



## POLYU STEM LECTURE SERIES



# Language and the brain - a few classical cases 語言與大腦——幾個經典案例

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香港理工大學 中文及雙語學系

Dr. Zhang Caicai 張愷愷博士

# 大綱

1. 大腦的結構與功能
2. 幾個經典案例
  - 布洛卡失語症
  - 維尼克失語症
  - 失讀症
  - 失憶症
  - 性格改變
3. 現代腦成像技術
4. 小結

# 1. 大腦的結構與功能



還是



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# 1. 大腦的結構與功能

- 《靈樞·海論》：「腦為髓之海，其輸上在於其蓋，下在風府。」
- 「髓海有作，則輕勁多力，自過其度；髓海不足，則腦腦轉耳鳴，脛酸眩冒，目無所見，懈怠安臥。」



<https://www.youtube.com/watch?v=C8gz4B9RDzI>

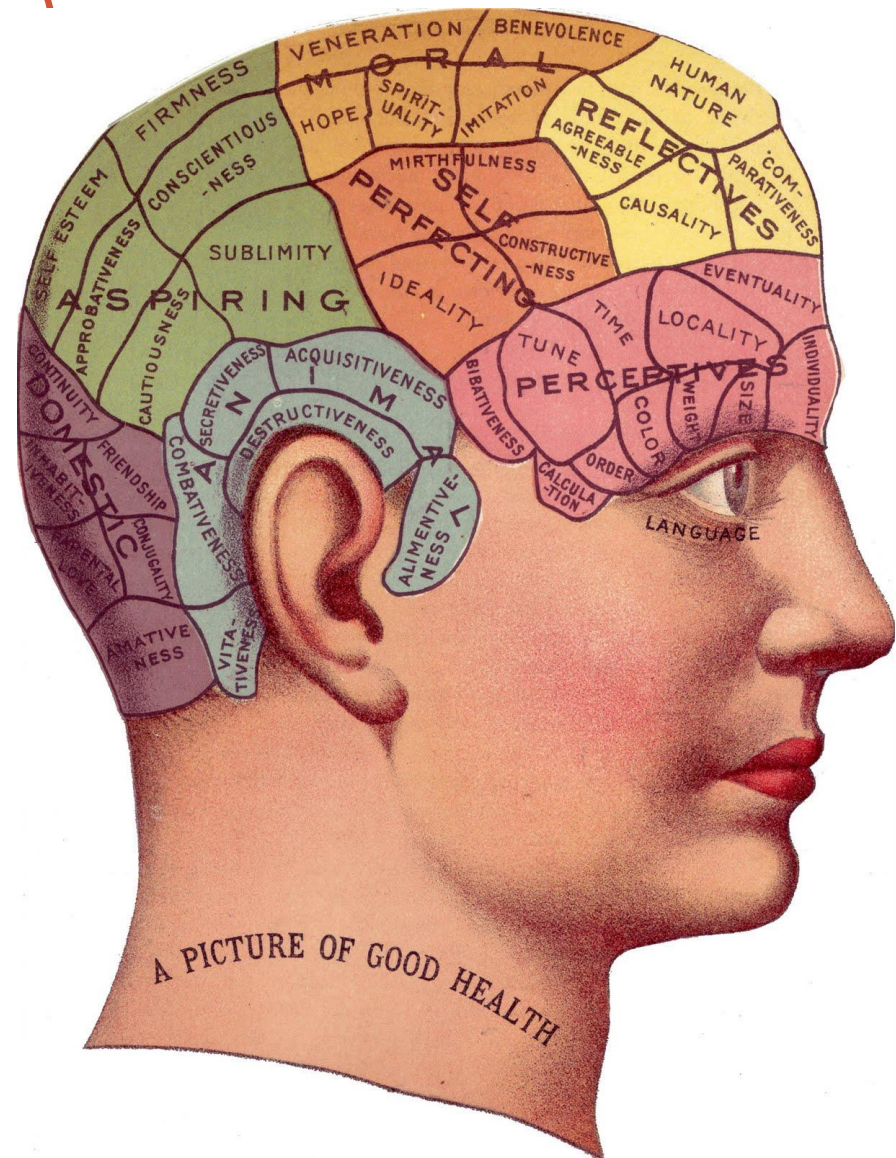


<http://www.culture24.org.uk/science-and-nature/art465847-Angela-Palmer-opens-portrait-Artist-Brain-Scottish-National-Portrait-Gallery>

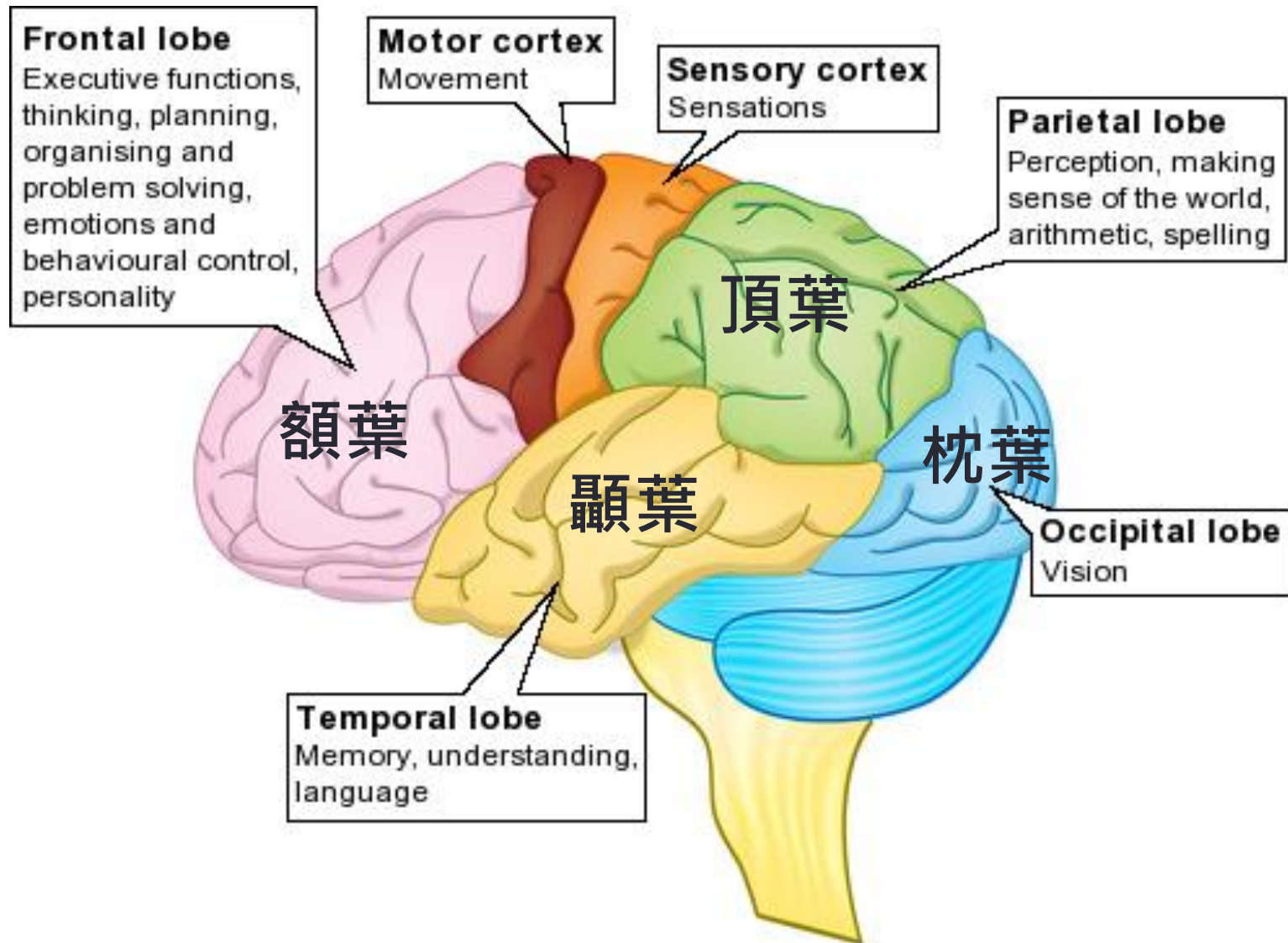
# 顱相學 (Phrenology)

- **Franz Joseph Gall (1758-1828)**

- “Show me the forces of the soul, and I will find the organ and the seat thereof.”



# 1. 大腦的結構與功能



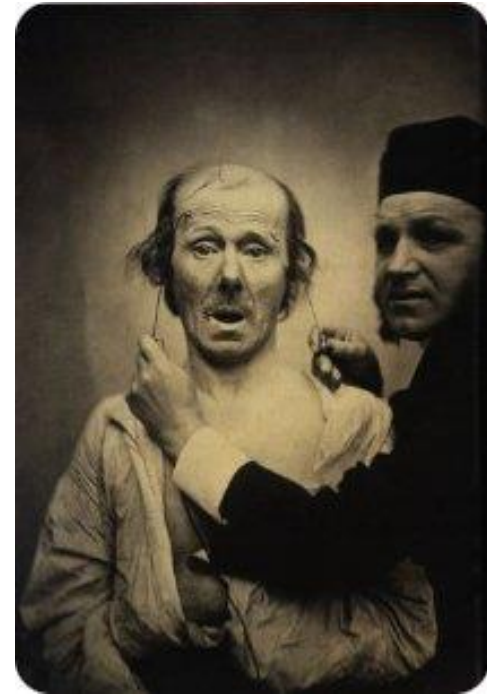
## 2. 布洛卡失語症 ( Broca's aphasia )

- **Leborgne**

- 「Tan」先生
- 除了「Tan」之外無法清晰說其他字

- **Lelong**

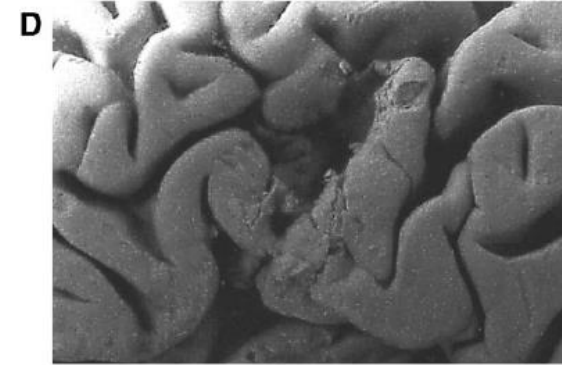
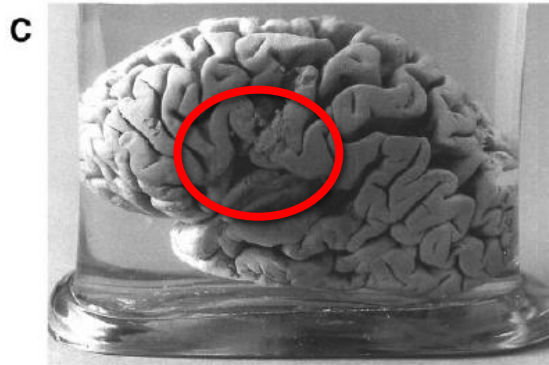
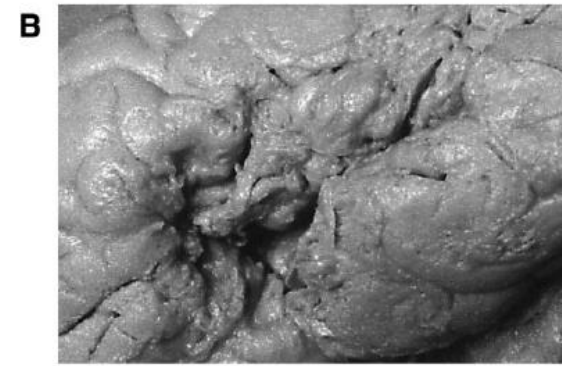
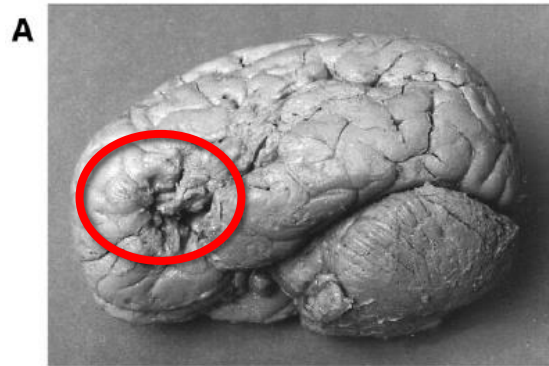
- 同樣有說話障礙
- 只能夠說出五個字：「Yes」, 「No」, 「Three」, 「Always」, and 「Lelo」 (a mispronunciation of his own name).



Paul Pierre Broca  
(1824-1880)

# 布洛卡失語症 ( Broca's aphasia )

- **表達型失語症**
  - 說話緩慢而且不流利
  - 缺乏語法
- 左腦的額下回後側損傷





# 韋尼克失語症 ( Wernicke's aphasia )

- 例子:

- What brings you to hospital?
- Boy, I'm sweating, I'm awful nervous, you know, once in a while I get caught up, I can't mention the **tarripoi**, a month ago, quite a little, I've done a lot well, I impose a lot, while, on the other hand, you now what I mean, I have to run around, look it over, **trebbin** and all that sort of stuff.



Carl  
Wernicke  
(1848-1905)

# 韋尼克失語症 ( Wernicke's aphasia )

- 接受型失語症
  - 說話流利但是沒有意義
  - 自造新詞
  - 對自己的症狀不自知
- 左腦顳上回後側損傷



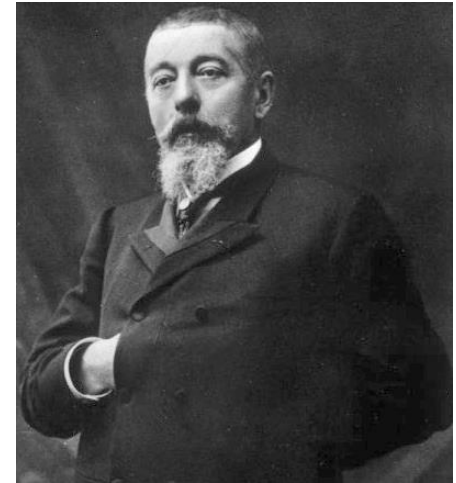
# 大腦中的核心語言區域

- 布洛卡區：語言表達
- 維尼克區：語言理解

Broca type	Wernicke type
- 說話遲緩、吃力、不流暢	- 說話流暢但內容空洞
- 缺乏語法和虛詞	- 語法和虛詞正常
- 說的句子短	- 說的句子長度正常
- 理解一般沒有問題	- 有理解障礙
- 自知有障礙	- 對自己的障礙不自知

# 失讀症 ( Alexia )

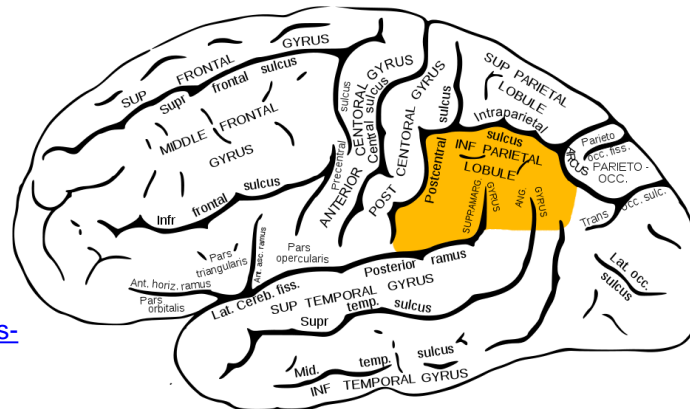
- Oscar C :
  - 退休商人
  - 有一天突然無法辨識字母
  - 不過仍然可以辨識不同的人與物件
- 純失讀症 ( Pure alexia )
  - 左腦的視覺皮層損傷
- 失讀症 + 失寫症 ( Alexia and Agraphia )
  - 左腦的Geschwind區



**Joseph-Jules Déjerine**  
1849-1917



<https://www.meridenct.gov/city-services/assistance/support-services-to-non-public-schools/abc-s-of-how-to-help-your-child/>

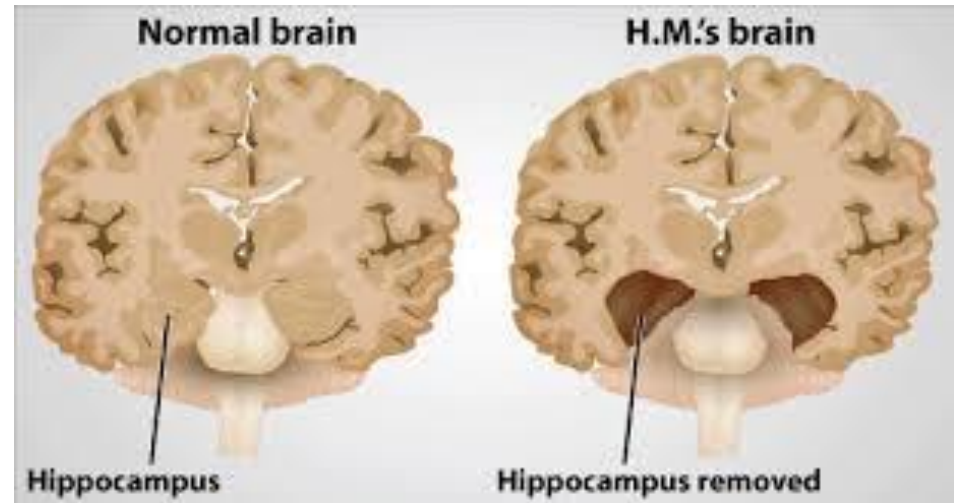


# 失憶症 ( amnesia )

- Henry Molaison
- 因癲癇緣故，切除了左右腦大部分的海馬體 ( Hippocampus )
- H.M. 從此無法再形成新的陳述性記憶 ( 關於新事件的記憶 )



1926-2008



# 性格改變

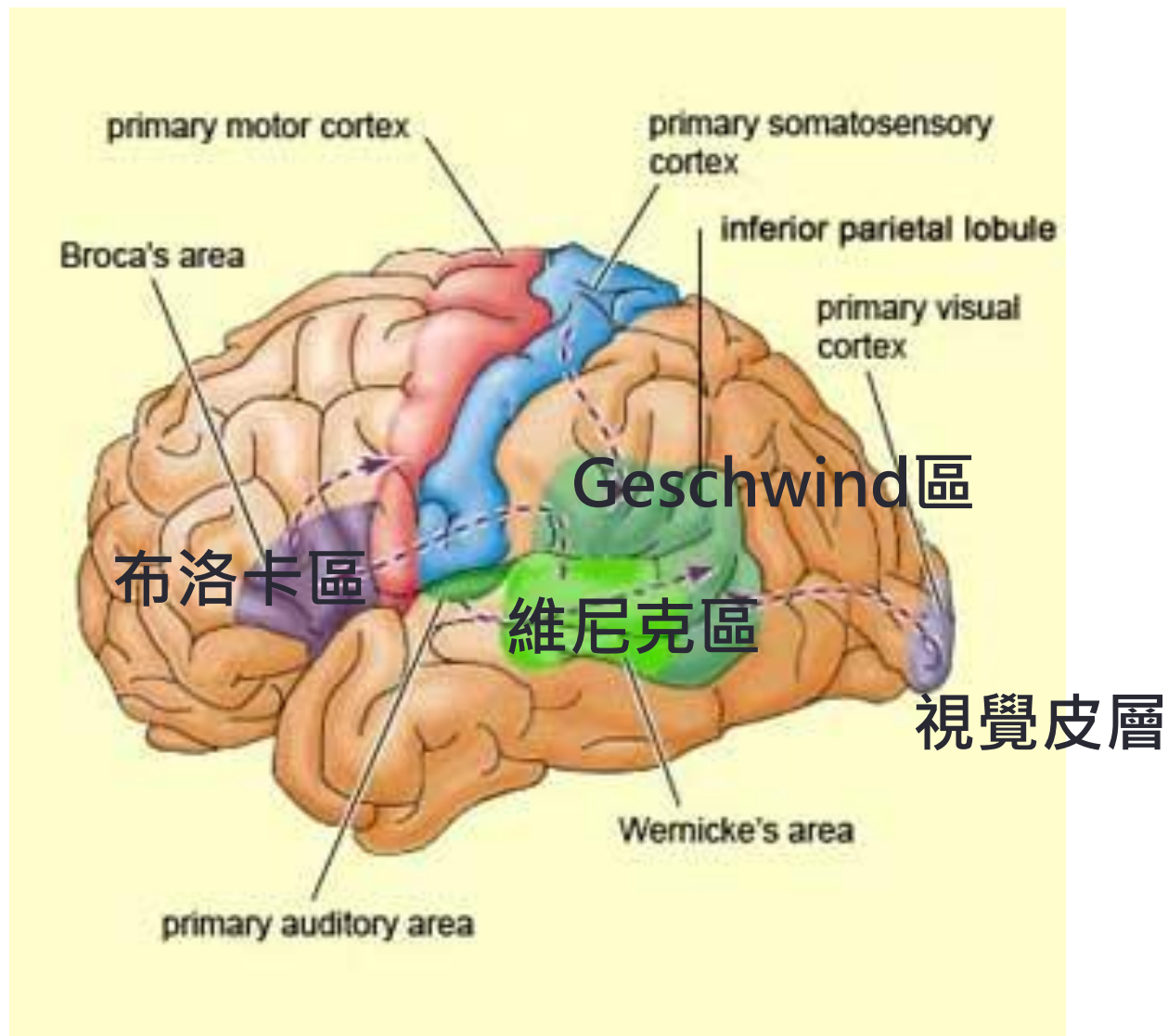
- Phineas Gage
  - 1848年9月13日，一場意外中一根鐵棍由下而上貫穿了Gage的左腦
  - 左腦額葉嚴重損傷
  - 從此性格大變
    - “The equilibrium or balance, so to speak, between his intellectual faculties and animal propensities, seems to have been destroyed... A child in his intellectual capacity and manifestations, he has the animal passions of a strong man.” (Dr. J. M. Harlow)



1823-1860



# 大腦中的語言區域



# 其他腦區

- 長期記憶
  - 海馬體 ( Hippocampus )
- 性格
  - 額葉 ( Frontal lobe )

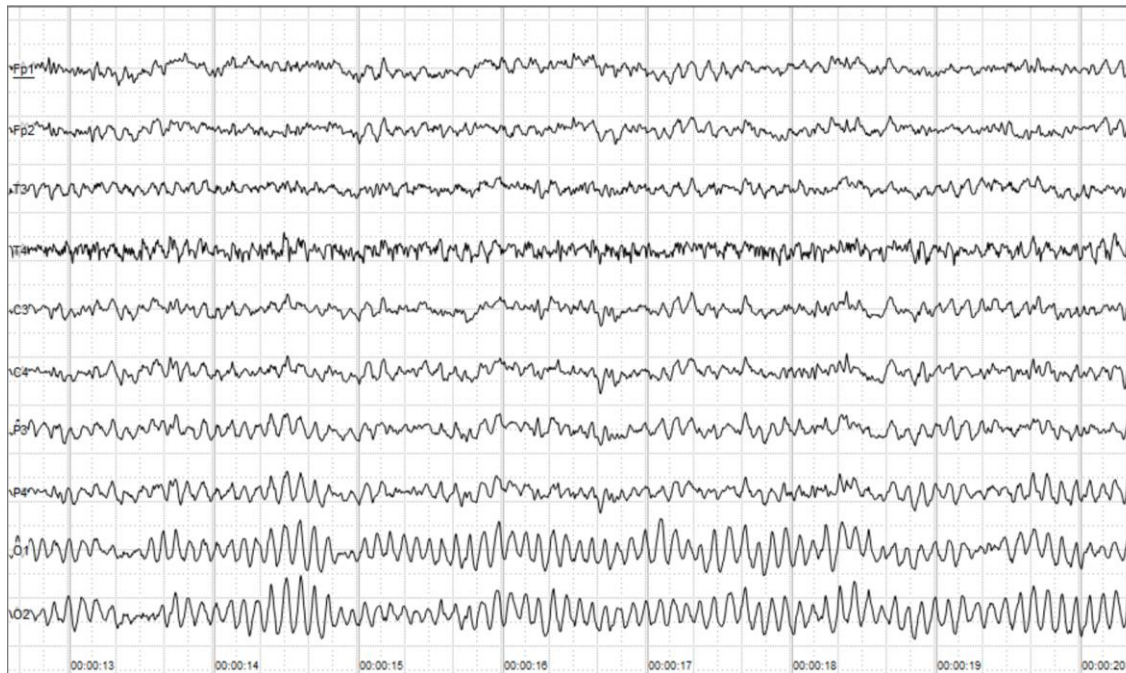


## 但是.....

- 純粹根據個別案例去理解腦部功能並不完善
  - 通常受損腦區範圍大；
  - 大腦損傷後患者可能會逐漸康復；
  - 有些案例（如癲癇）可能本身大腦發育與結構會與正常人不同。
- 現代腦成像技術
  - 腦電圖（Electroencephalography）
  - MRI（Magnetic Resonance Imaging）
  - 檢測正常人在正常狀態下表達和理解語言時的大腦活動。

# 3. 現代腦成像技術

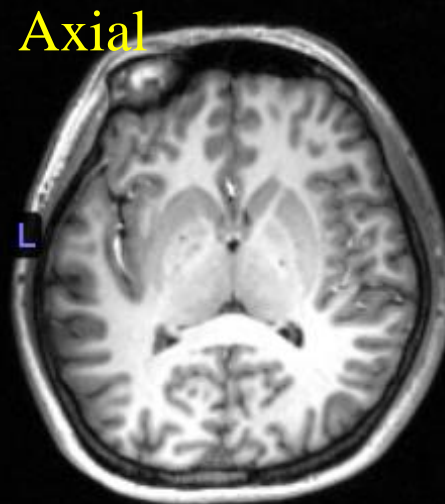
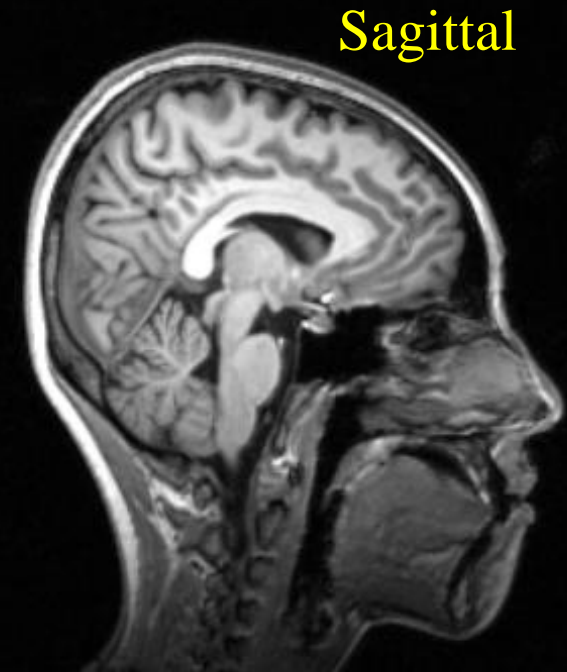
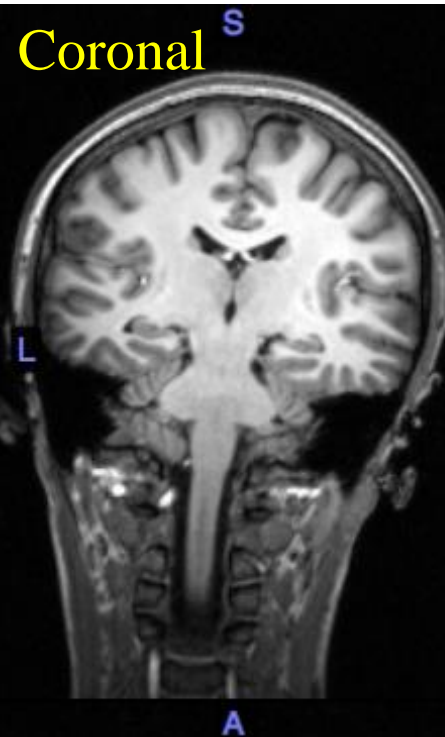
- 腦電圖 ( Electroencephalography )
  - 用電極於腦外記錄腦內的電流變化



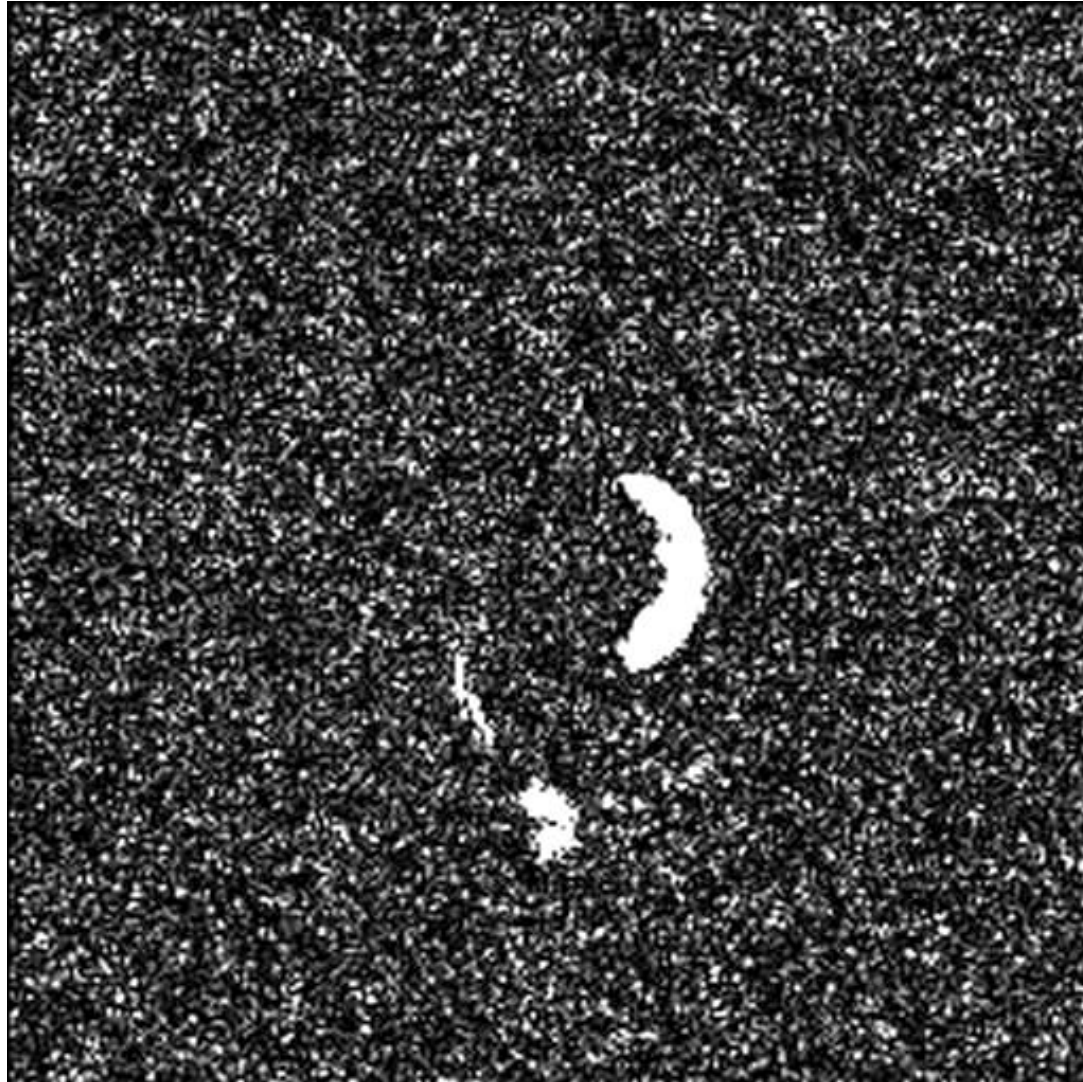
<https://en.wikipedia.org/wiki/Electroencephalography>

### 3. 現代腦成像 技術

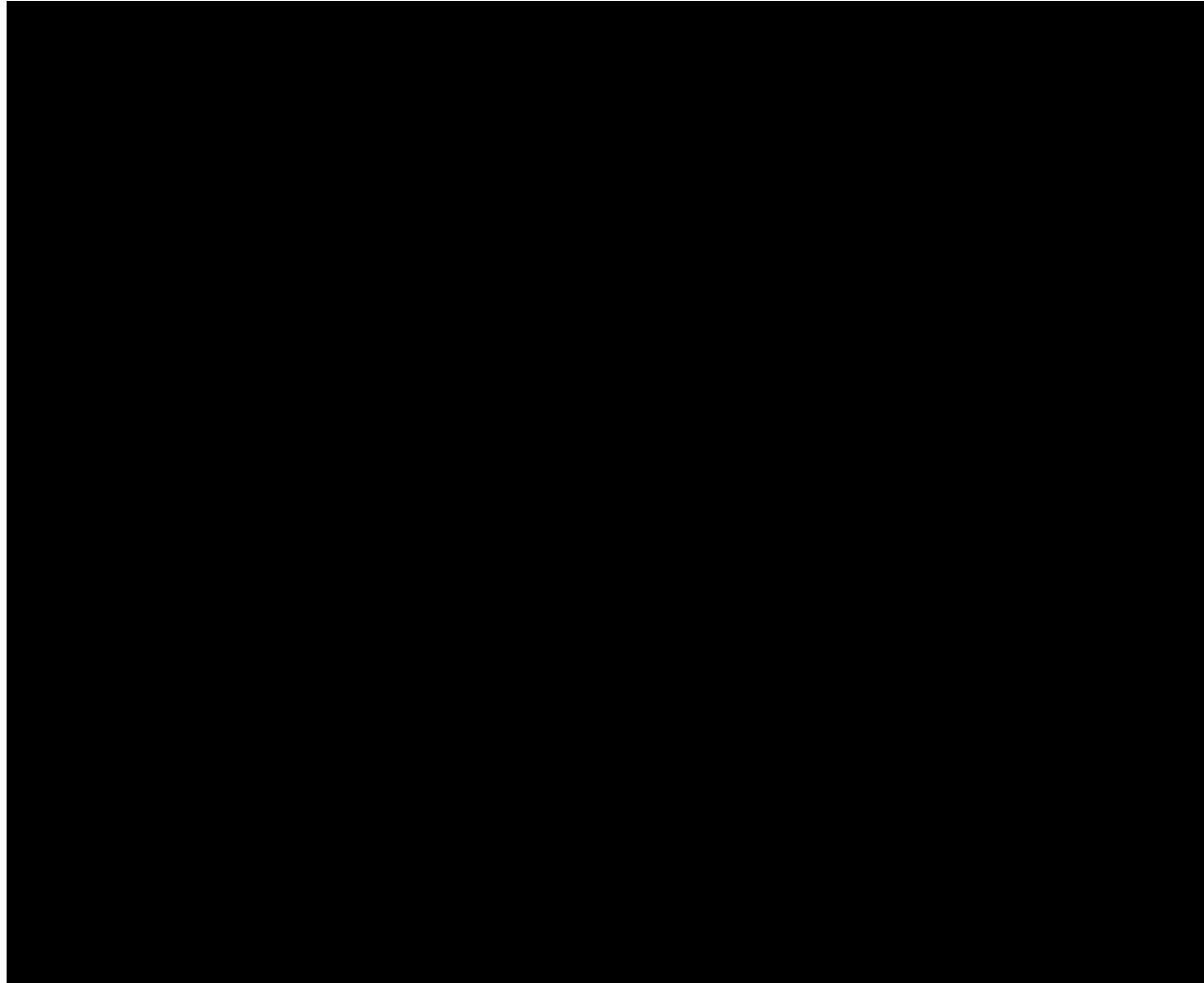
- MRI ( Magnetic Resonance Imaging )
- 磁力共振成像



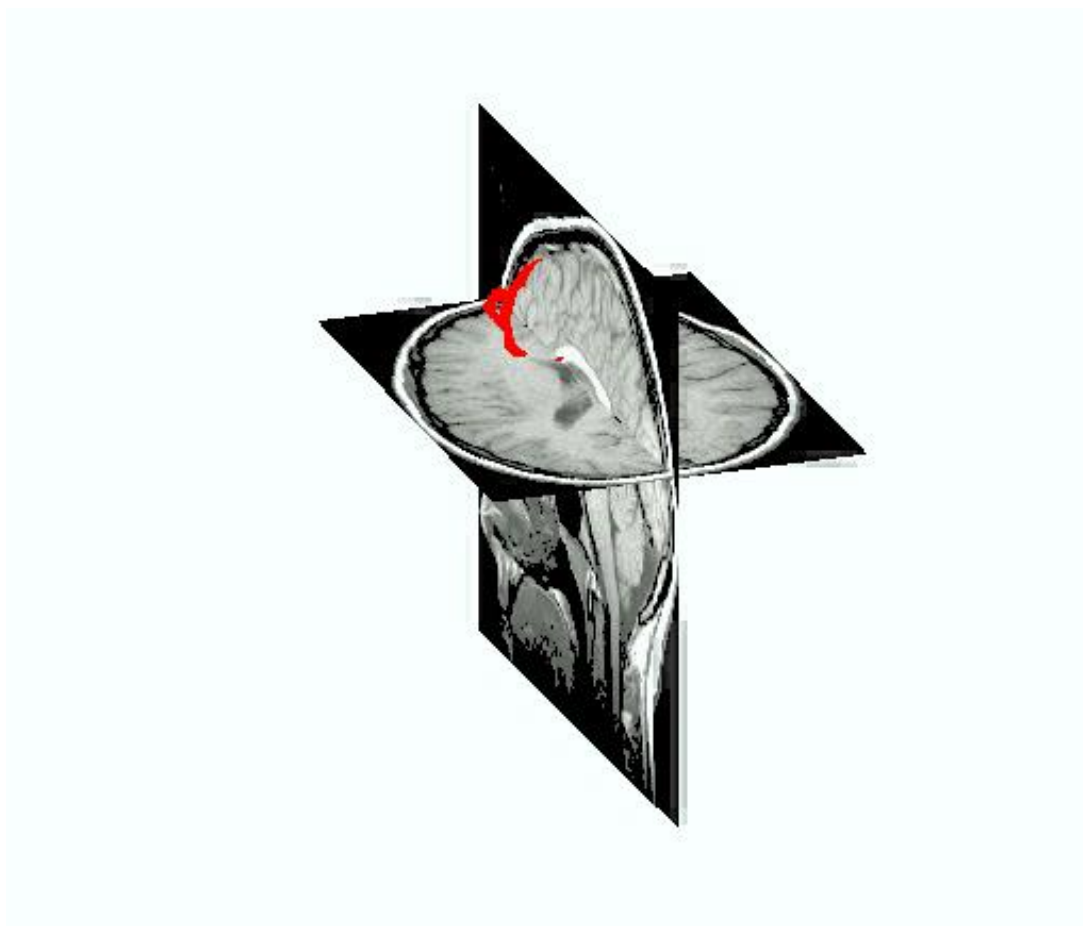
# 結構MRI



# 功能MRI



# 擴散張量磁共振造影 (DTI)



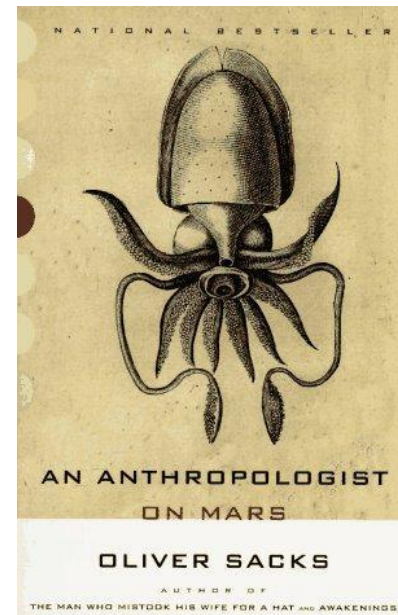
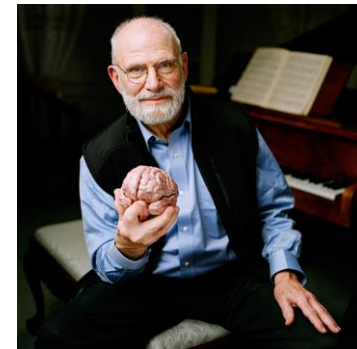
## 4. 小結

- 大腦的結構與功能
  - 四個腦葉：額葉、頂葉、顳葉和枕葉
- 幾個經典案例
  - 表達與接受型失語症
  - 失讀症
  - 失憶症
  - 性格改變
- 現代腦成像技術
  - 腦電圖 ( Electroencephalography )
  - MRI ( magnetic resonance imaging )

# 一些相關的電影、電視和書籍



## Oliver Sacks

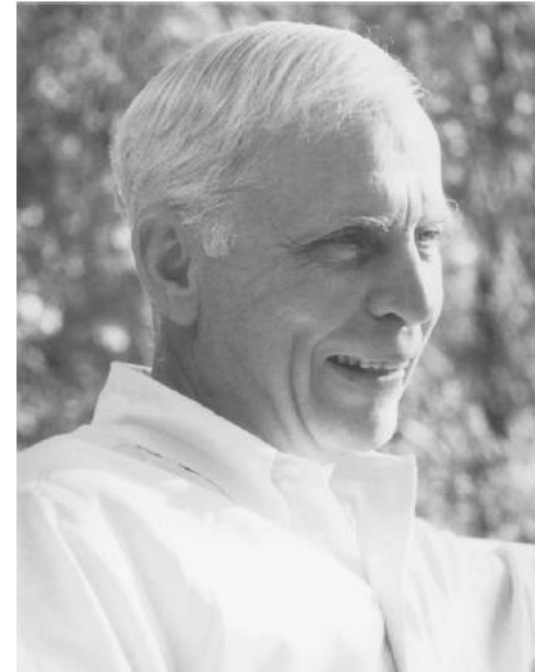




# 最後的話.....

- “Brain science is extremely important, independently from its importance in medicine. It provide the opportunity to **understand ourselves**, to understand how our brain functions, **how we remember**, **how we generate emotions ...**”

-- Mountcastle, 1998



Vernon Mountcastle,  
father of  
neuroscience.

# 最後的話.....



<http://sun.yatsen.gov.tw/learn/fight/html/info/mb24.htm>

Contact me here:

Dr. Caicai Zhang

[caicai.zhang@polyu.edu.hk](mailto:caicai.zhang@polyu.edu.hk)

Q & A



[http://www.sohu.com/a/113259803\\_391025](http://www.sohu.com/a/113259803_391025)