

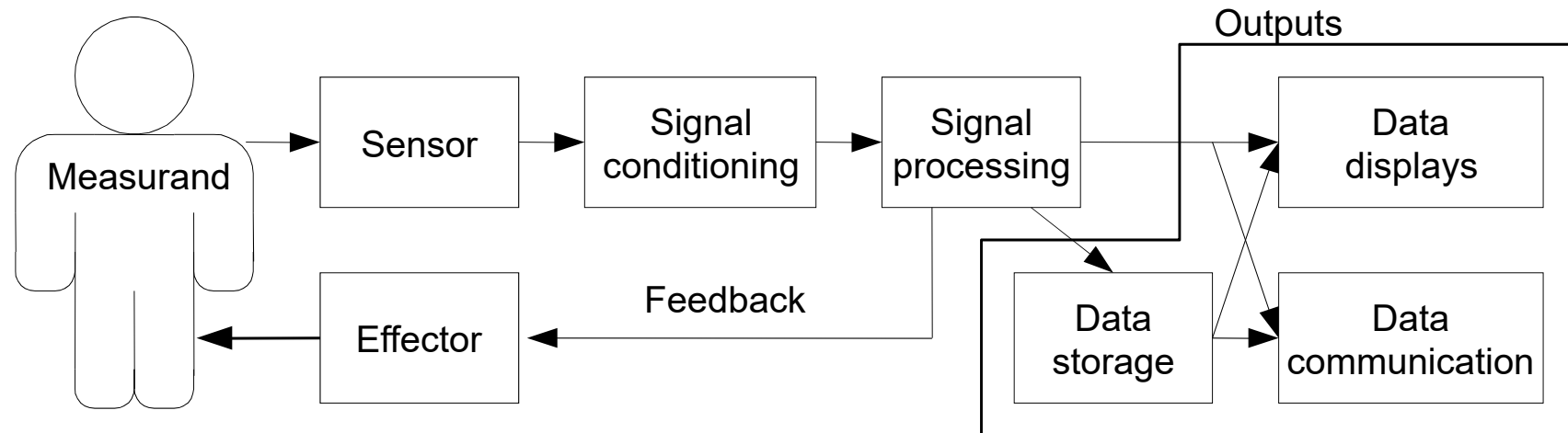
醫學電子導論

Introduction to Biomedical Electronics

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長庚大學電機系

Bioinstrumentation



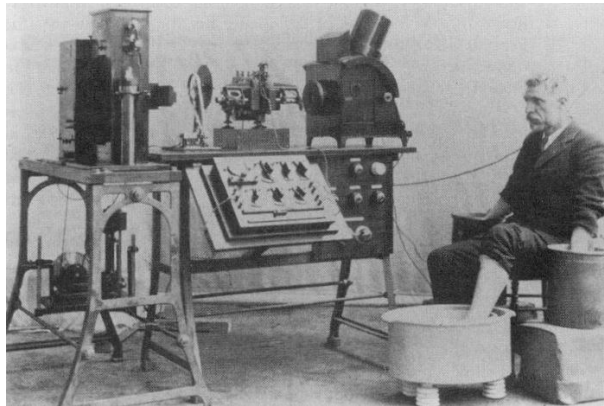
John G. Webster, Bioinstrumentation, John Wiley & Sons, 2003.

Electrocardiography (心電圖)

Patient Monitors



First Electrocardiograph (ECG)
by William Einthoven in 1903



Portable ECG
system



ECG Holter



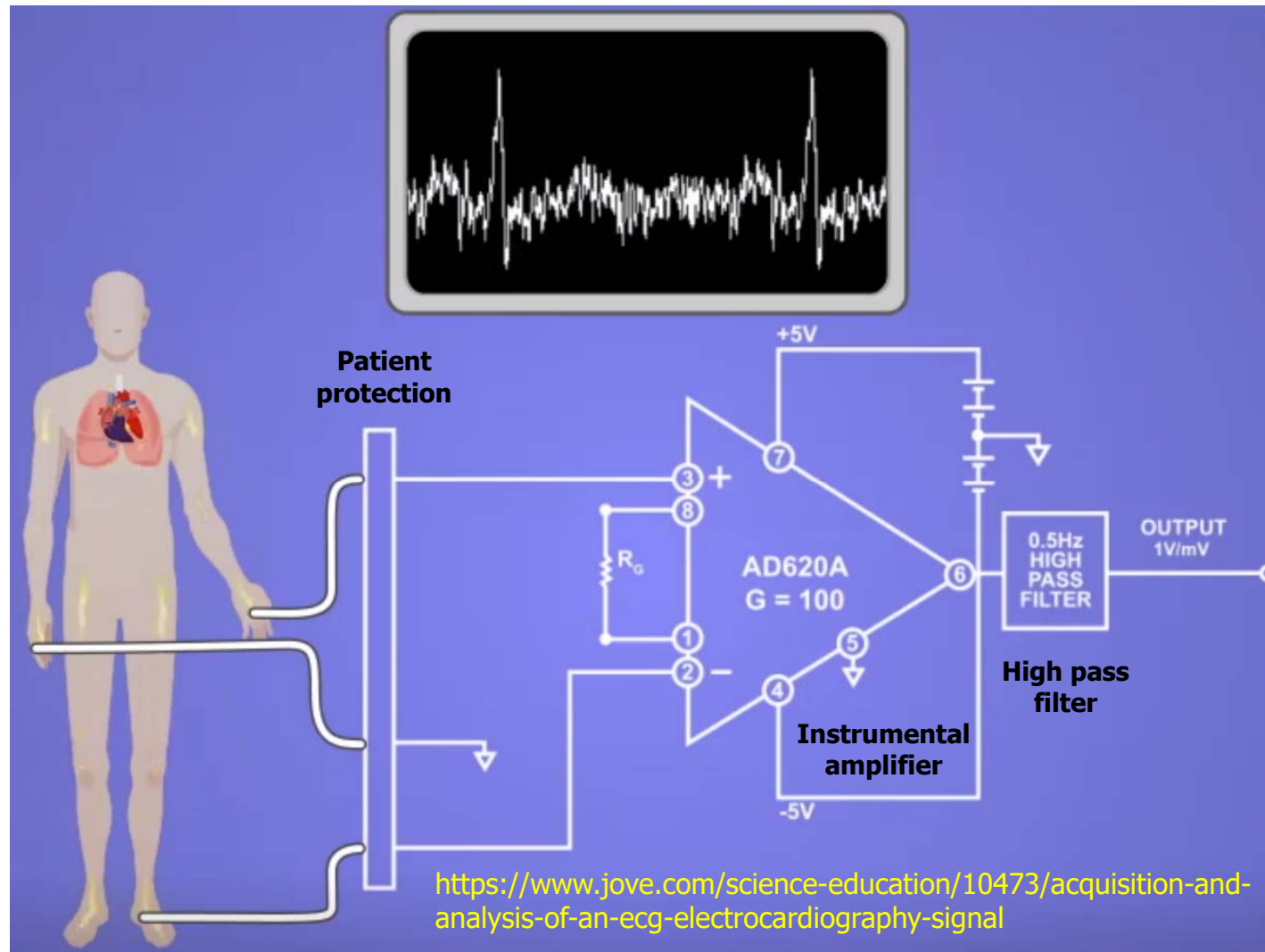
Embedded ECG



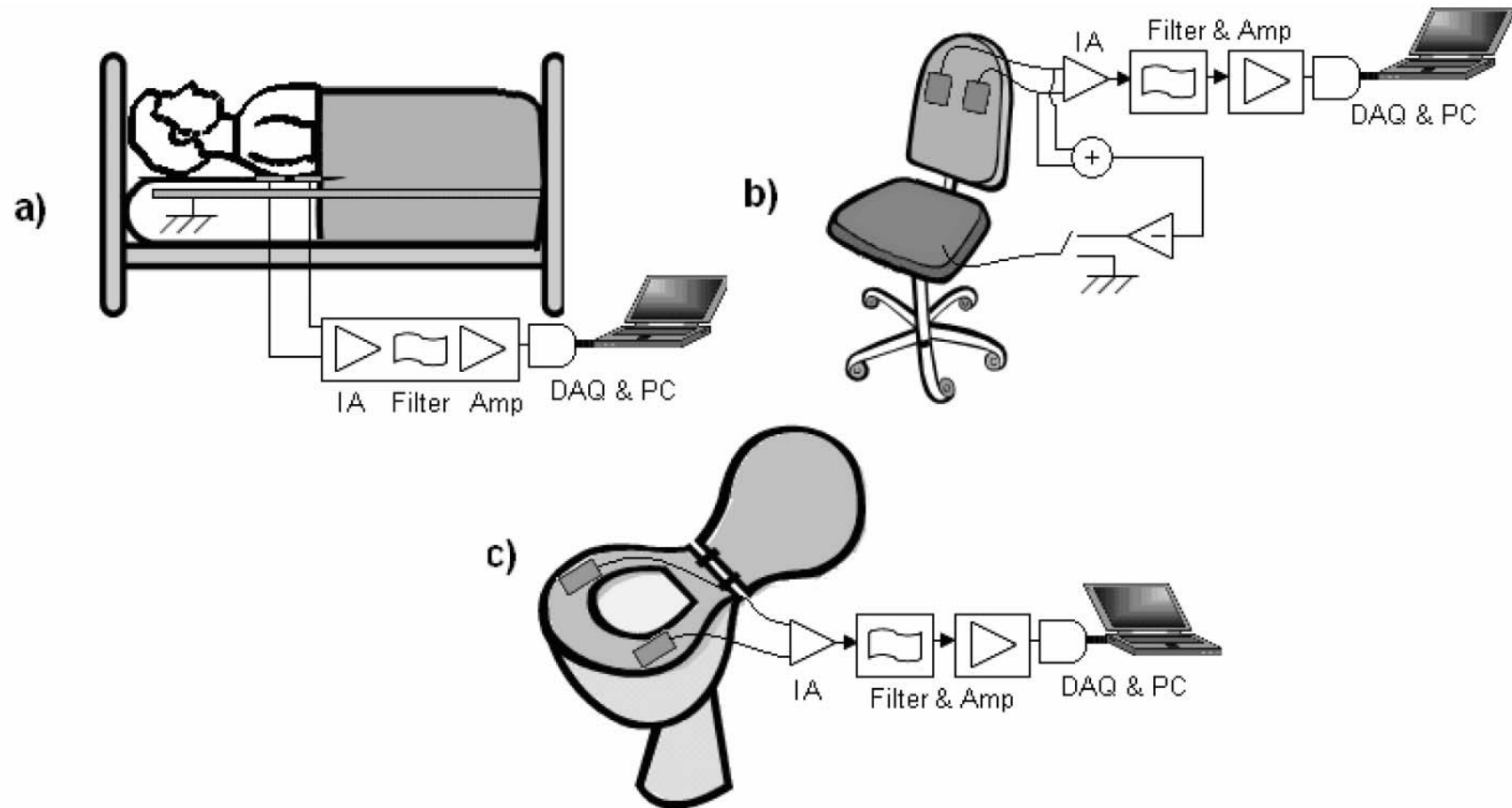
ECG chip



Biopotential amplifier

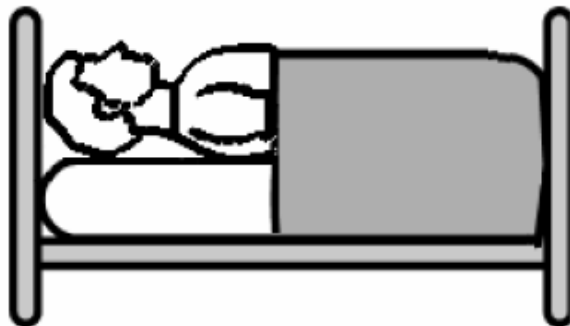
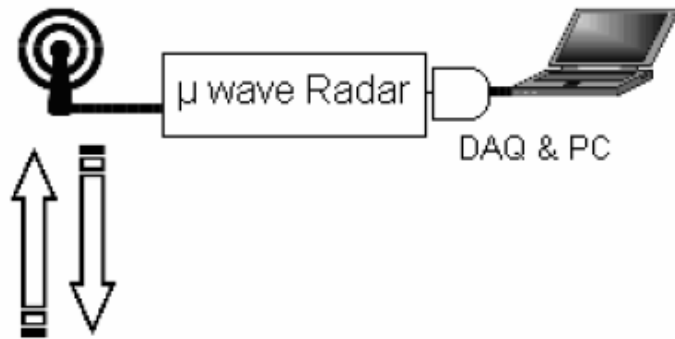


Unobtrusive ECG monitoring based on capacitive-coupled electrode

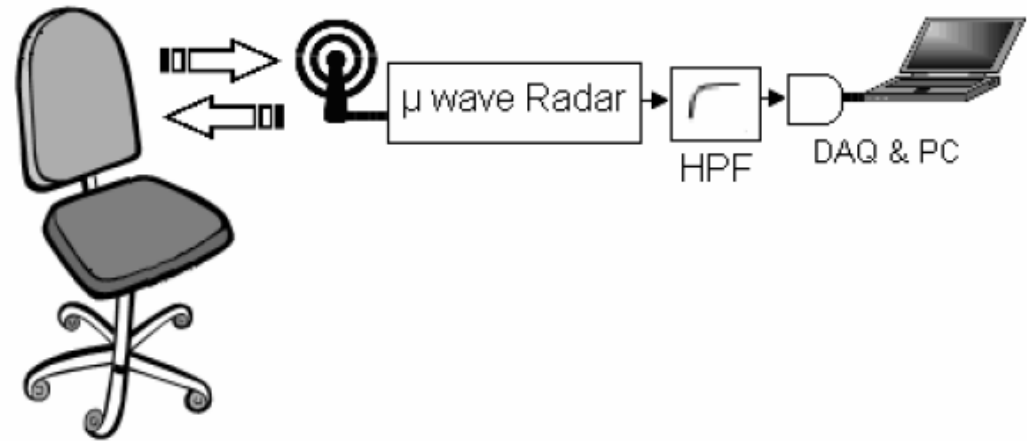


Non-contact ballistocardiography

Respiratory monitoring system



Heart rate monitoring system

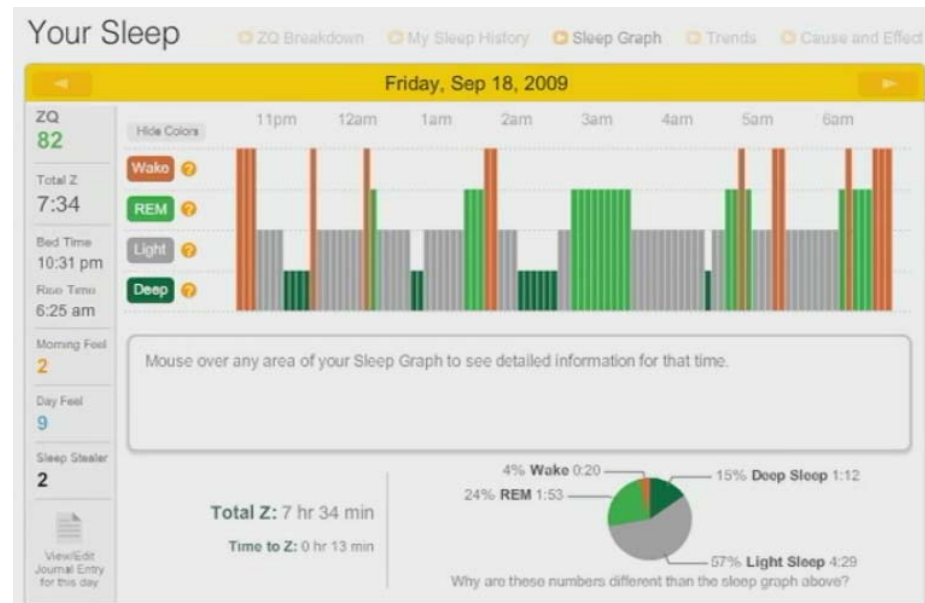


Sleep staging using brain waves

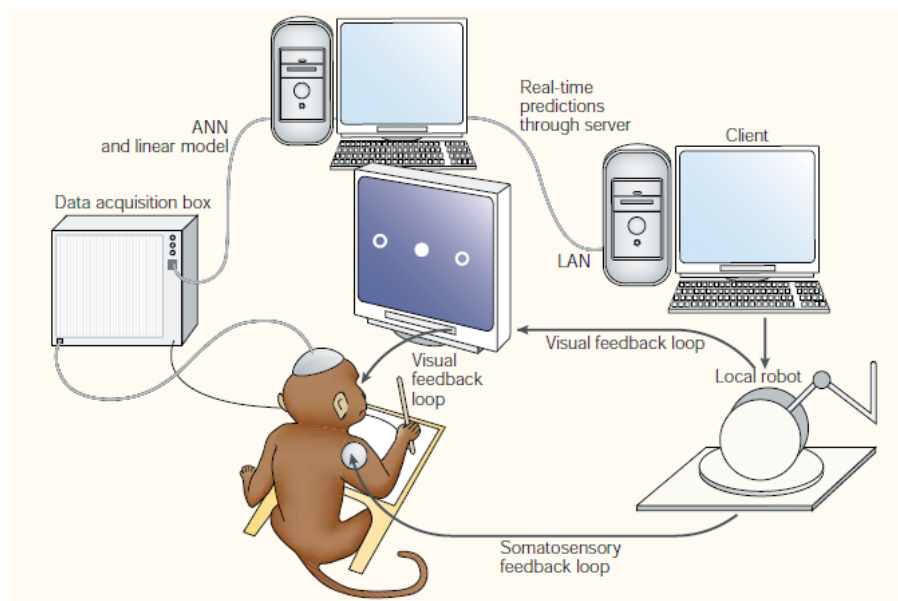


Z.Q. score

Not only helps you with quantifying your sleep, but also tells others you're awake.



Brain computer interface



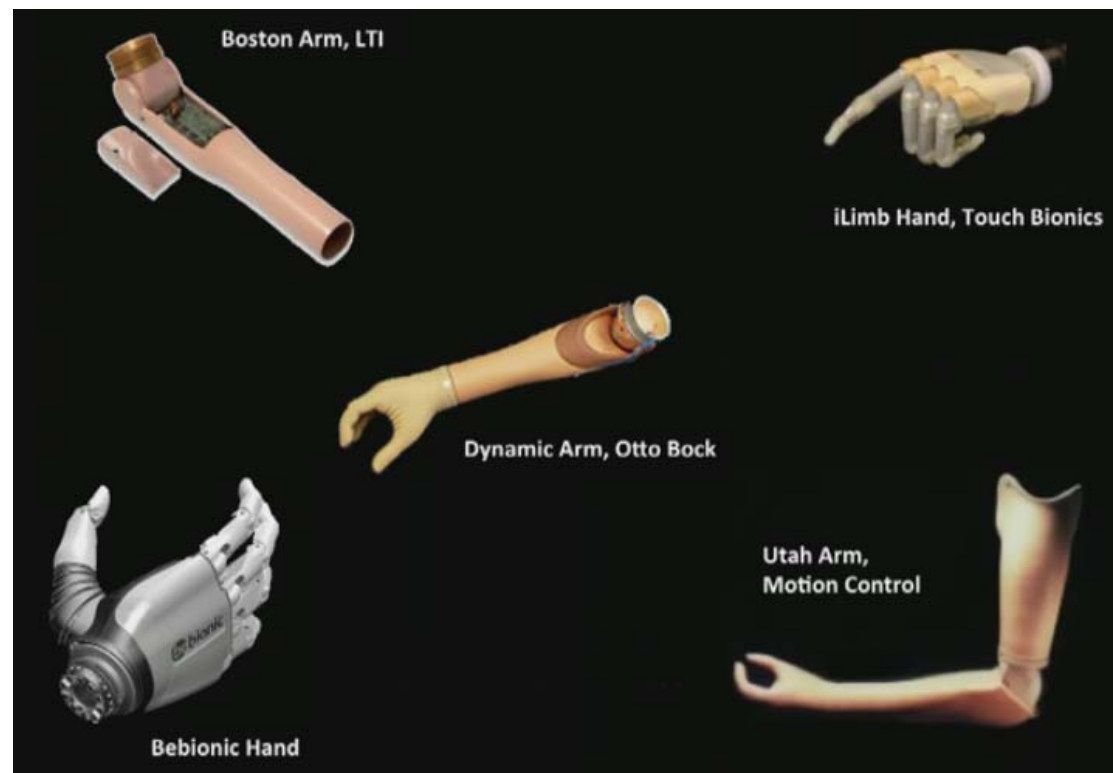
*Miguel Nicolelis et al, Duke University
Scientific American 2002, Nature
Review Neuroscience 2003.*



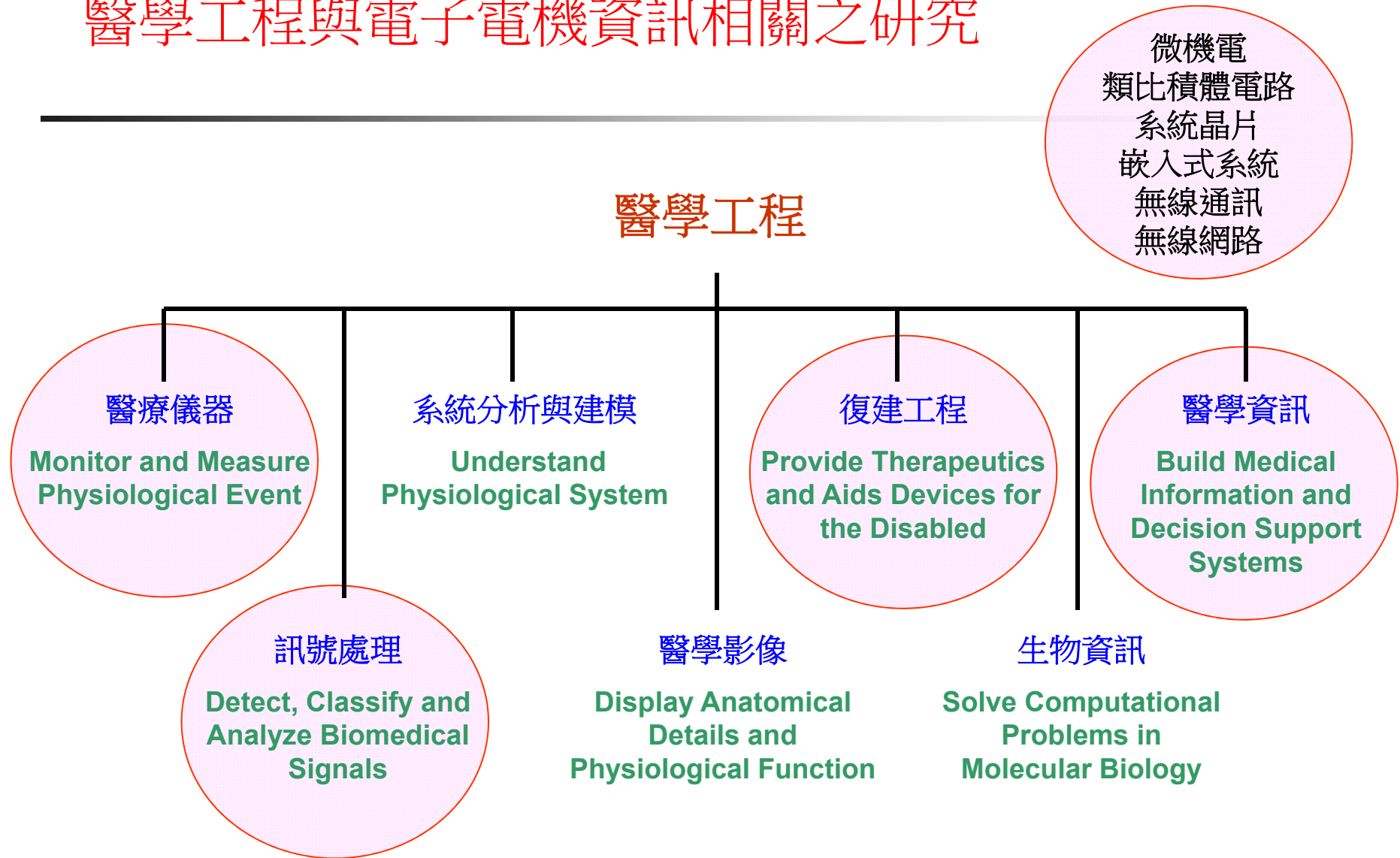
*BrainGate Collaboration
Brown University, Nature 2012*

Bionics (仿生學) & neurorehabilitation (神經復健)

- The science of replacing part of a living organism with a mechatronic device or a robot.



醫學工程與電子電機資訊相關之研究



Outline

- **Introduction to medical electronics**
- **Bioelectric instrumentations**
 - Electrocardiograms and applications
 - Bioelectrical amplifiers
 - Electrical safety
 - Electroencephalograms & applications
 - Artificial intelligence in medical signals
- **Biomedical optics (蔡孟燦老師)**
- **Medical ultrasound (醫放系 崔博翔老師)**
- **Cardiorespiratory instrumentations**
 - Blood pressures & respiration
 - Unobtrusive physiological monitoring
- **Neuro-rehabilitation (職治系 陳信壅老師)**
 - Electromyography & electrical stimulation
 - Robot-assistive rehabilitation

Grading Policy

- Midterm exam & final exam (70%)
- Classworks, class reports & attendance (30%)