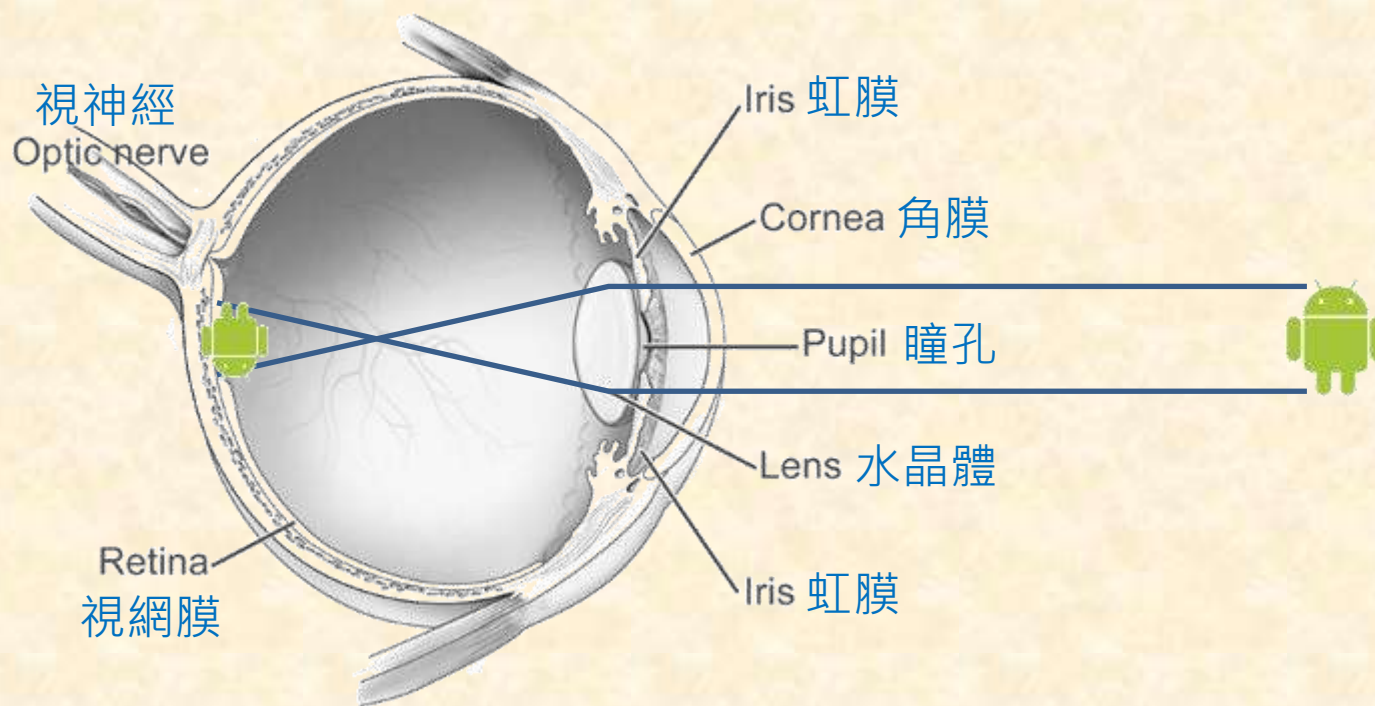


人工視網膜

Artificial Retina

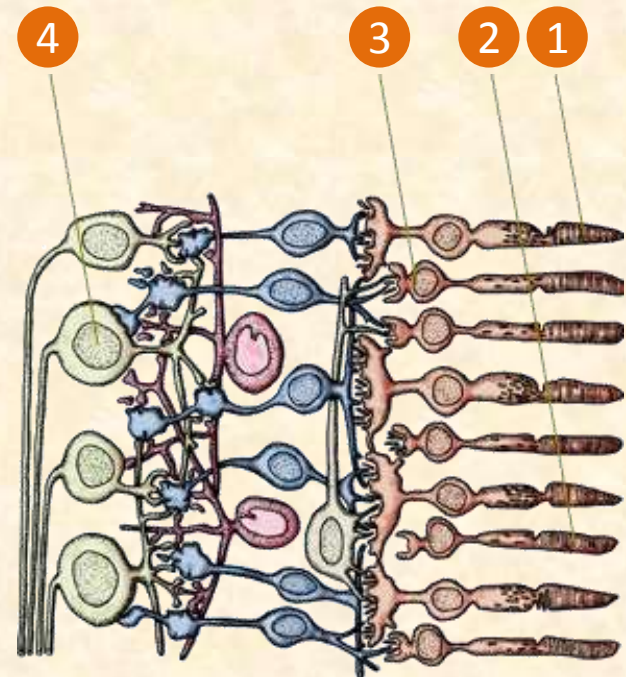
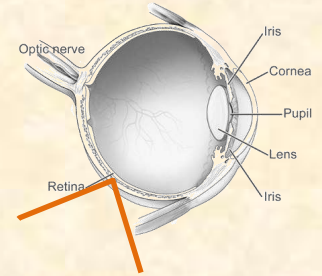
第一組
電機四 王瑋辰
羅弘諺
陳柏羽

視網膜成像原理



視網膜構造

- 感光細胞
 - 椎狀細胞(1)
高光度，色彩
 - 桿狀細胞(2)
低光度，明暗
- 雙極細胞(3)
- 神經節細胞(4)



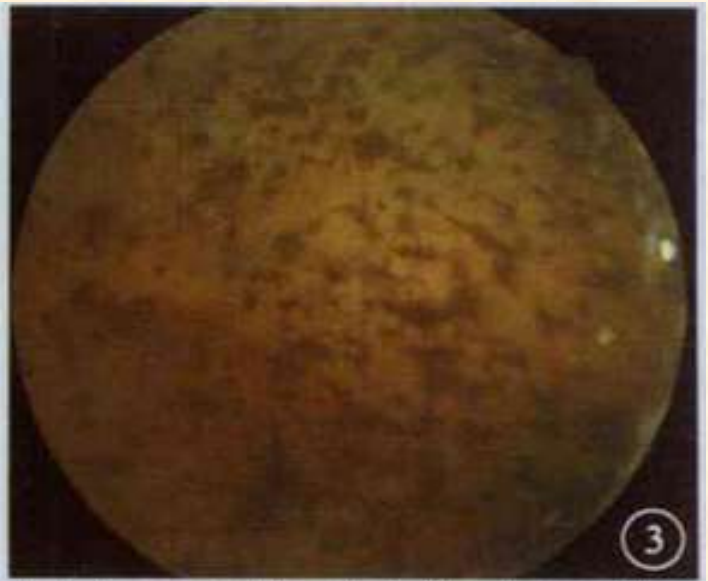
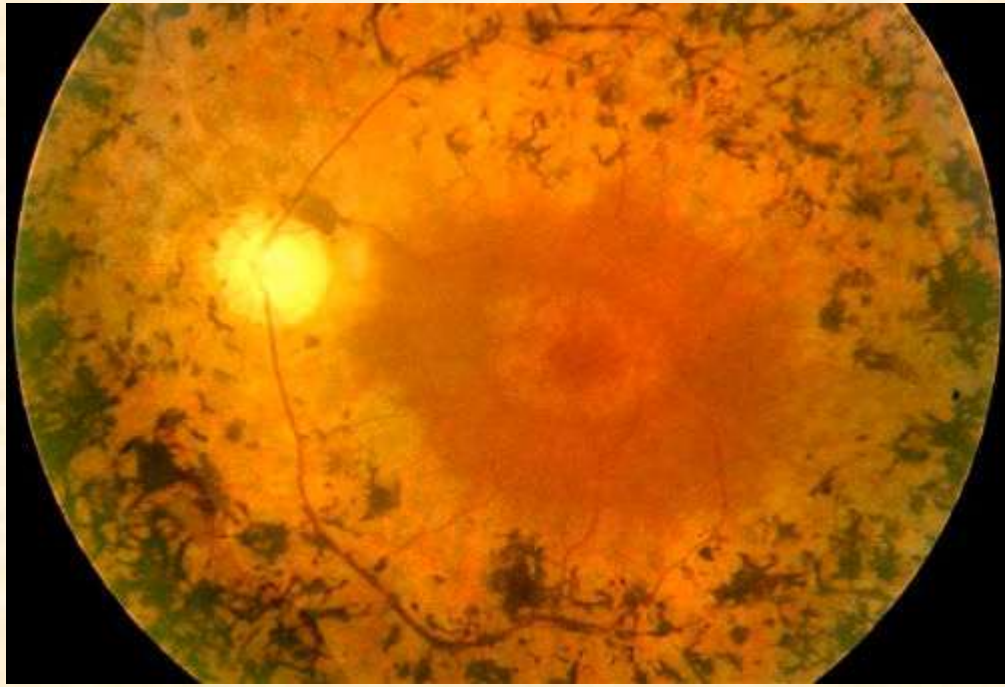
適用疾病

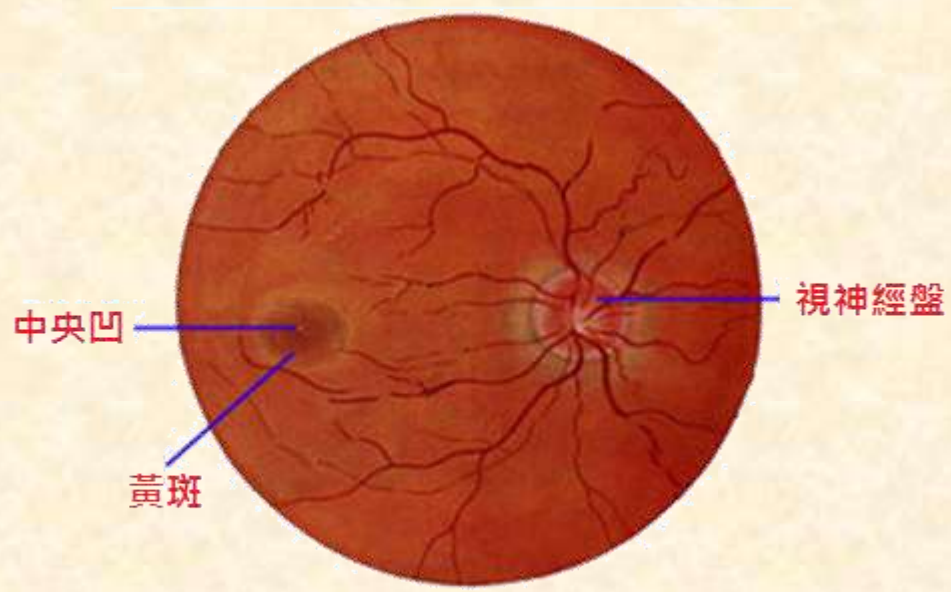
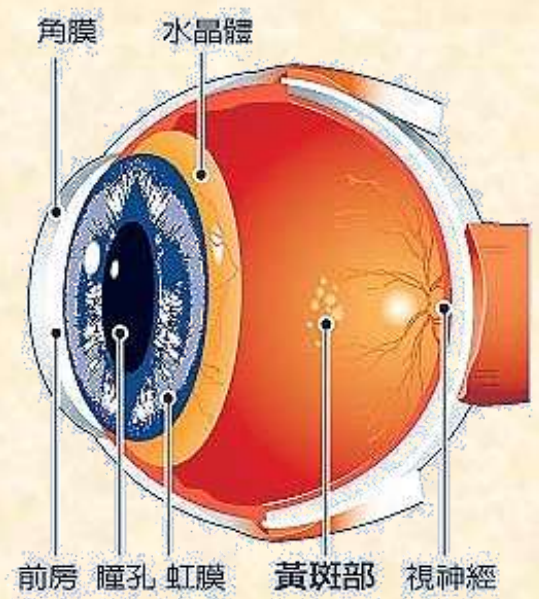
- 適用條件：
 - I. 非天生失明者
 - II. 殘存有視網膜細胞及良好視神經通道
- 目前使用對象：
 - I. 色素性視網膜炎(遺傳性疾病)
 - II. 老年性黃斑退化(高齡患者)

色素性視網膜炎

- 網膜色素變性(Retinitis Pigmentosa, RP)
- 多遺傳式之遺傳性疾病
- 尚無有效療法
- 桿狀細胞及錐狀細胞衰竭

- 早期：夜盲、周邊視野缺失
- 晚期：中心視野、完全失明

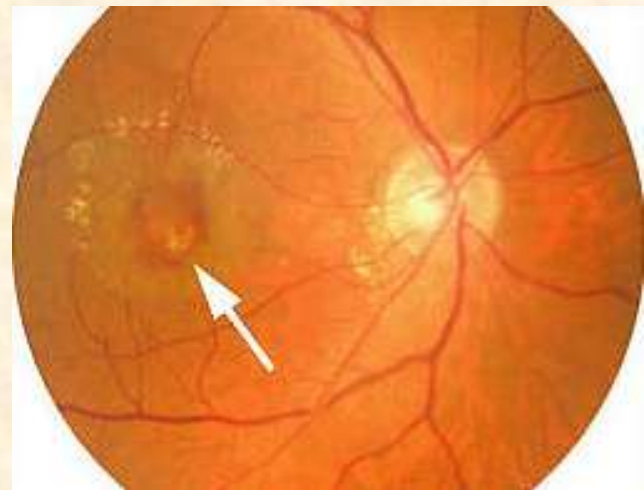
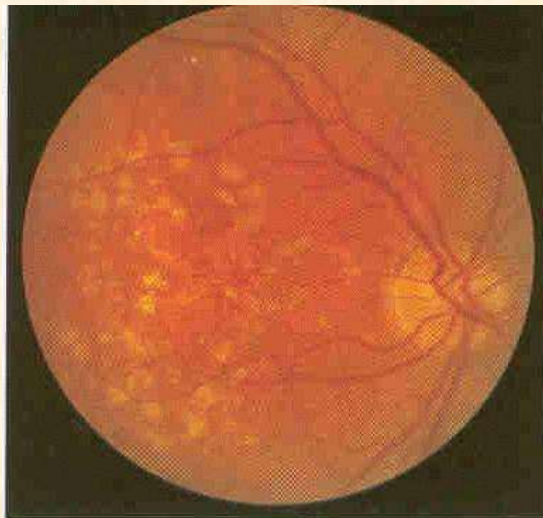




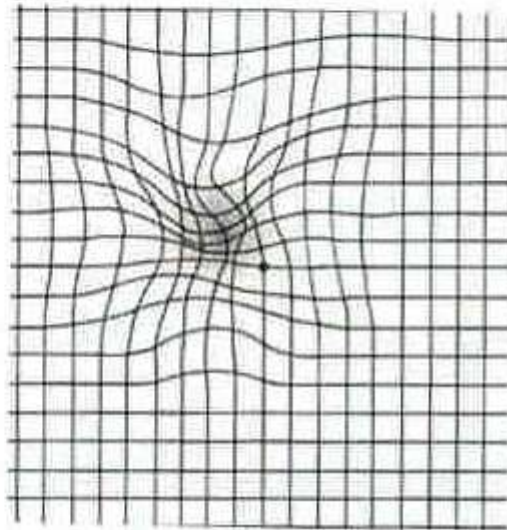
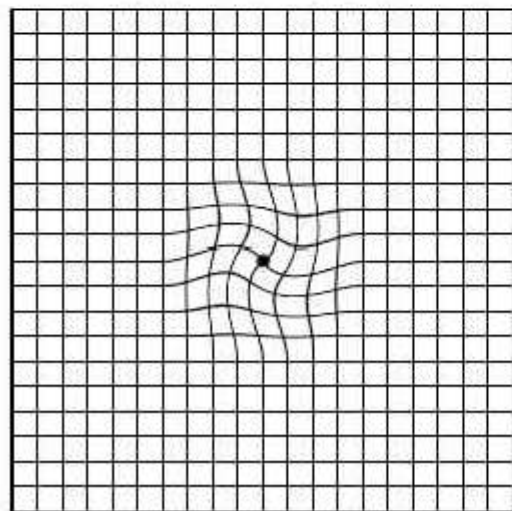
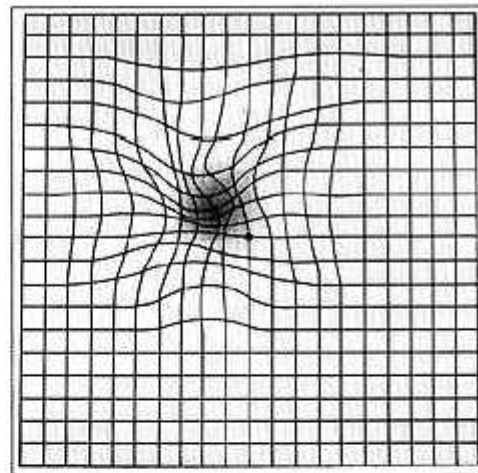
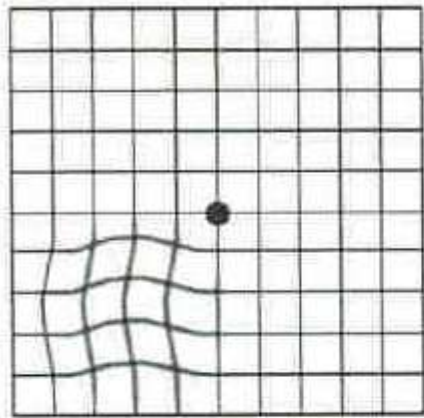
眼底鏡所見(右側)

老年性黃斑退化

- 視網膜之退化病變，好發於高齡患者
- 乾型：視力損害小，無法代謝之沉積物
濕型：損害大，脆弱之新生血管
- 影響中心視野
- 尚無有效療法



安格拉斯圖形



ASR

- Artificial Silicon Retina(人造矽視網膜)
- Second Sight - Argus
- 大腦學習機制
- 概念上與人工耳蝸相似

“使用電流刺激依然完好的神經，讓大腦接收到信號並認為感官仍在正常工作”

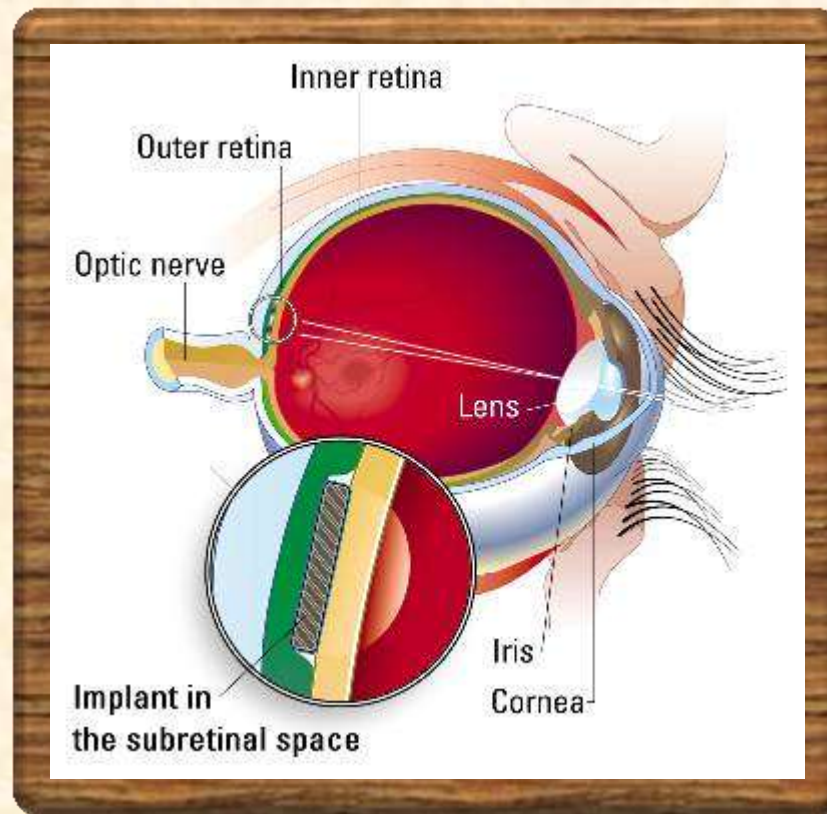
- 進展緩慢？

ASR

- Difficulties
 1. 微小的電極陣列
 2. 持續的電源供應
 3. 生物相容性的電極陣列
- Solutions
 1. 2mm (16 electrodes)
 2. 3500 self-contained solar cells
 3. 柔性襯底之人造視網膜生物微電極陣列

ASR

- 視網膜外補償技術
刺激神經細胞產生動作電位

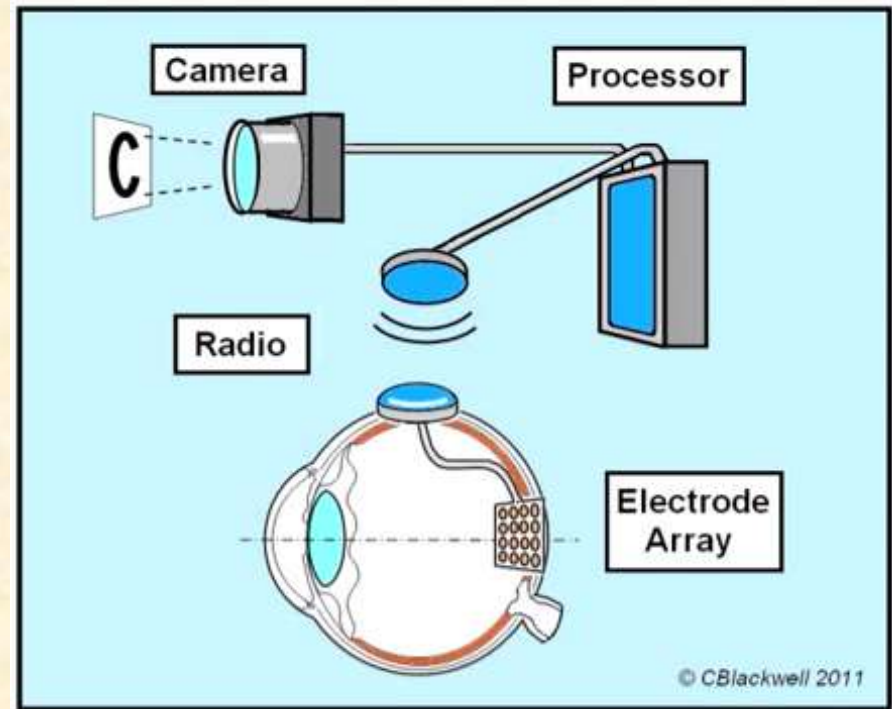
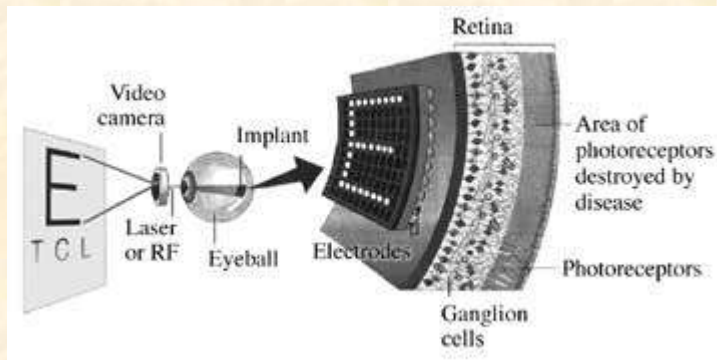


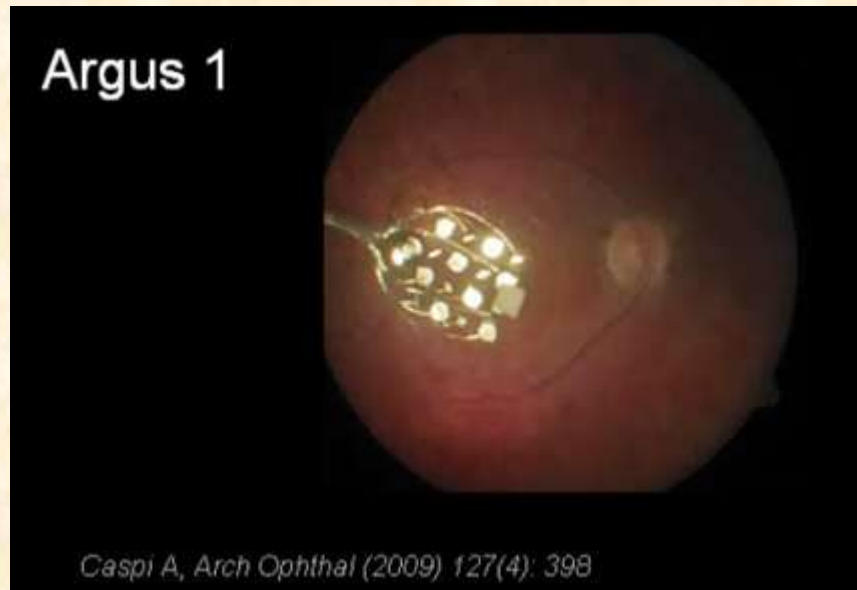

Second Sight



ASR

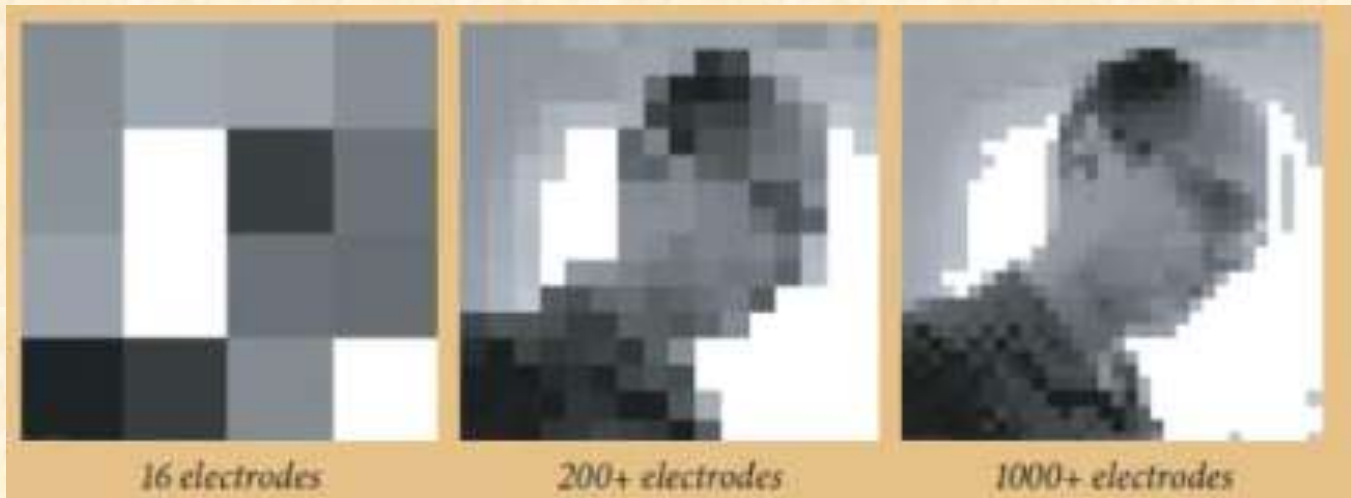
- 以Second Sight之Argus為例子
- 外部裝置：攝影機、處理器、天線
- 內部裝置：接收器、電極陣列



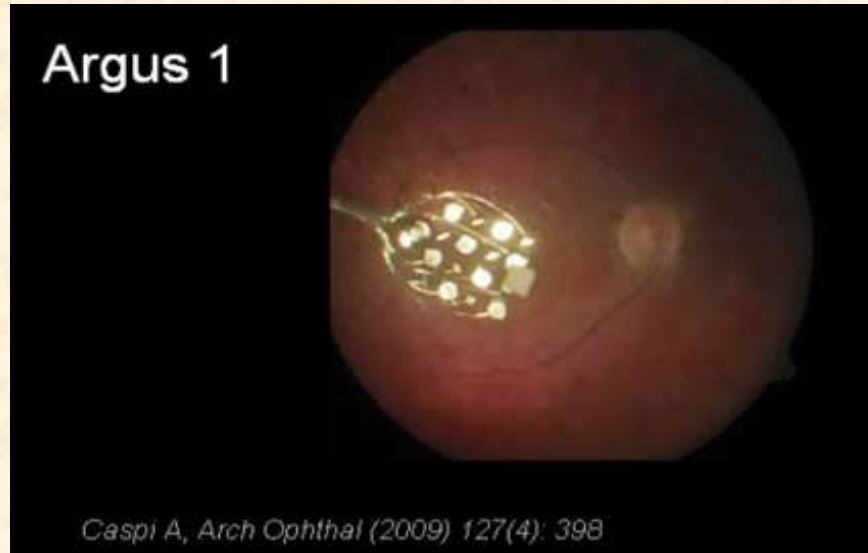


效果評估

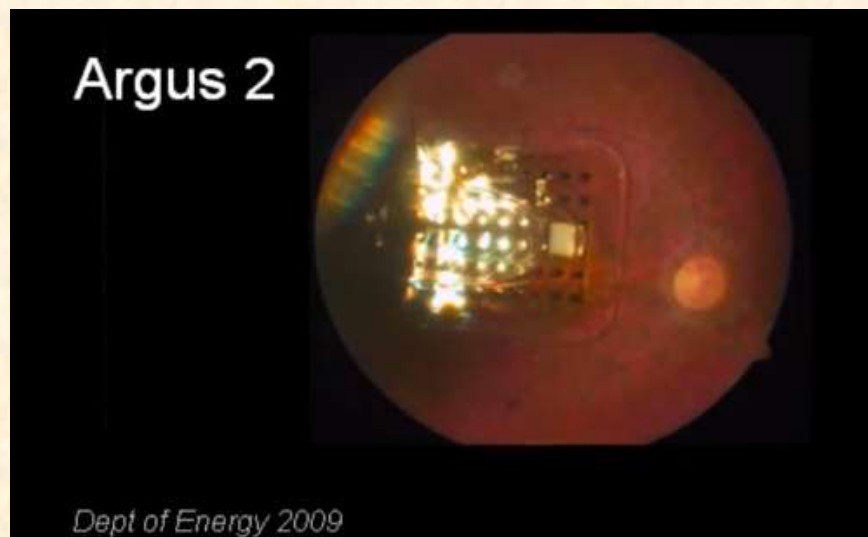
- 取決於精密度
- 電極數量vs視網膜面積
- 2004, 16 electrodes
- 2008, 60 electrodes



- 16 VS 60 electrodes



(a) 16 electrodes



(b) 60 electrodes

效果評估

- 區分光亮與黑暗
- 效果類似“馬賽克畫”
- 黑白，非彩色
- 術後需3個月~半年時間適應
- 辨認物體、獨自走動



未來趨勢

- 解析度
- 適應性
- Processor
- 可攜性
- 成本



2008, Argus 2

Thank you for your listening



Q&A

①
視網膜
介紹

②
相關疾病

③
ASR

④
效果評估

⑤
未來趨勢