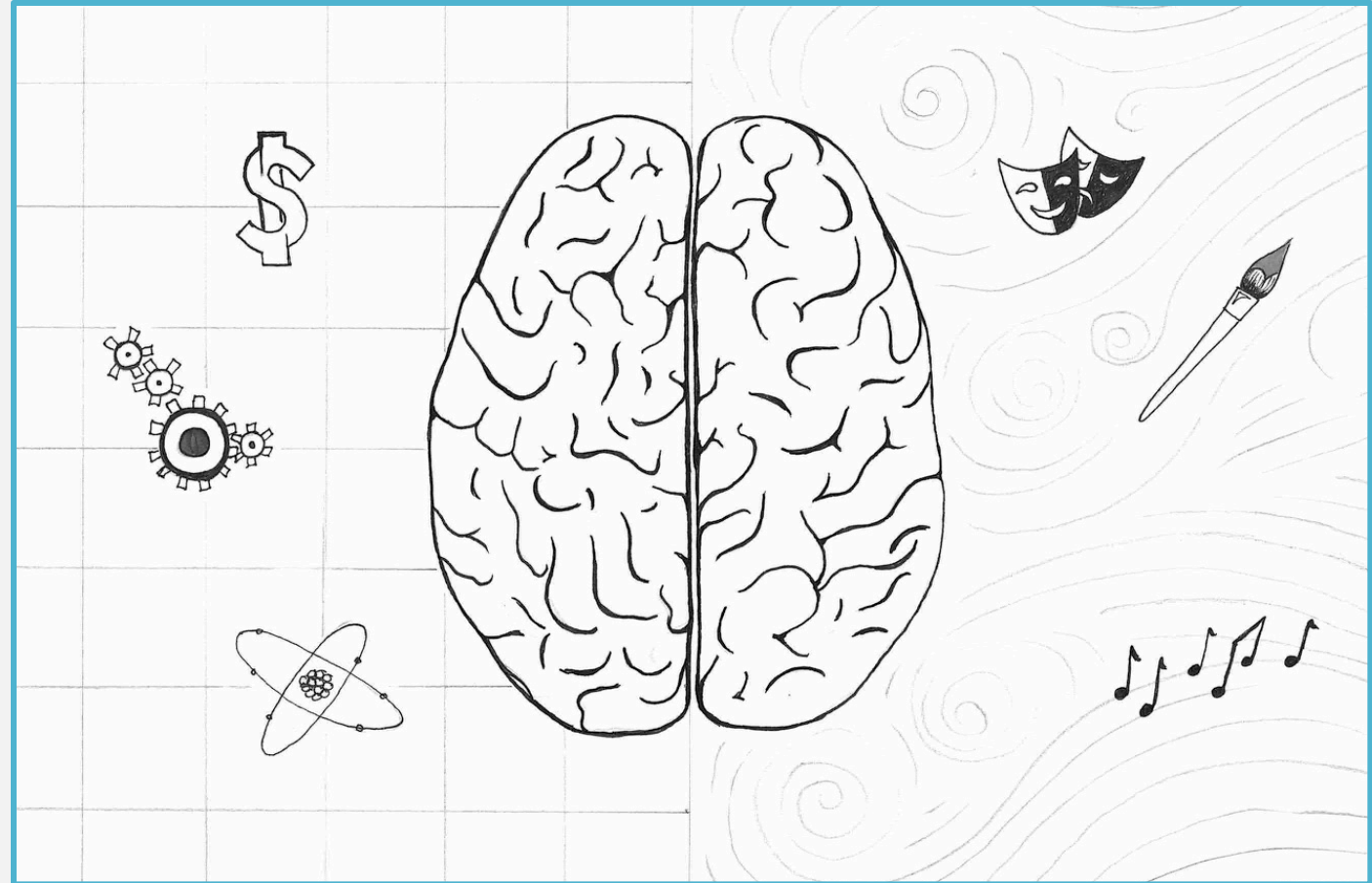
Executive Functions

- Develops last — fully at around 25 years
- Influenced by environment and social interaction as well as genes.
- Working memory
- Comprises the frontal cortex, temporal lobe, parietal lobe and occipital lobe



Prefrontal Cortex

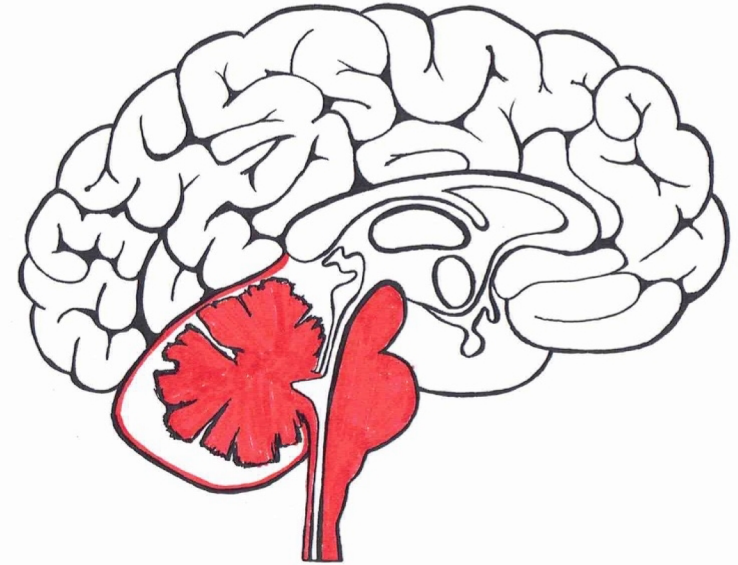
- Right prefrontal cortex (RPFC) develops first - spatial, social and creative
- Left prefrontal cortex (LPFC) – more analytic, logical, sequencing and synthesizing, executive decision-making



Survival brain (Reptilian)

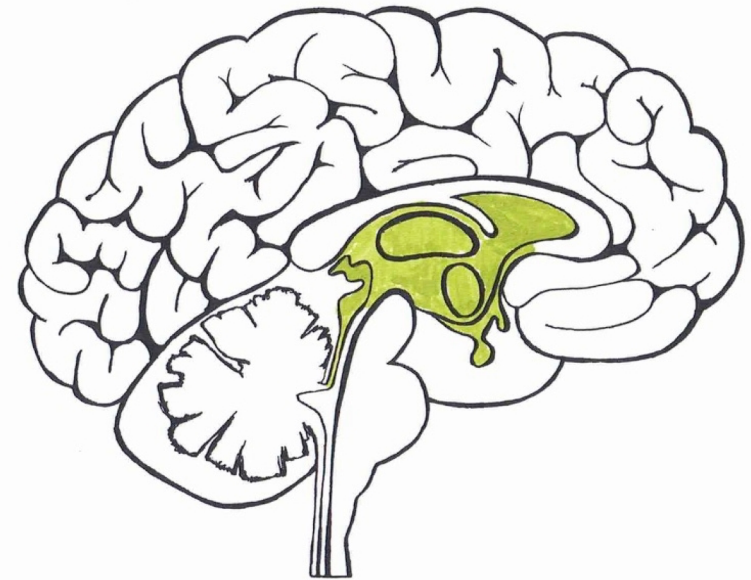
The most primitive area of the brain

- Includes brain stem (midbrain, pons, medulla oblongata) and cerebellum
- Controls survival functions:
- Heart rate
- Breathing
- Sleeping
- Digestion
- Temperature
- Balance



THE PROTECTIVE BRAIN

- The brain protects
- The brain can over-protect



The Whole Brain

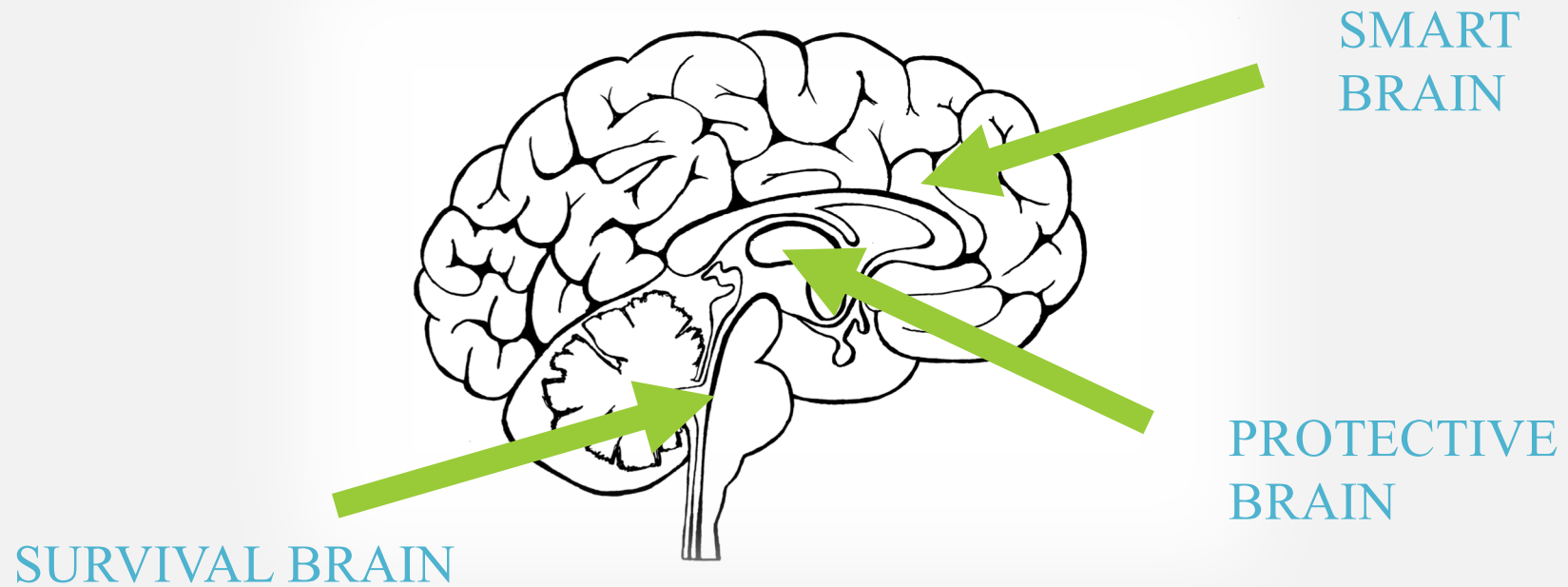
A question ...

What are the implications of neuroplasticity for teaching and learning?

Section 2:

The emotional, protective brain

The Triune Brain



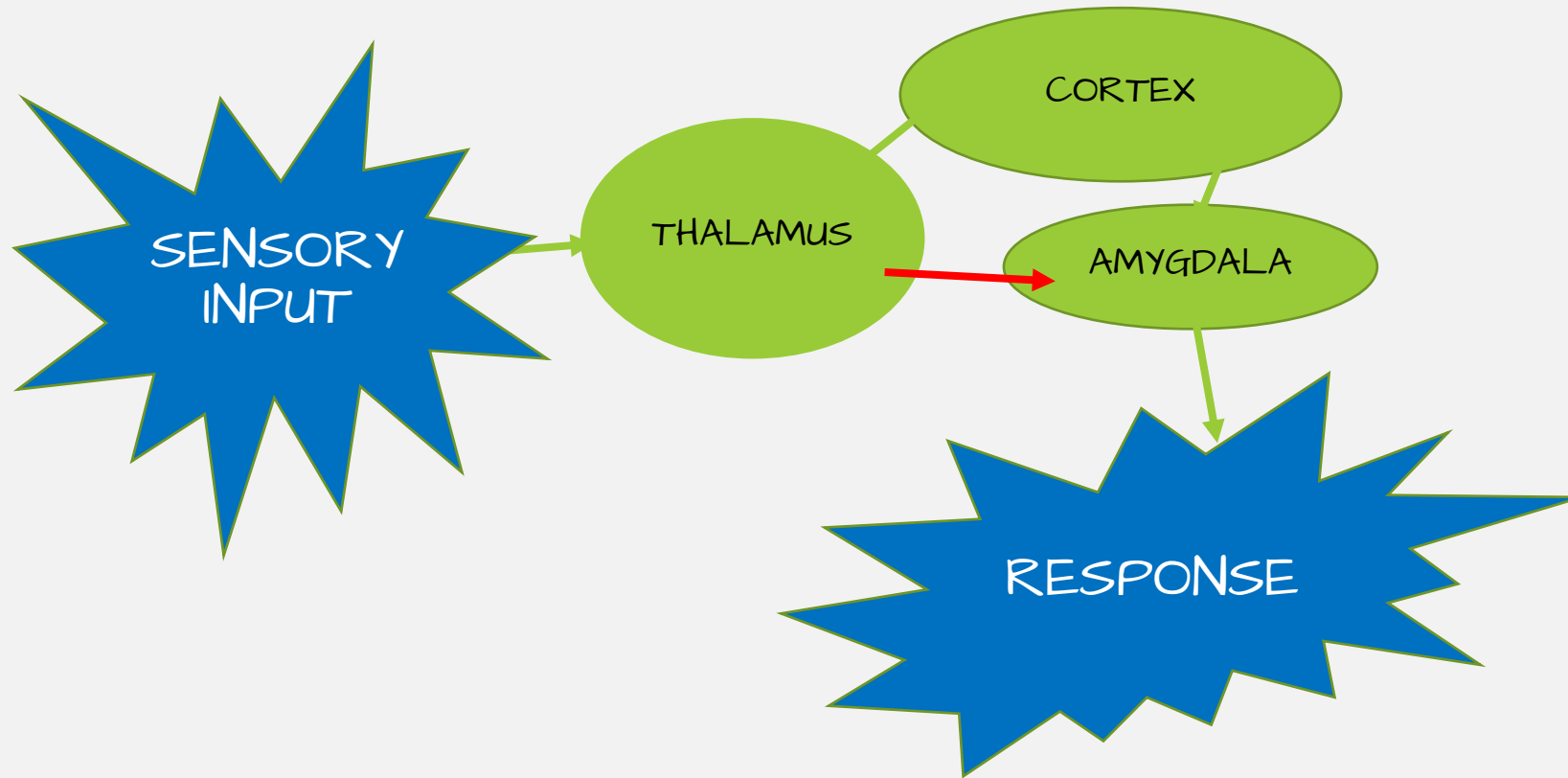
Firing of the Amygdala

- Warning system, triggered by novelty
- The amygdala fires ultra-quickly
- If no danger detected, directs message to the cortex
- If danger is detected, immediate initiation of stress response

Amygdala regulation

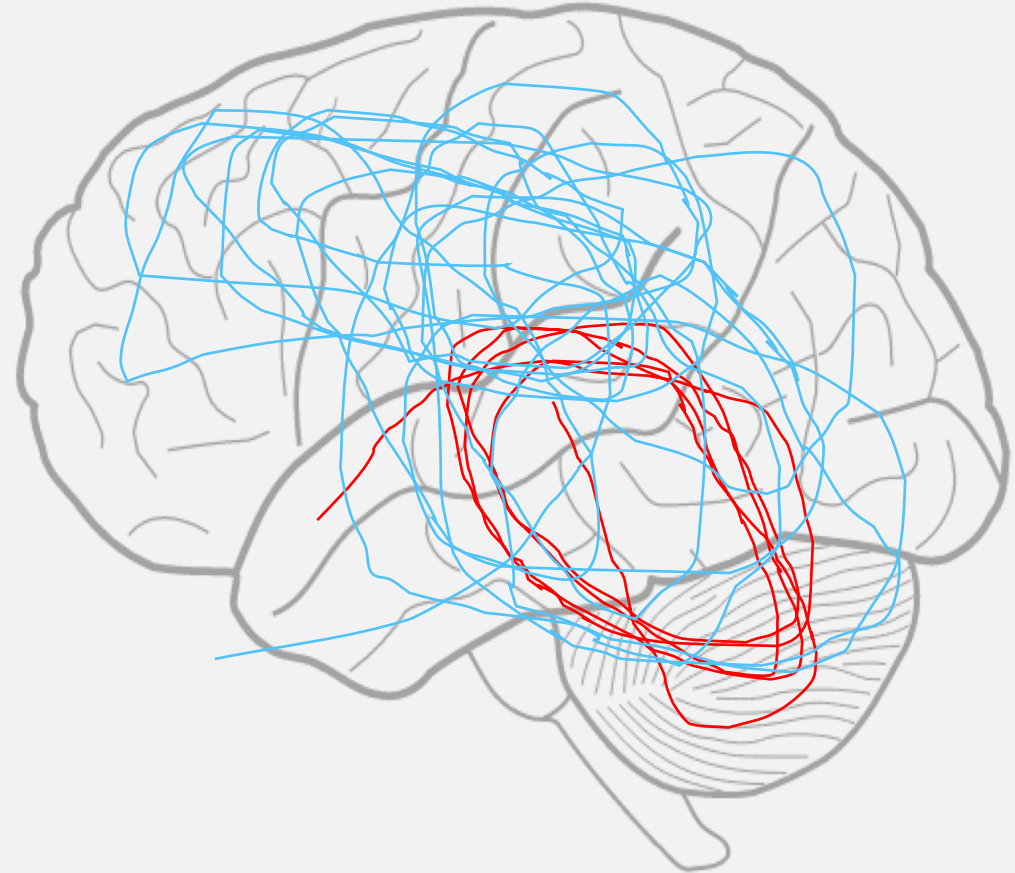
- Stimulation/up-regulation of the Amygdala leads to anger, fear, anxiety and violence.
- Down-regulation of the amygdala leads to calmness.
- Associations are formed between danger, pain and negative outcomes.
- Kluver-Bucy Syndrome - action is disinhibited - impulsiveness and recklessness.
- Benzodiazepine functions like alcohol – the same type of disinhibited behaviour.

FAST AND SLOW PATHS TO RESPONSE



Circuiting on the fast and slow tracks

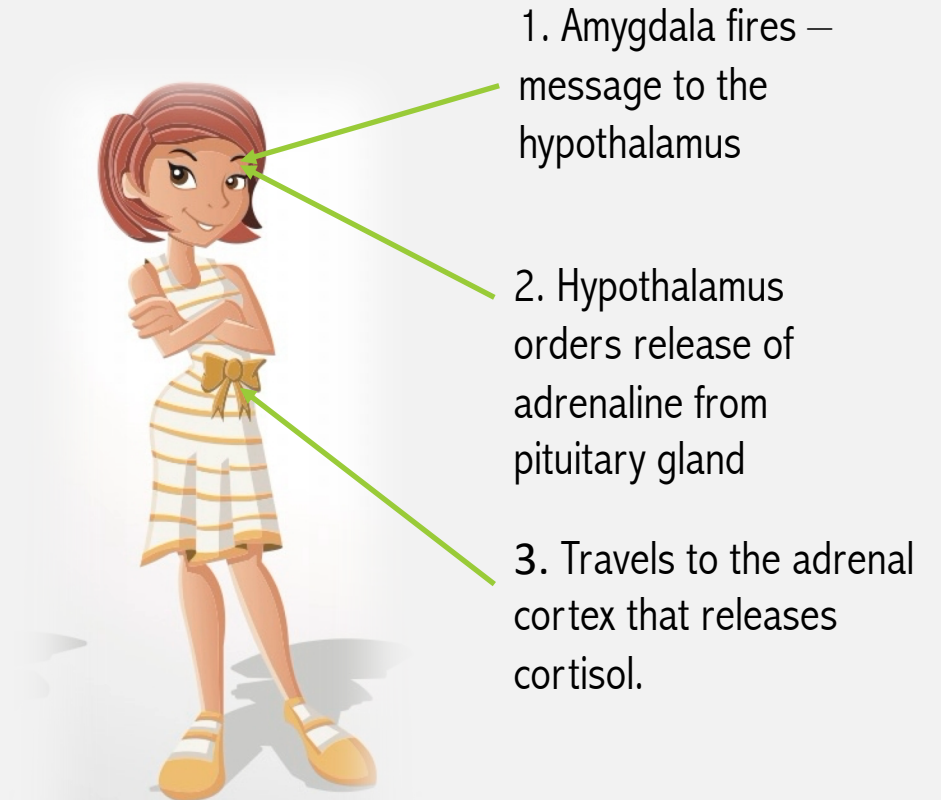
- **FAST ROUTE:** All resources circuit between the mid-brain and the survival brain – away from the smart brain.
- **SLOW ROUTE:** Circuiting from mid-brain to survival brain



Up-regulation of the sympathetic nervous system

Fight, flight or freeze response

- Neurotransmitters (e.g. adrenaline and cortisol)
- Increased heart rate
- Pounding heart/tight chest/feeling of suffocation
- Slowed digestion - distress
- Dilation of pupils
- Blood flow to muscles in arms
- Priming of muscle groups to respond
- Numbness
- Fainting
- Nausea
- Hot or cold
- Sense of time



Children learning about the brain

Videos

- Panic and the brain – 2:37
- Minds behind bullying – 6:29 mins