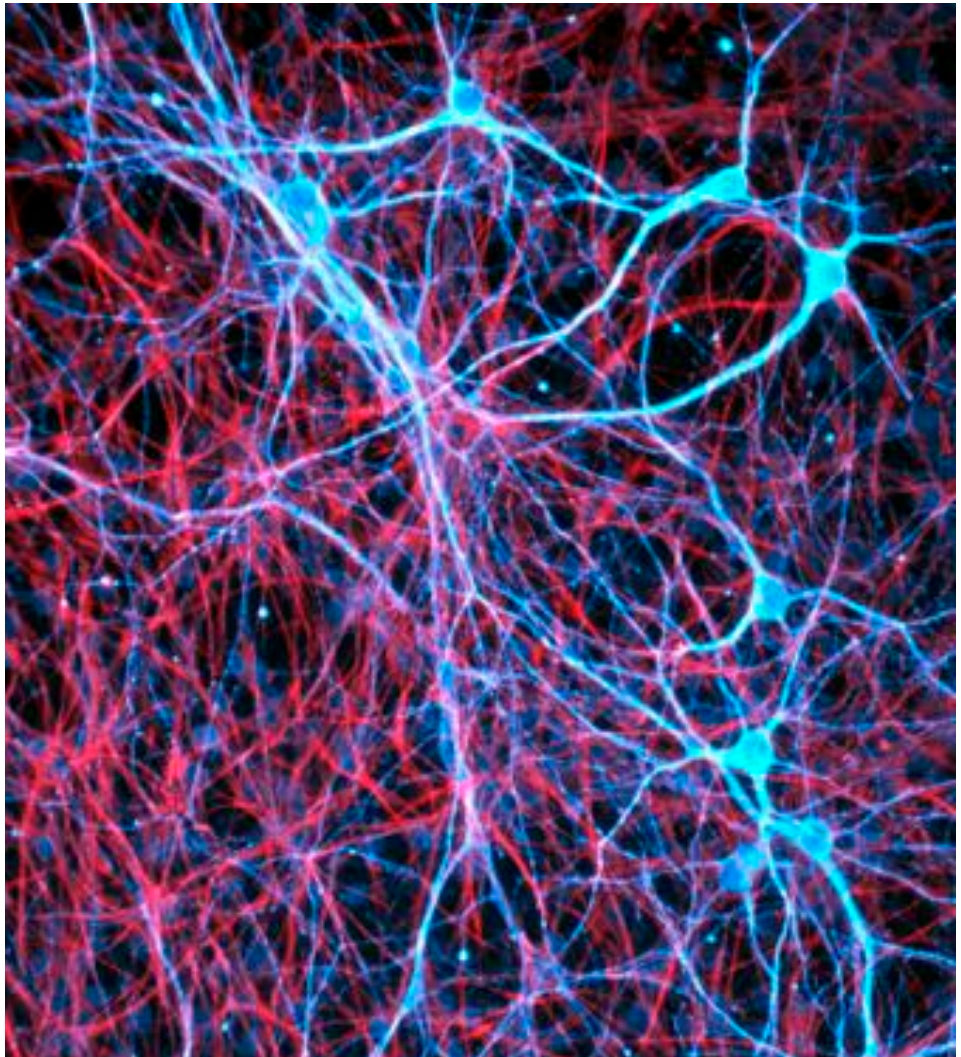
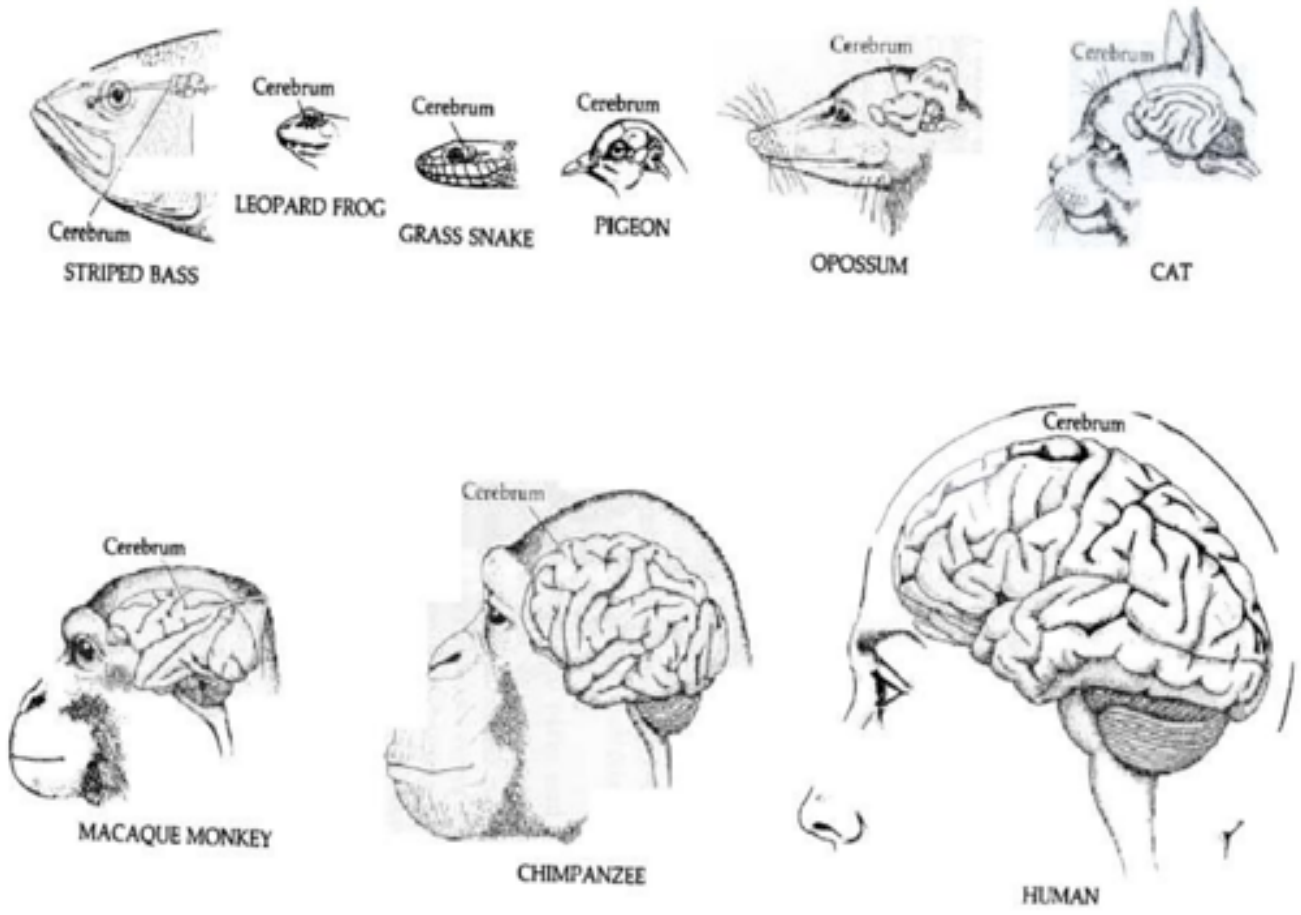
人脑 Human Brain



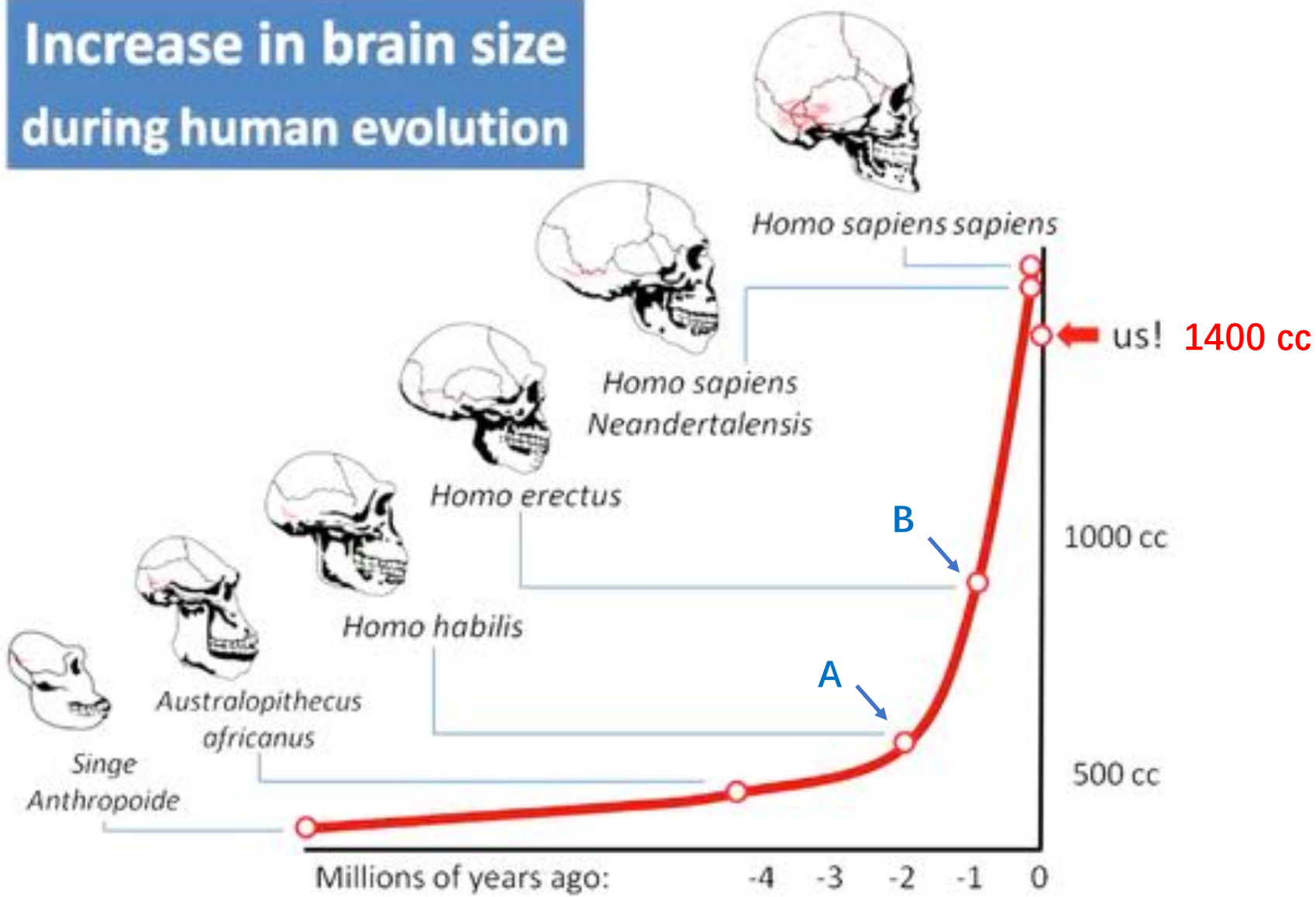
脑的进化 Brain Evolution



much more folded
to fit inside the skull

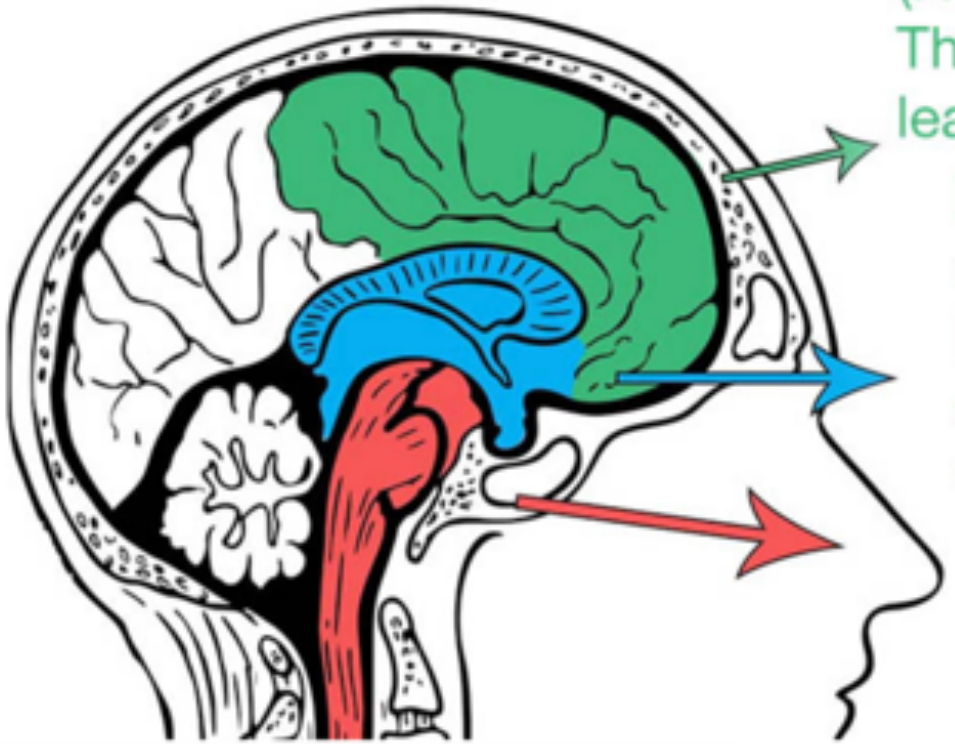
10B neurons
100B neuroglial cell

达尔文过程 Darwinian Process



A : cooking and access to brain nutrients
B : cooked starchy tubes

人脑的三个脑



Rational Brain
(Neocortex)
Thinks, moves, creates, learns

2-3 million years old

Emotional Brain
(Limbic System)
Feels, remembers and interacts with others

150 million years old

Survival Brain
Reacts automatically to environment

250 million years old

人脑的功能区

Frontal Lobe

Suppressess socially inappropriate behavior.

Predicts consequences of actions.

Plays a role in the choice between good and bad actions.

Parietal Lobe

Assists with the interpretation of touch.

Plays a role in the knowledge of numbers and their relationships.

Helps with the understanding of objects, shapes, and space.

Occipital Lobe

Processes and makes sense of visual information.

Temporal Lobe

Assists with the perception and interpretation of sound.

Plays a role in the recognition of objects and visual memory.

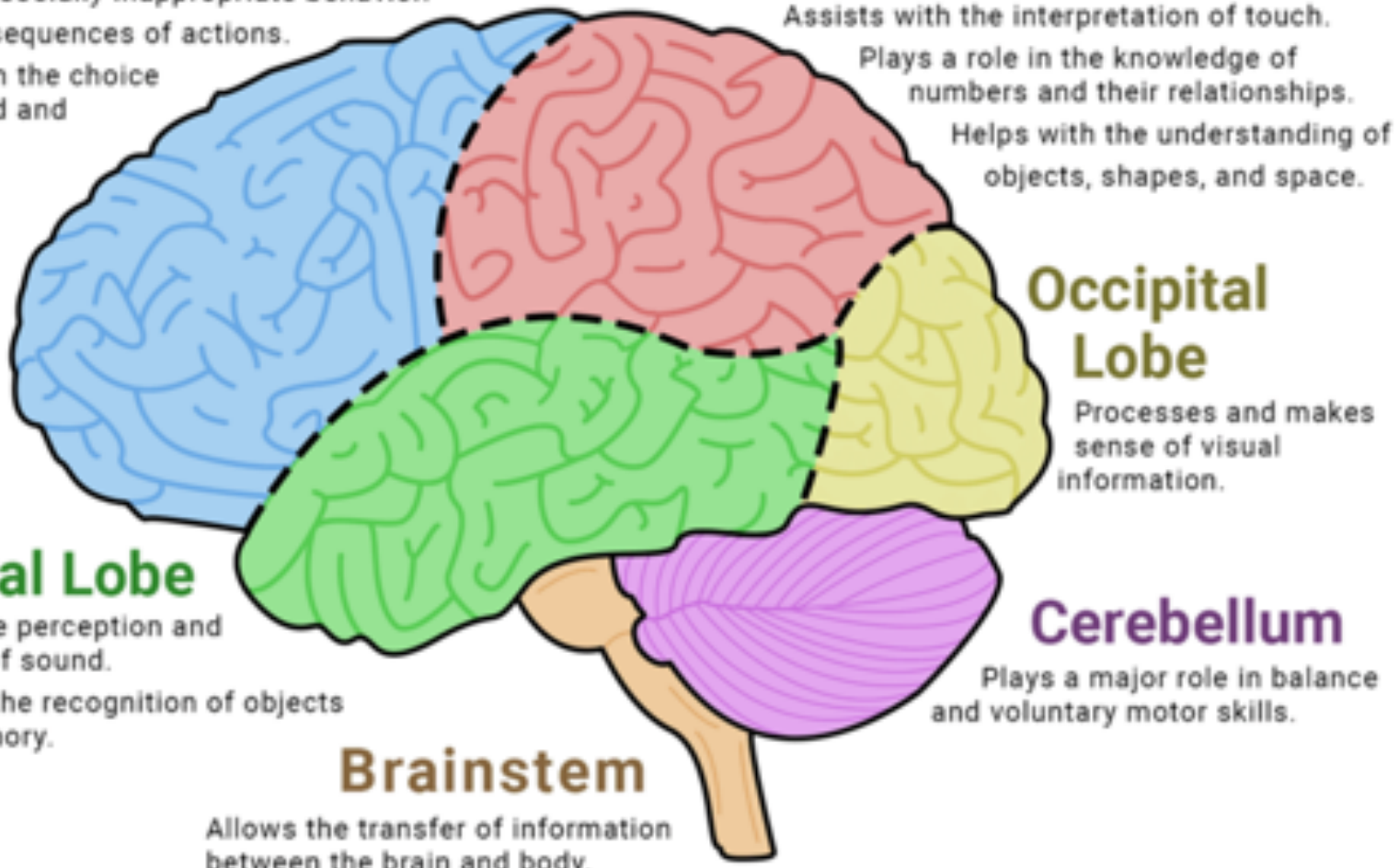
Cerebellum

Plays a major role in balance and voluntary motor skills.

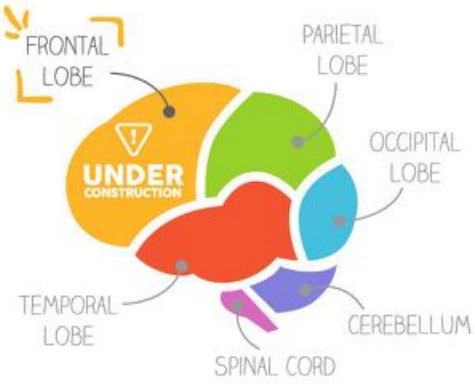
Brainstem

Allows the transfer of information between the brain and body.

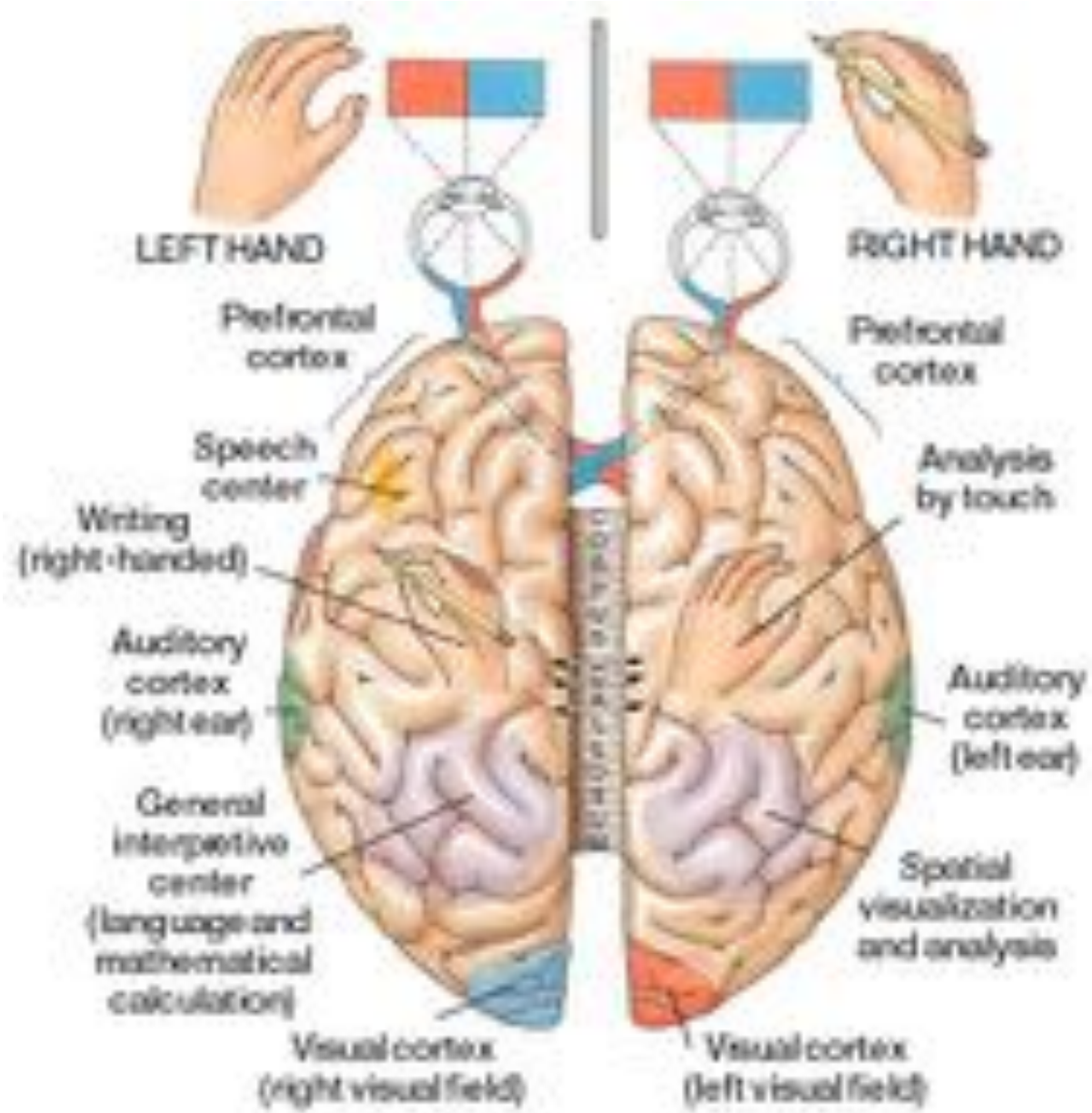
Plays a role in automatic functions such as the heartbeat and breathing.



The Teen Brain



人脑的左右半球

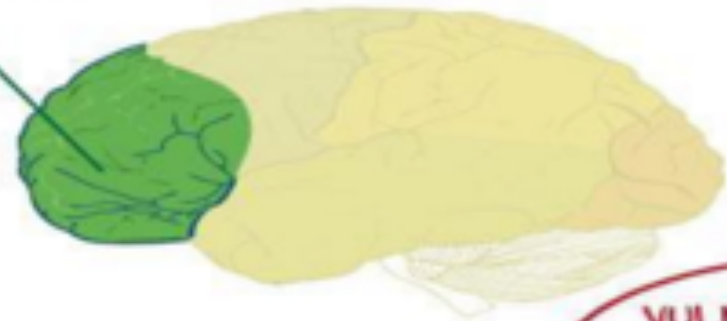

LEFT HAND
RIGHT HAND
Prefrontal cortex
Prefrontal cortex
Speech center
Writing (right-handed)
Analysis by touch
Auditory cortex (right ear)
Auditory cortex (left ear)
General interpretive center (language and mathematical calculation)
Spatial visualization and analysis
Visual cortex (right visual field)
Visual cortex (left visual field)

TEEN'S BRAIN

MAY NOT FULLY DEVELOP UNTIL YOUR MID-2 OS

PREFRONTAL CORTEX

ACTS AS THE CEO OF THE BRAIN. HAS BEEN IMPLICATED IN PLANNING COMPLEX COGNITIVE BEHAVIOR. PERSONALITY EXPRESSION. DECISION MAKING. AND MODERATING SOCIAL BEHAVIOUR.



THE LAST PART OF THE BRAIN TO DEVELOP IS THE PRE-FRONTAL CORTEX

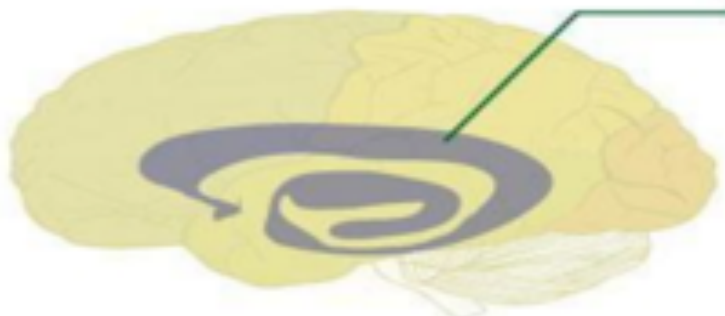
VULNERABLE TO DANGEROUS BEHAVIORS AND SERIOUS MENTAL DISORDERS

THE MOST SIGNIFICANT CHANGE TAKING PLACE IN AN ADOLESCENT BRAIN IS THE INCREASE IN COMMUNICATIONS AMONG GROUPS OF NEURONS

THE DEVELOPMENT OF HORMONE-FUELED LIMBIC SYSTEM BEGINS BETWEEN AGES 10 TO 12 AND MATURES OVER THE NEXT SEVERAL YEARS

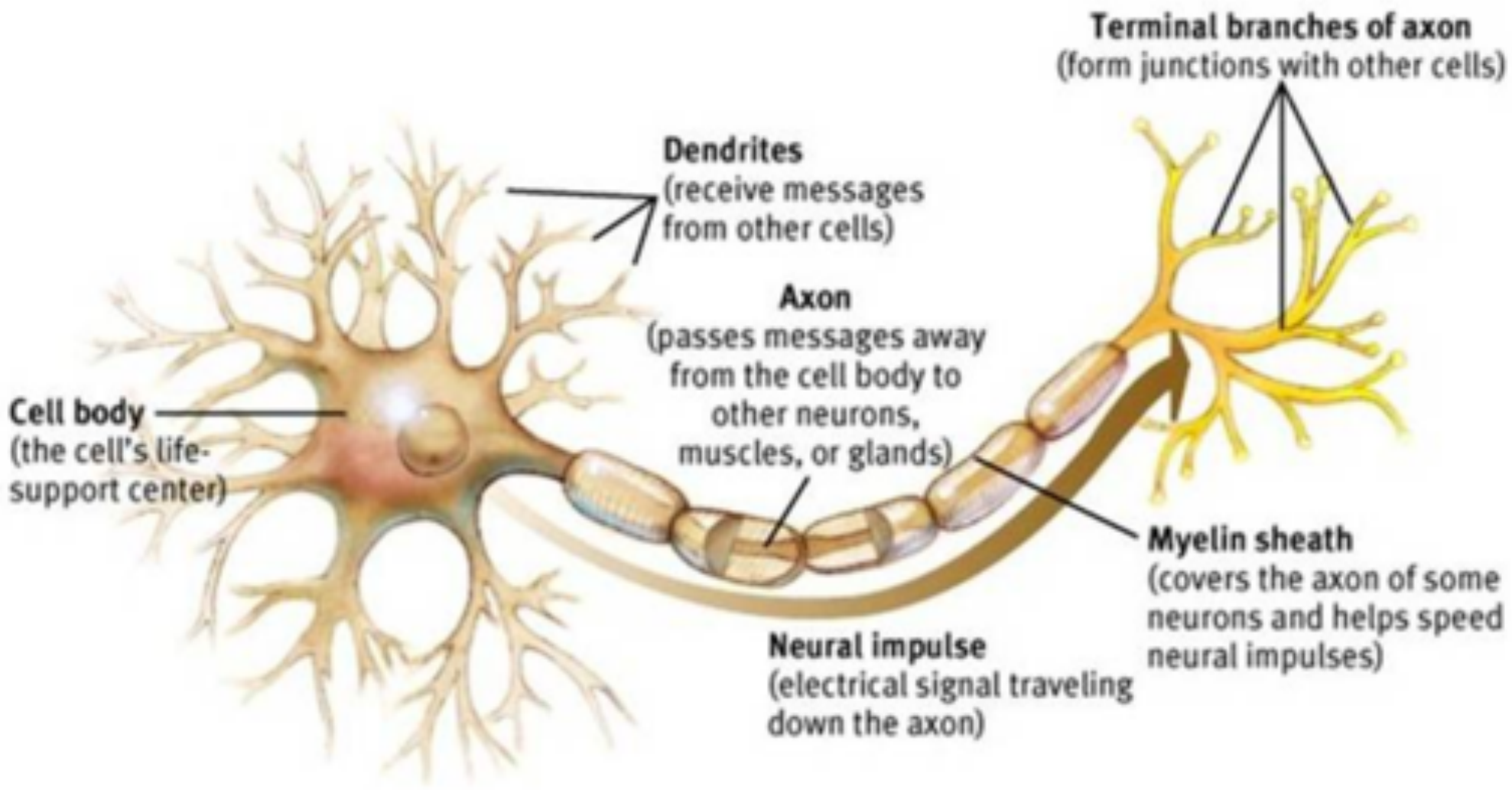
LIMBIC SYSTEM

SUPPOERTS EMOTION. BEHAVIOR. MOTIVATION. LONG-TERM MEMORY. AND OLFACTION

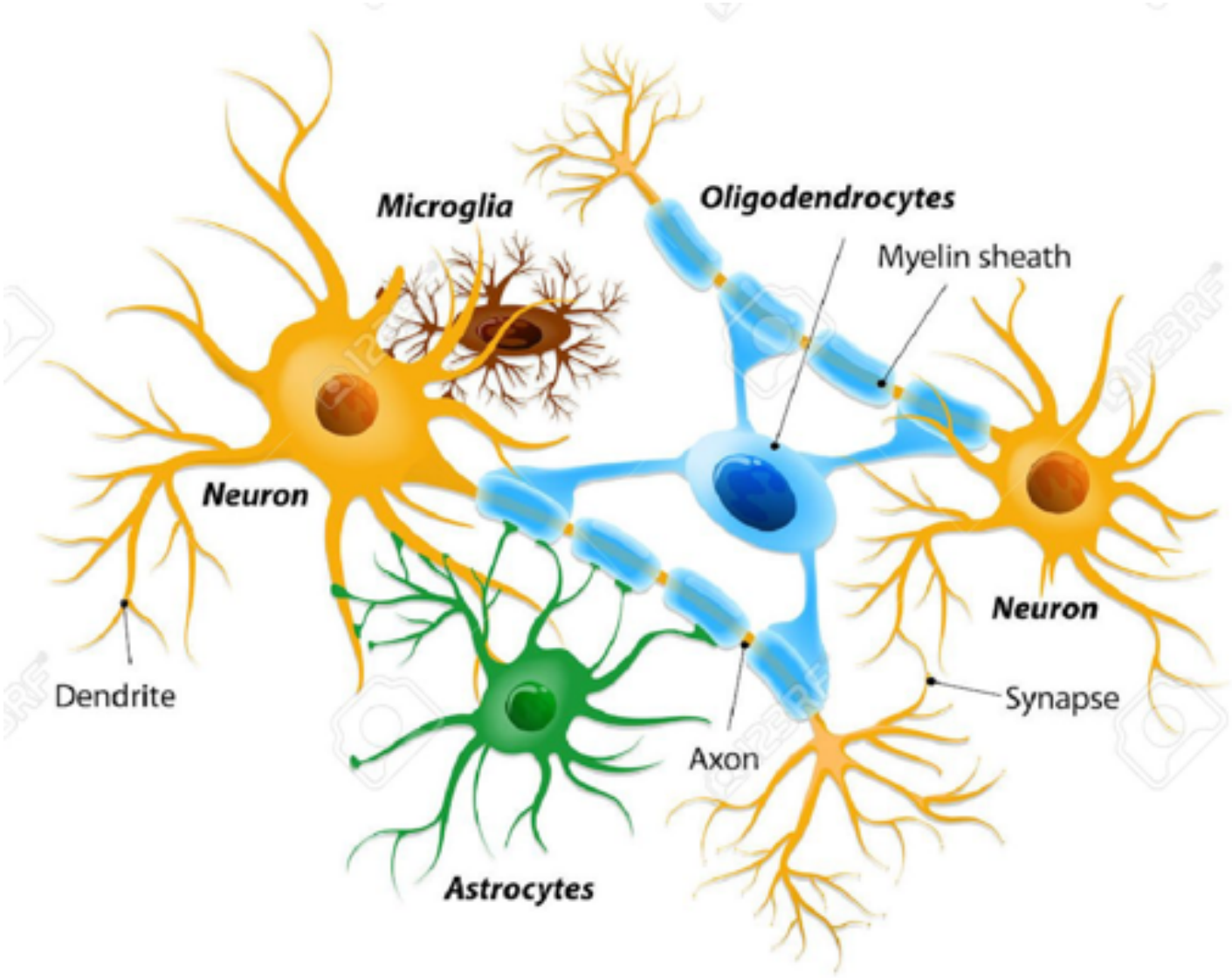


DEVELOPINGHUMANBRAIN.ORG

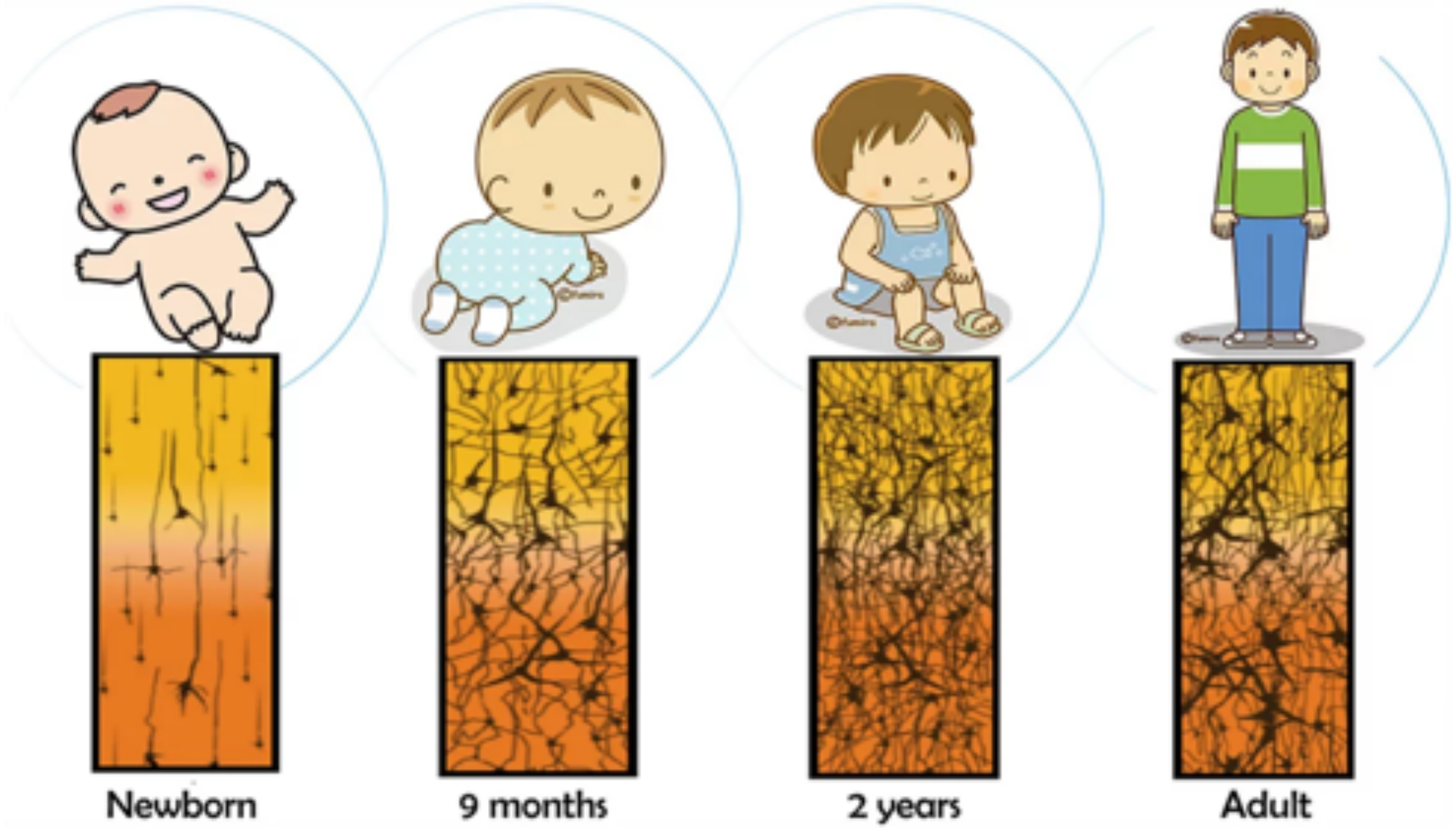
人脑的组成 Neuron



人脑的组成 Neuroglial Cells



人脑的成长 Brain Growth



Growth Mindset

What's past is prologue.

- 人脑是怎么工作的？
- 人脑是怎样体验情绪的，左右我们的快乐与悲伤的？
- MIND 脑海里有什么？
  - MEMORY 记忆
  - IMAGINATION 想象力
  - DETERMINATION 意志力
  - INSPIRATION 灵感
  - DECISION 抉择
  - INTELLIGENCE 智力就是你不知道怎么办时动用的东西
  - ...

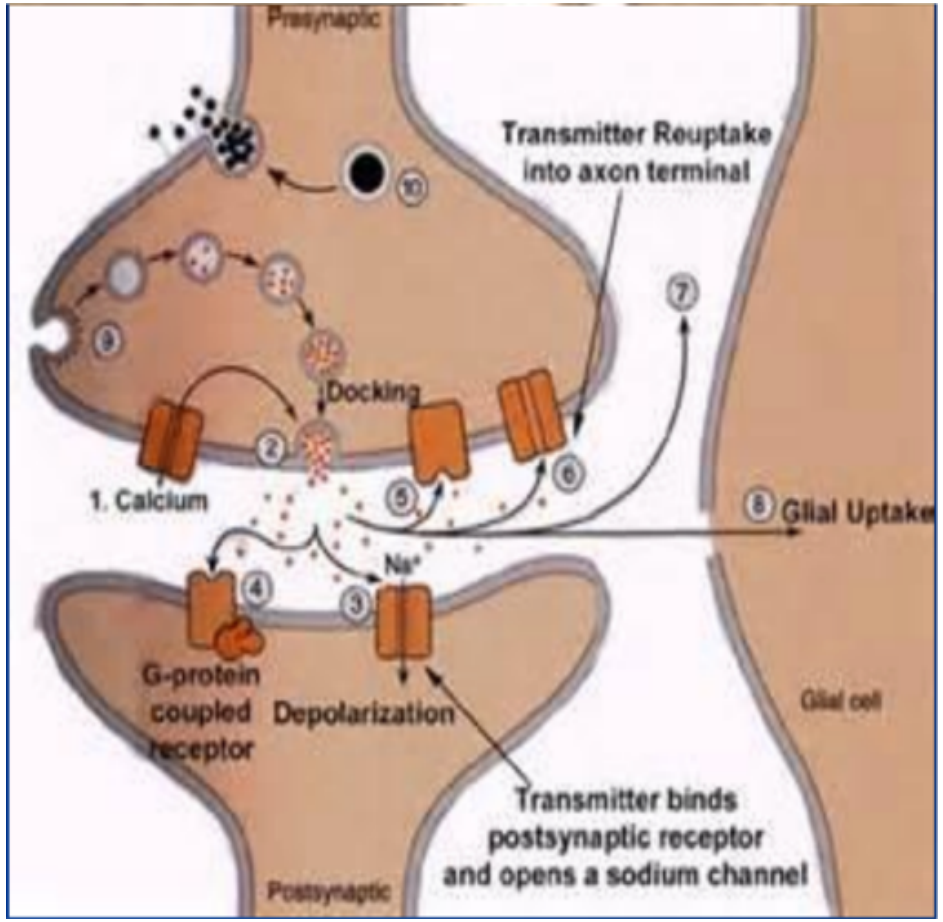
问题 questions

- 生命是什么时候开始起源的？
- 人脑有多重？
- 人脑里的神经胶质细胞的数量是神经元细胞的多少倍？
- 人脑里的前额页到几岁之后才会成长完成？

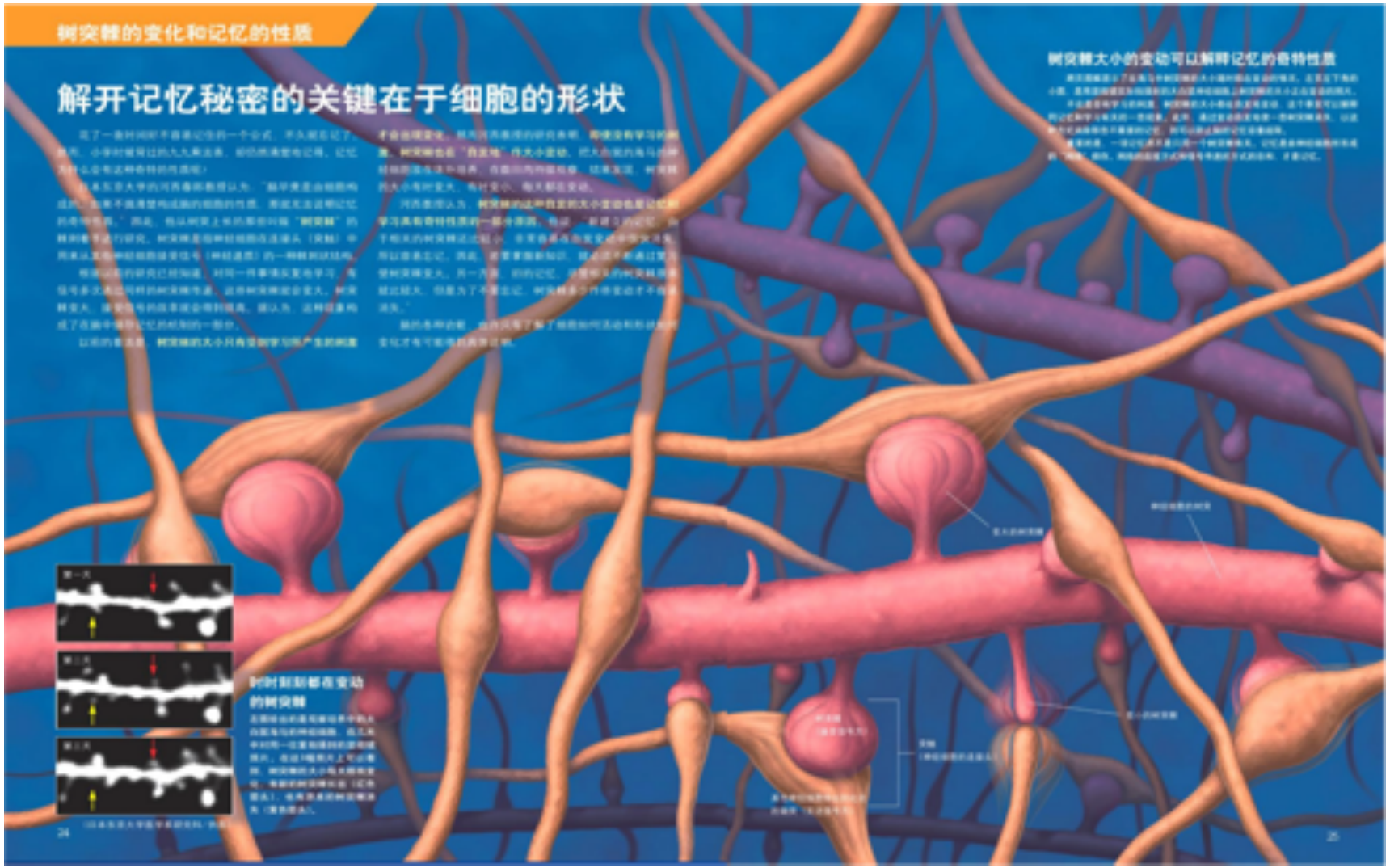
Appendix

突触 Synapse

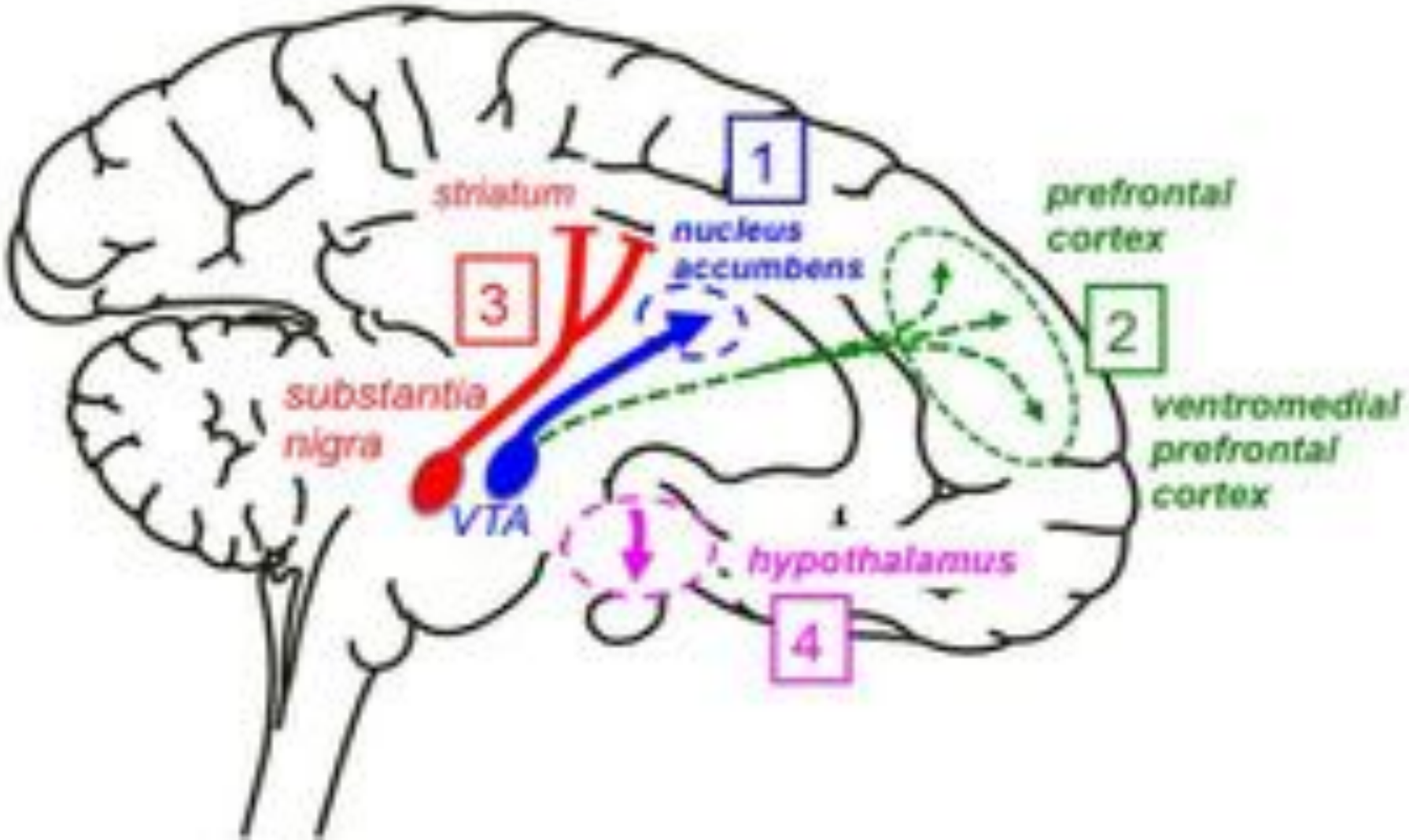
- Sherrington C.S, (1857-1952)，1932年获诺 贝尔生理或医学奖
- 提出了突触的概念，认为神经元的末稍分支与 另一个神经元胞体或树突仅仅是接触，在原生 质上并不连续。



记忆


树突棘的变化和记忆的性质
解开记忆秘密的关键在于细胞的形状
树突棘大小的变动可以解释记忆的奇特性质
时时刻刻都在变动的树突棘

多巴胺 Dopamine



独特之处 Uniqueness of Human Brain

1. cerebral cortex increased in size in evolution
2. forebrain is more folded to fit inside the skull
3. guided by the **Prefrontal Cortex**, the center of logical responses, rather than the Limbic System with the emotional response.