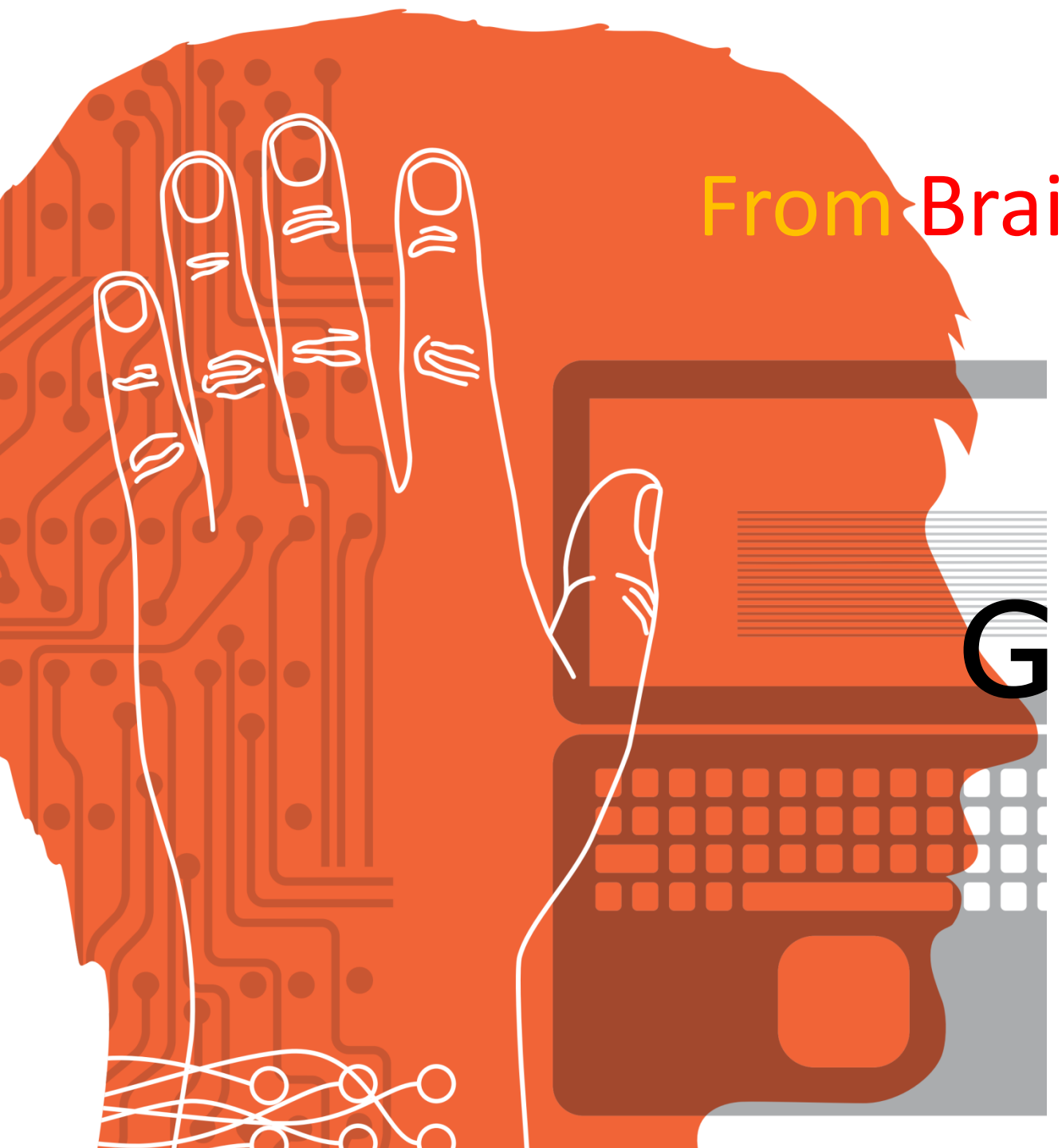


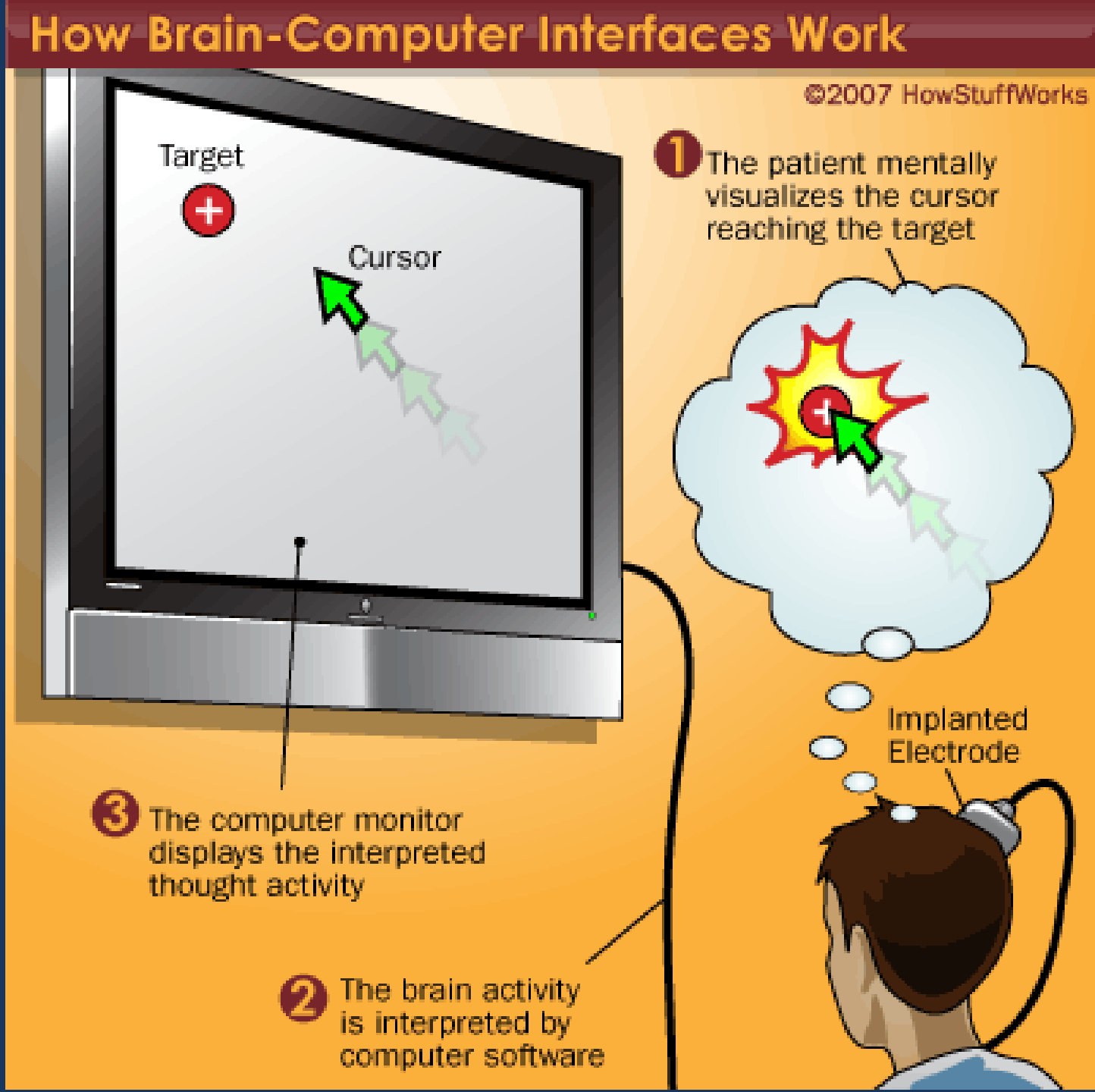
From Brain to Bytes

Group 4th

洪文起
梁楷彣
陳韋達

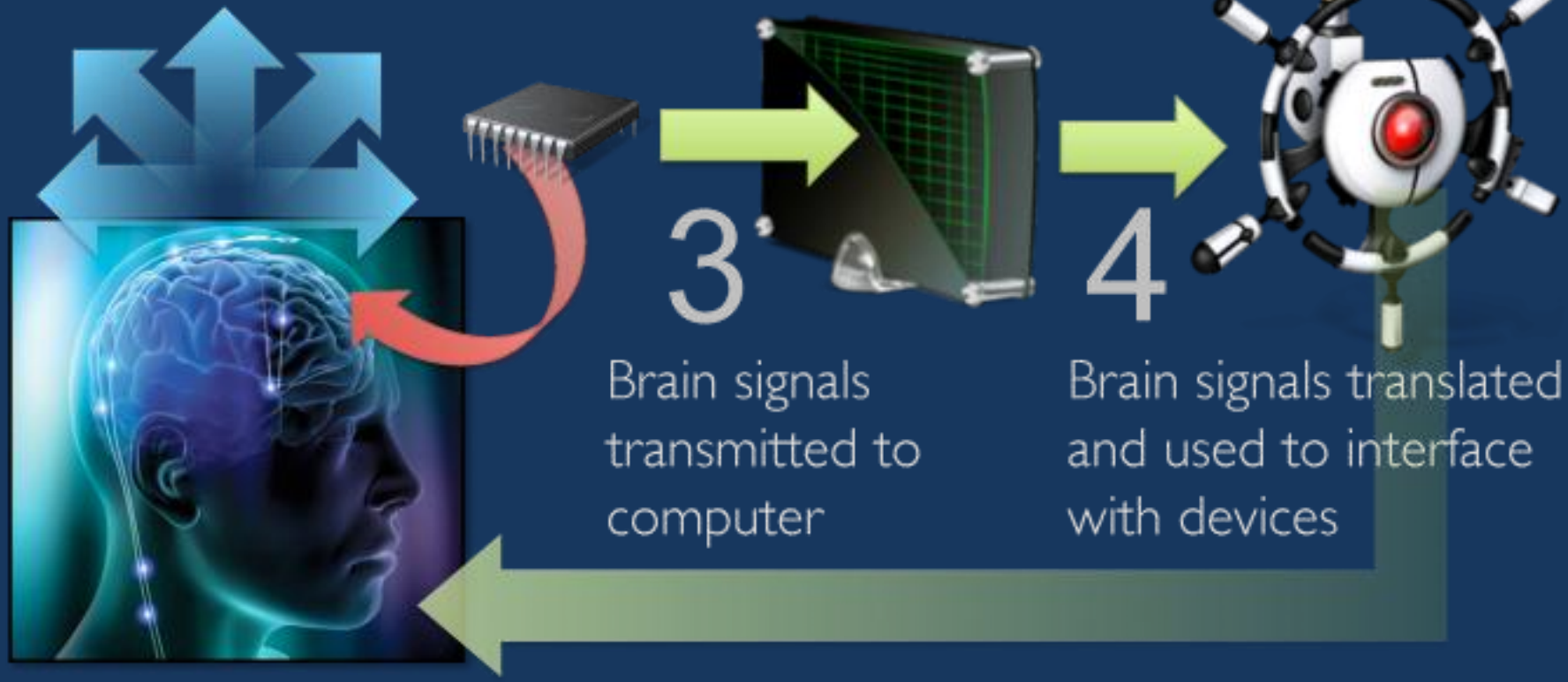
BCI

?


How Brain-Computer Interfaces Work
©2007 HowStuffWorks
Target
Cursor
1 The patient mentally visualizes the cursor reaching the target
Implanted Electrode
3 The computer monitor displays the interpreted thought activity
2 The brain activity is interpreted by computer software

1 Thoughts fire brain signals

2 Device (e.g. electrodes) near or in brain pick up brain signals

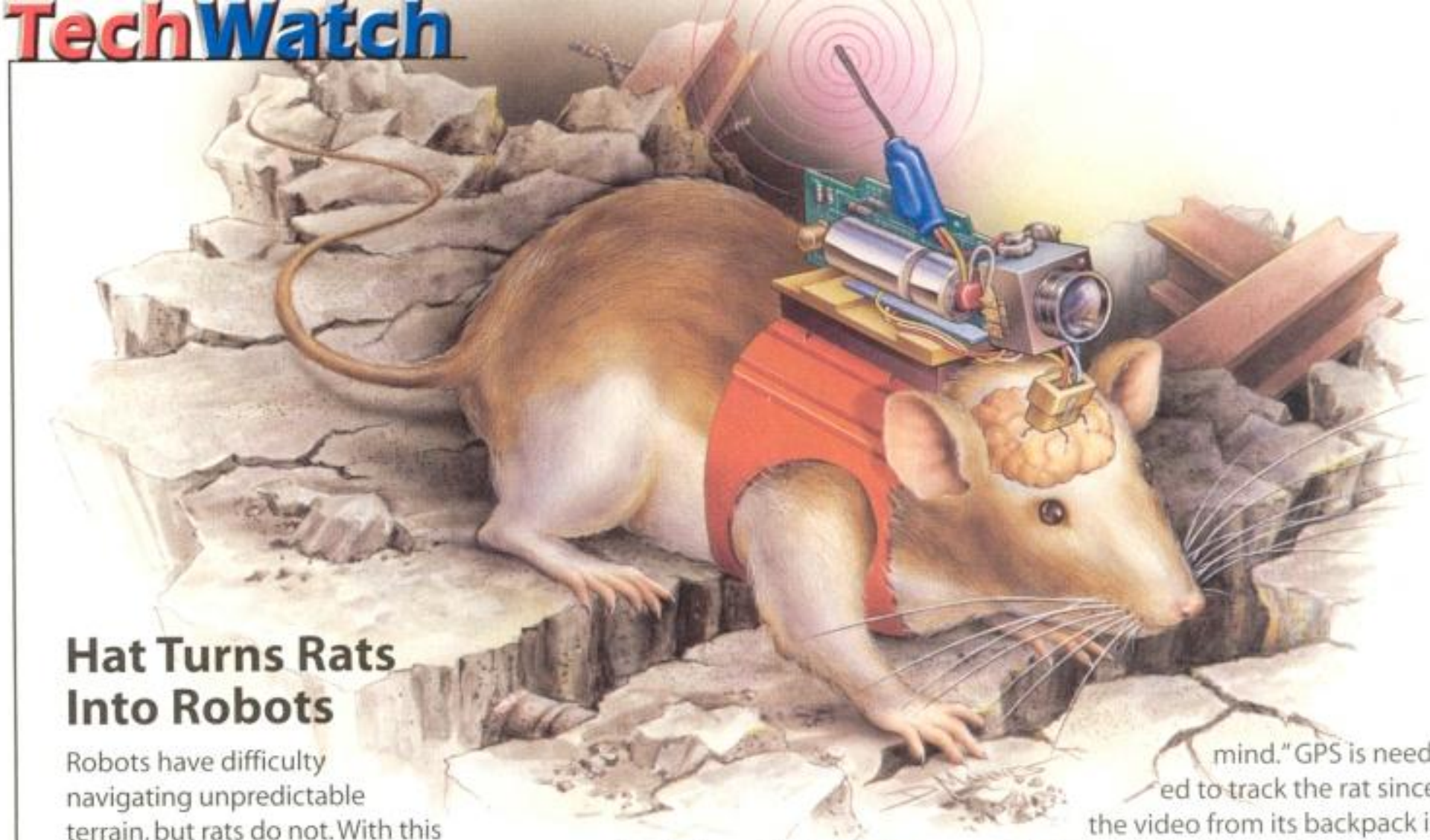


3 Brain signals transmitted to computer

4 Brain signals translated and used to interface with devices

Brain Computer Interface

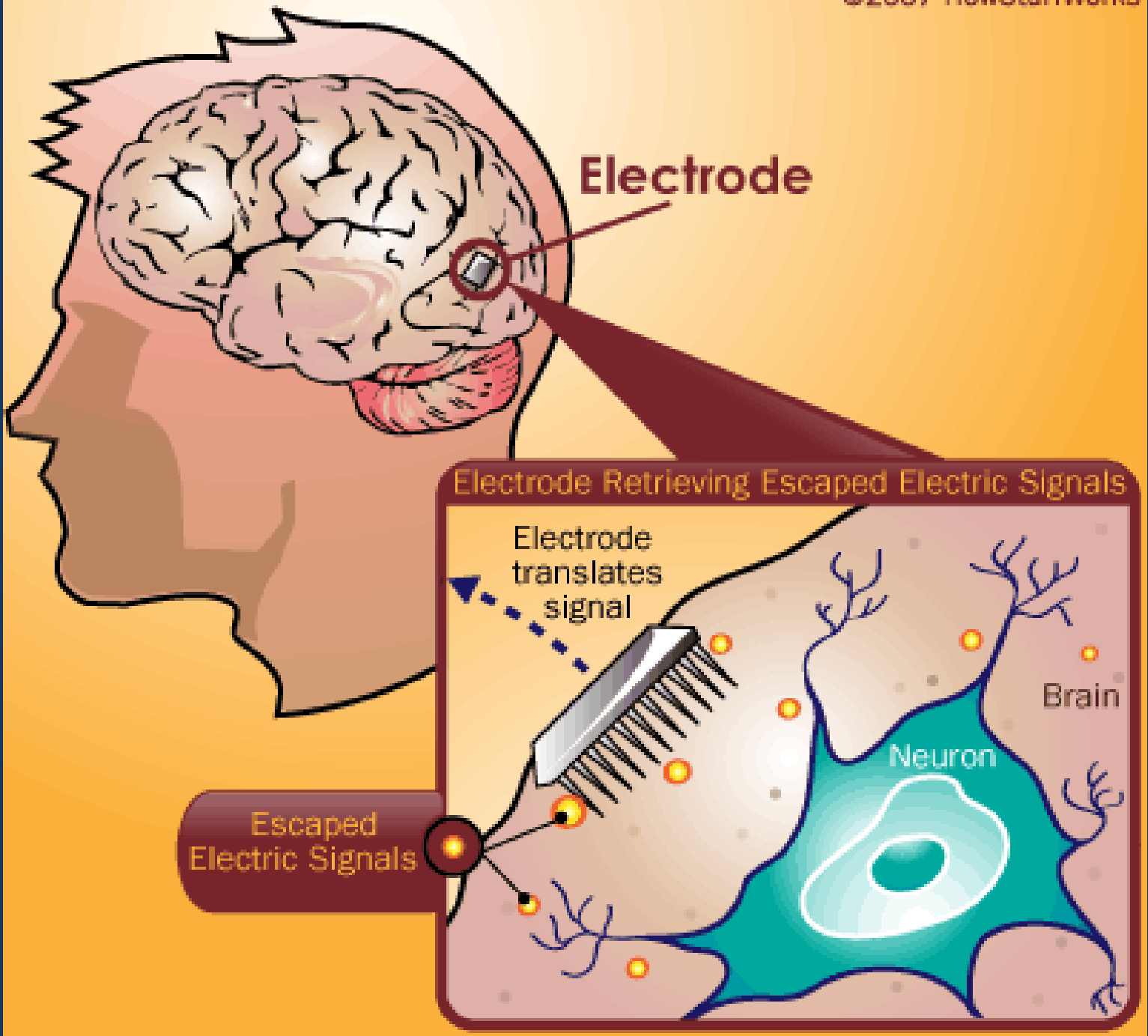
invasive



Hat Turns Rats Into Robots

Robots have difficulty navigating unpredictable terrain, but rats do not. With this in mind, Sanjiv Talwar and John Chapin of SUNY Downstate Medical Center in Brooklyn, N.Y., attached electrodes to a rat's brain—two to the areas that receive signals from its whiskers and a third to a "pleasure center" in the hypothalamus. Computer commands turn the rat right, left, and even up and down.

"It's not just a mobile robot platform," says Talwar, "but a biological sensor where you can read the rat's mind." GPS is needed to track the rat since the video from its backpack is shaky, but Talwar believes improved computer and wireless technology will make it possible to track it directly from neural signals. The rats may be used for search-and-rescue operations or to find land mines.



invasive

disadvantages

non-invasive

Non Invasive - EEG

Non Invasive - EEG

- 原理:偵測頭皮上大腦發出的電訊號
- 優點:
  High in time resolution，可至幾個Ms之內
- 缺點:
  Low in spatial resolution
  易受到肌電訊號影響

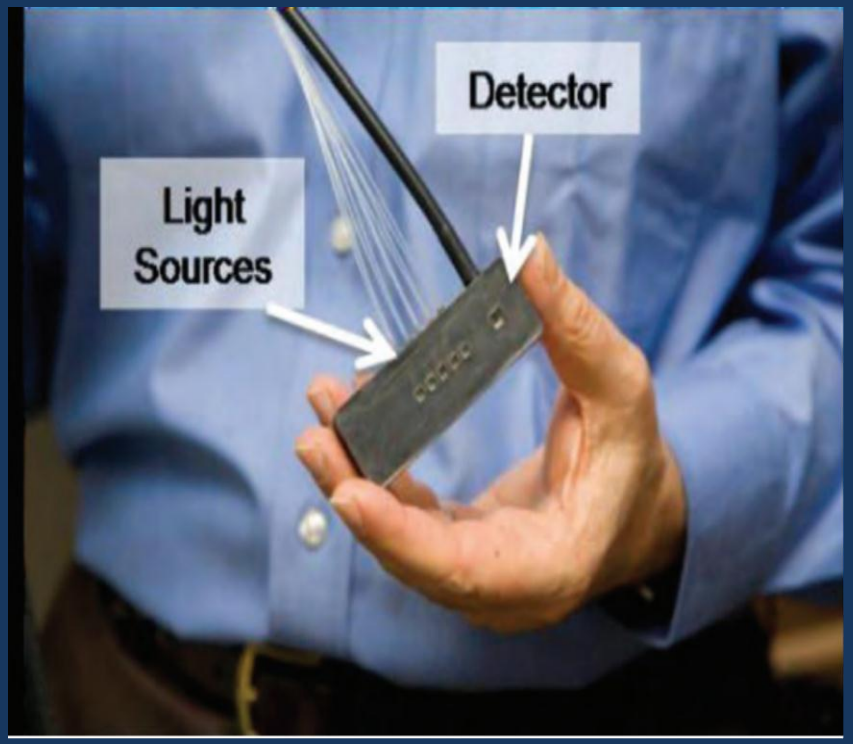
Non Invasive - fNIRS

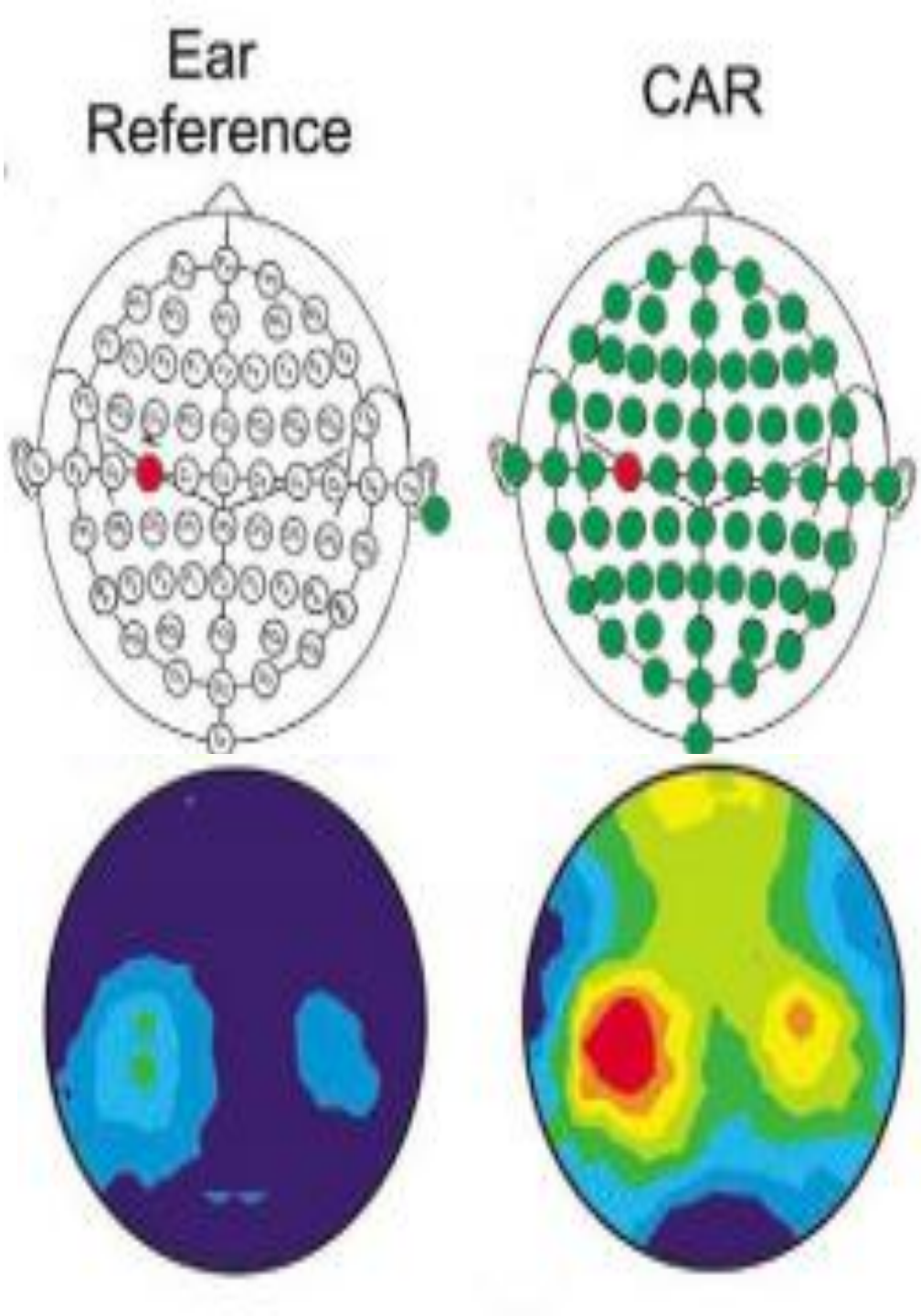
Non Invasive - fNIRS

- 原理:利用紅外線偵測大腦血液的流動
- 優點:

  High in spatial resolution
  不易受到肌電訊號影響
  容易裝置
- 缺點:

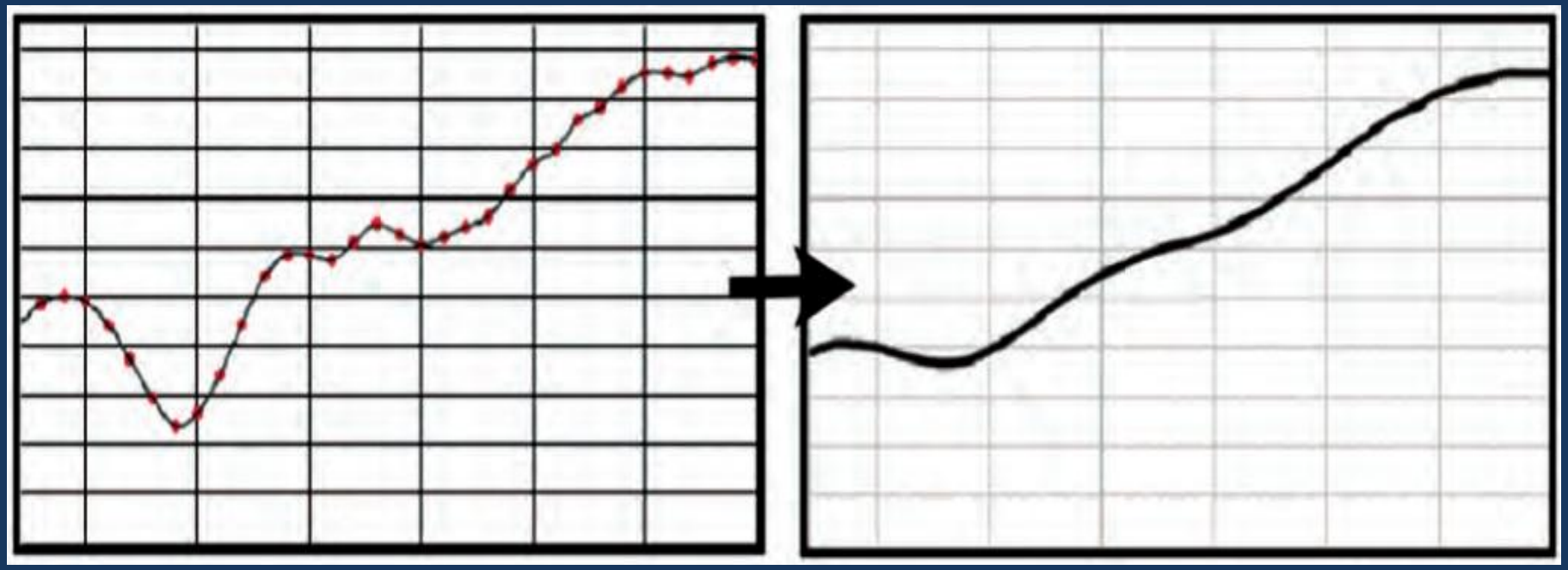
  Low in time resolution



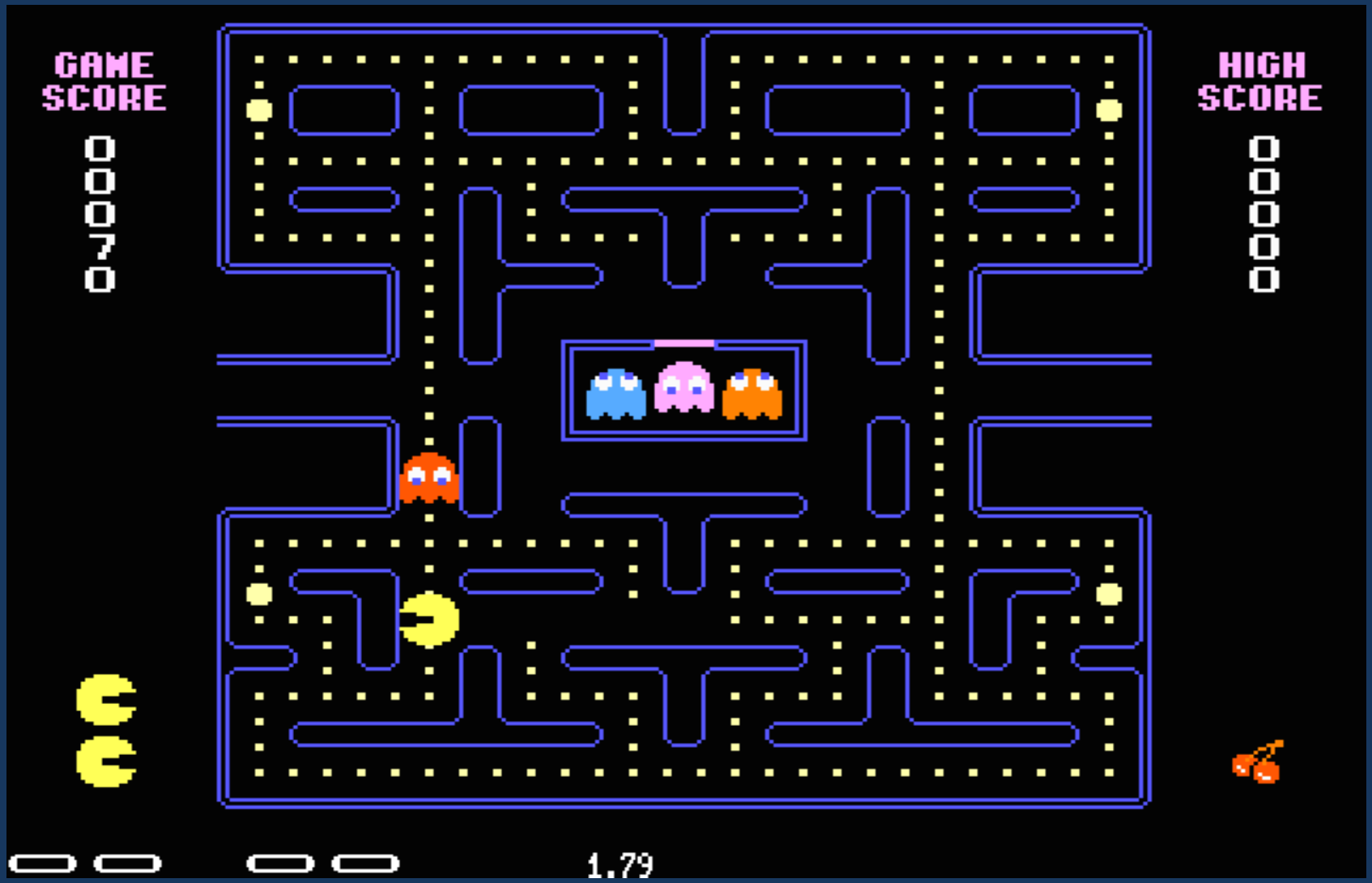

Ear
Reference
CAR

Passive BCI

偵測大腦的勞累程度給予不同程度的反應



Example of Passive BCI



Example of BCI

Specific Design

Error rate

Response time

False acceptance rate