



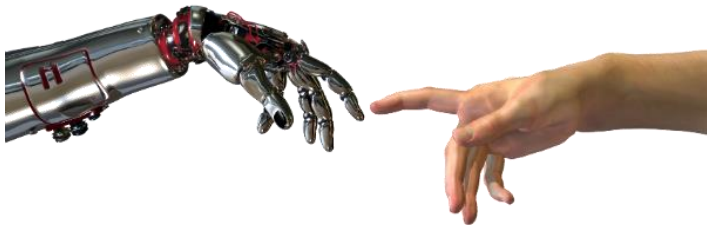
THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Department of Biomedical Engineering
生物醫學工程學系

PolyU STEM Lecture Series
Engineering & Bionic Human
工程與仿生人類

Dr. LAU Hin Chung
劉衍中

hclau@polyu.edu.hk





THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Department of Biomedical Engineering
生物醫學工程學系

S

T

E

M



What Is Bionic Human? 仿生人類

- The word **bionic** was coined by Jack E. Steele in **1958**
- Bionic:
 - having or denoting an artificial, typically electromechanical, body part or parts (Oxford Dictionaries)
- Influenced by Steele's work, Martin Caidin (science fiction writer and aviation expert) published the book "**Cyborg**" in **1972** (半機械人)
 - physical abilities are extended beyond normal human limitations
- The book "Cyborg" was adapted for popular television series "**The Six Million Dollar Man**" (1973–1978) and its spinoff "**The Bionic Woman**" (1976–1978)



“Cyborg”

Neil Harbisson's "eyeborg" allows him to hear colors, even those beyond the range of sight.



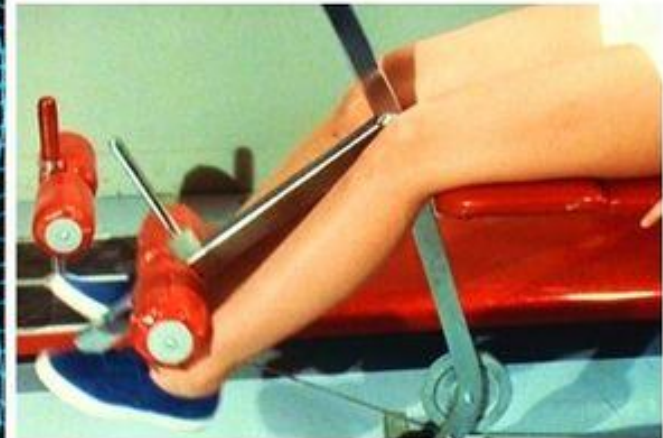
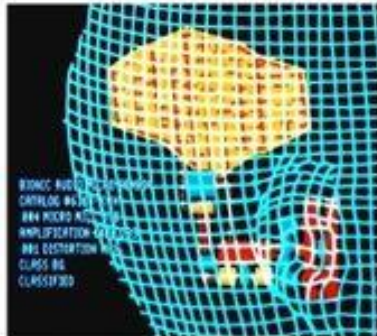
What Is Bionic Human? 仿生人類

- The word **bionic** was coined by Jack E. Steele in **1958**
- Bionic:
 - having or denoting an artificial, typically electromechanical, body part or parts (Oxford Dictionaries)
- Influenced by Steele's work, Martin Caidin (science fiction writer and aviation expert) published the book "**Cyborg**" in **1972** (半機械人)
 - physical abilities are extended beyond normal human limitations
- The book "Cyborg" was adapted for popular television series "**The Six Million Dollar Man**" (1973–1978) and its spinoff "**The Bionic Woman**" (1976–1978)

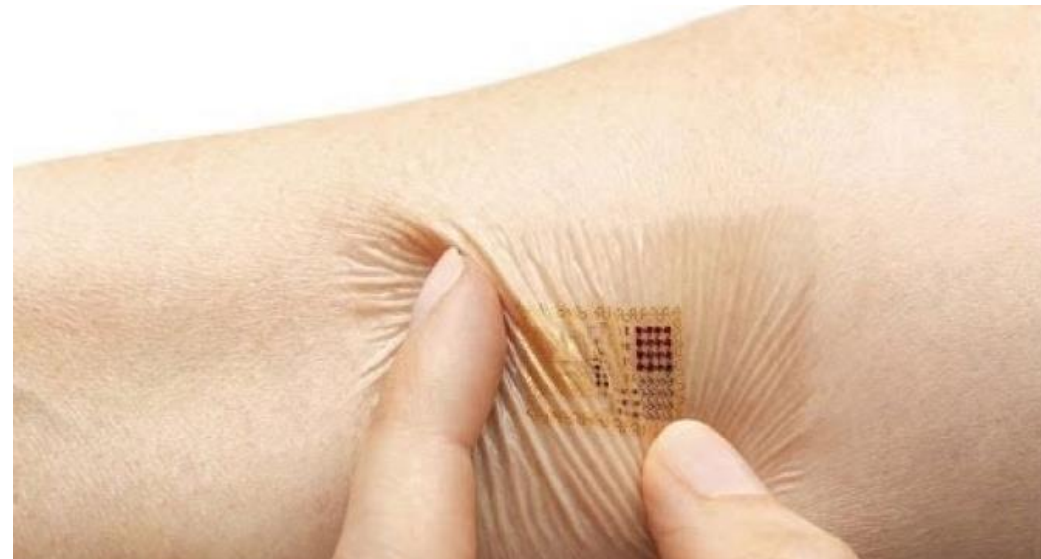
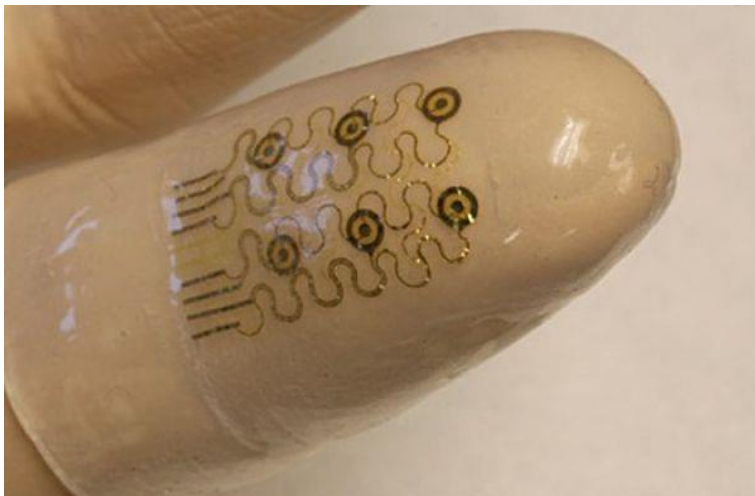
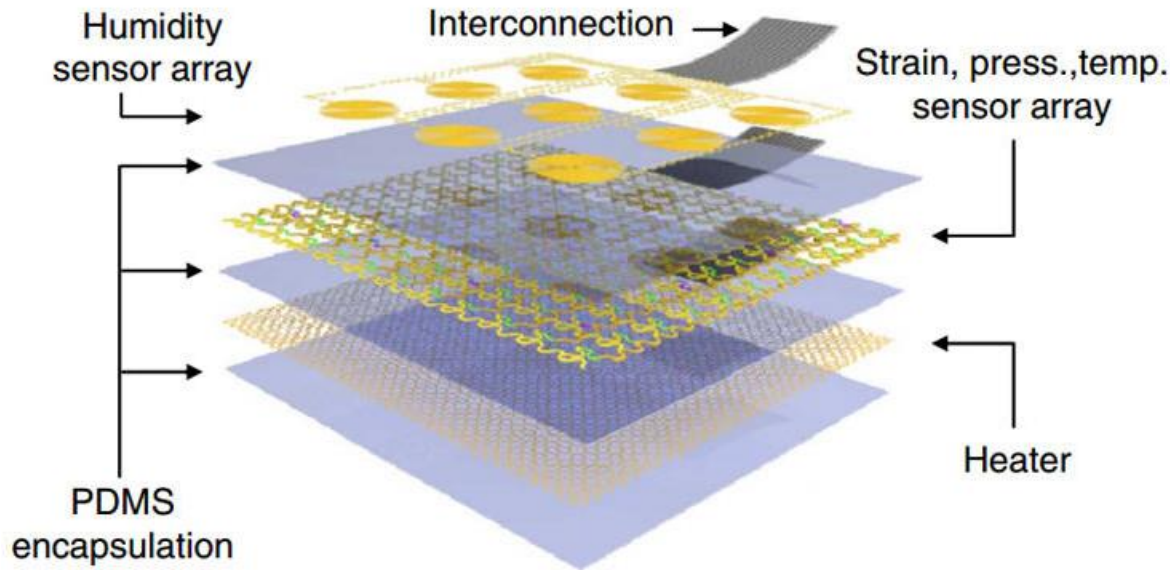


The Bionic Woman

<https://www.youtube.com/watch?v=4Wd6luVya4M>









<https://www.youtube.com/watch?v=hBjeS6CXnsM>





Our normal heart:

- 60 to 100 beats a minute
- ~70 ml of blood
- 4.9 litre/ minute

⇒ up to 30 liters/ minute
during extreme exercise
= **500ml/second**

In 2001, Robert Tools received the first completely self-contained artificial heart transplant (AbioCor Implantable Replacement Heart). He survived for 151 days without a living heart



Our normal heart

- 60 to 100 beats
- ~70 ml of blood
- 4.9 litre/ minute

⇒ up to 30 liters/
during extreme exercise
= 500ml/second



In 2001, Robert Tools received the first completely self-contained artificial heart transplant (AbioCor Implantable Replacement Heart). He survived for 151 days without a living heart



THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Department of Biomedical Engineering
生物醫學工程學系

S

T

E

M



THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Department of Biomedical Engineering
生物醫學工程學系



There are too many un-solved problems!



Engineering - the most common undergraduate degree among Fortune 500 CEOs. [Source: Forbes]

- Engineers are *detail-oriented, analytical and trained in systematic problem-solving.*



Tim Cook, CEO of Apple
(Industrial Engineering)

Jerry Yang, Yahoo
co-founder
(Electrical Engineering)

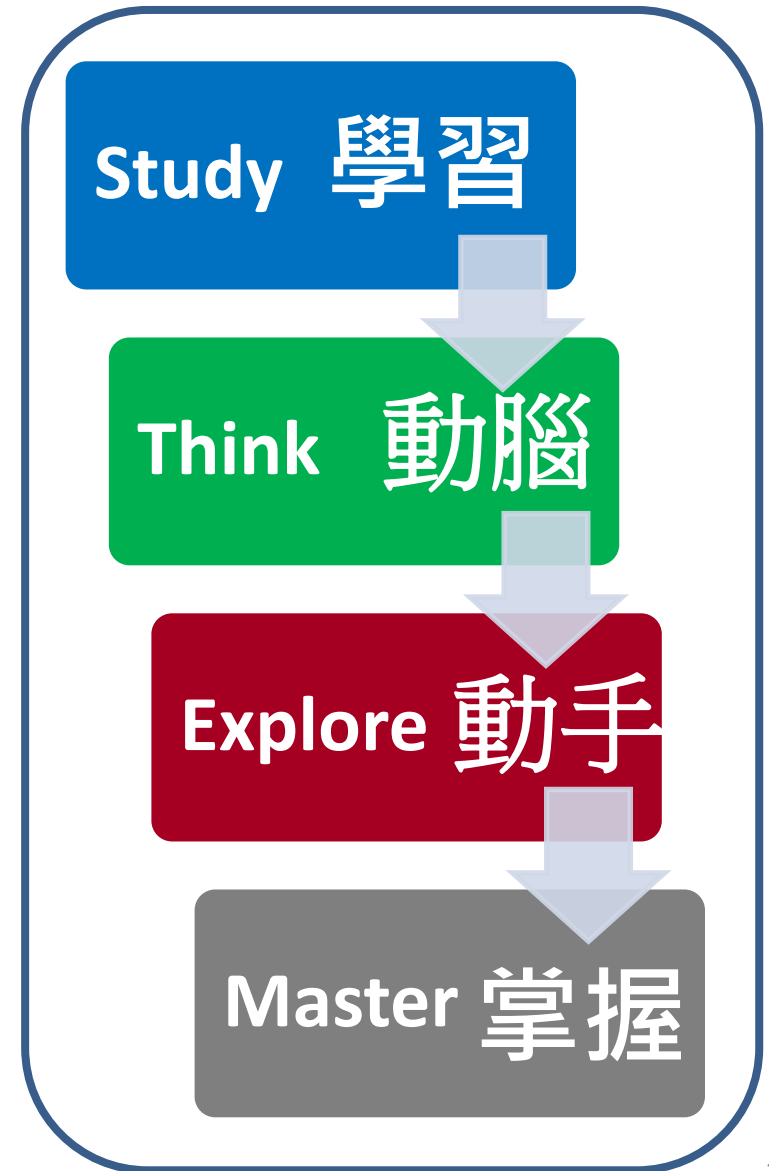


Ginni Rometty, IBM
(Electrical Engineering and
Computer Science)



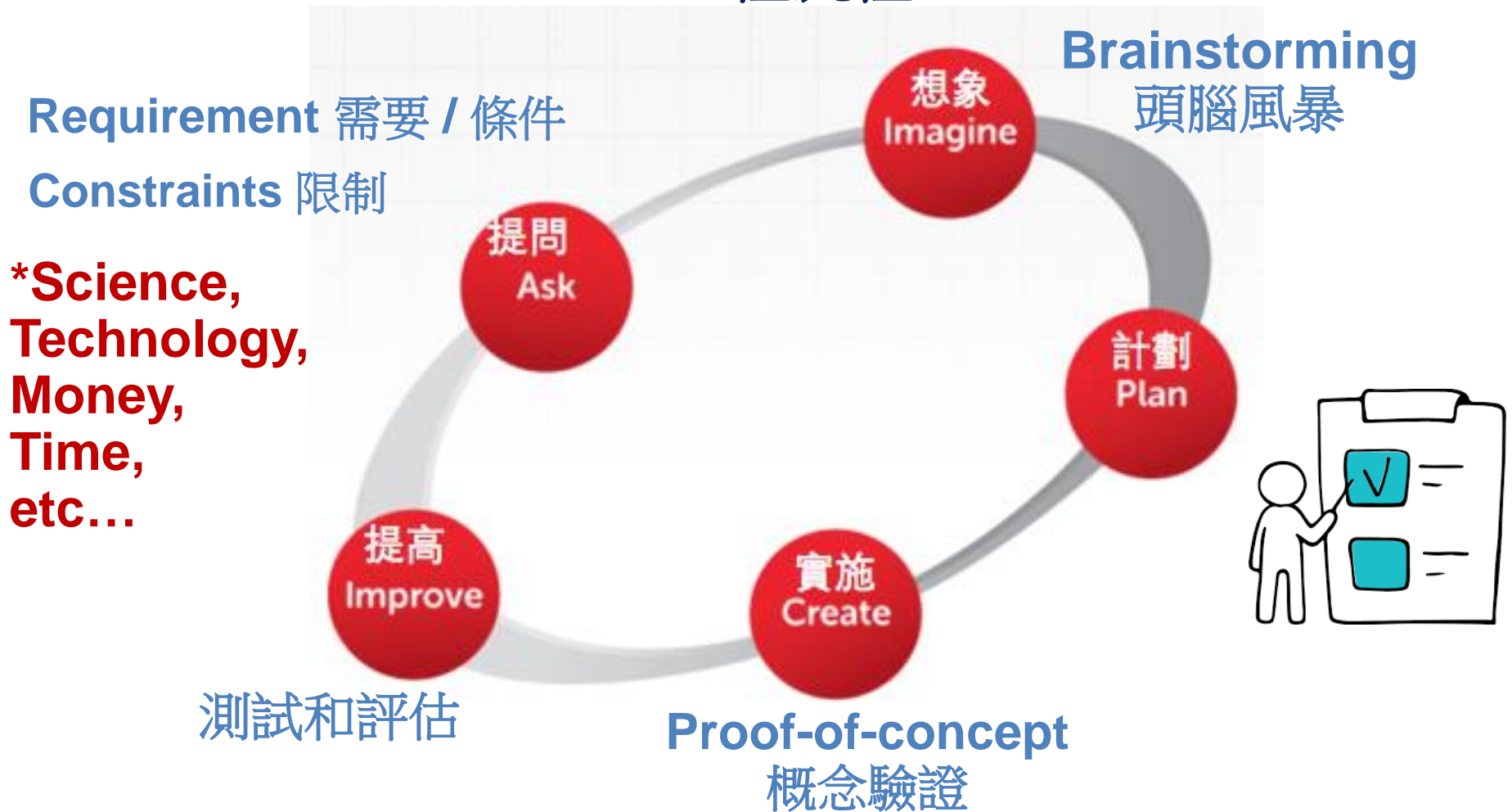
Mark Zuckerberg, Facebook
(Computer Science)

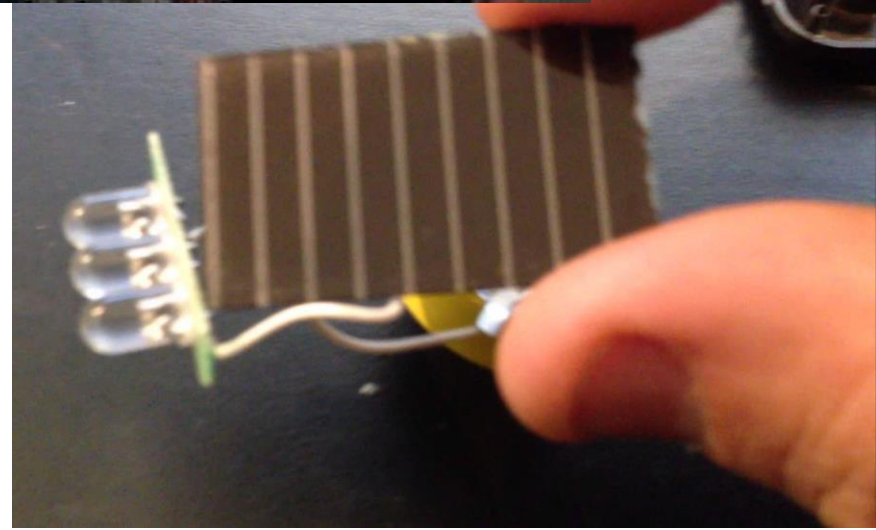
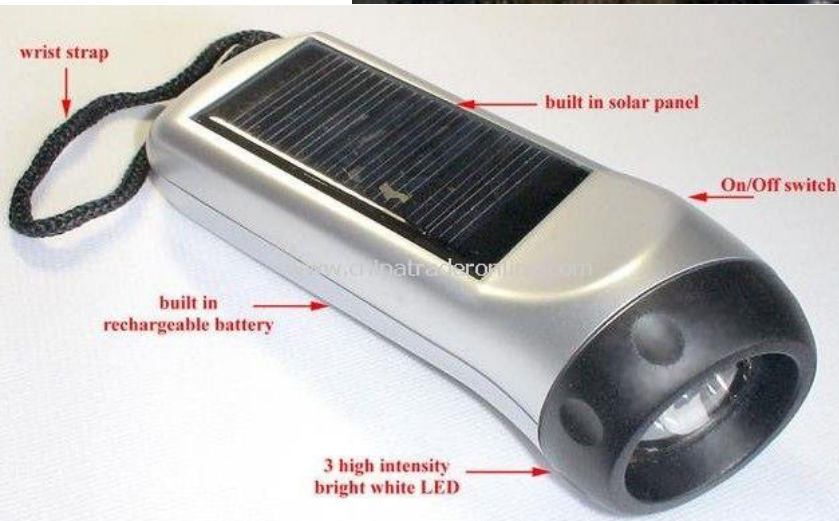
Study
Think
Explore
Master

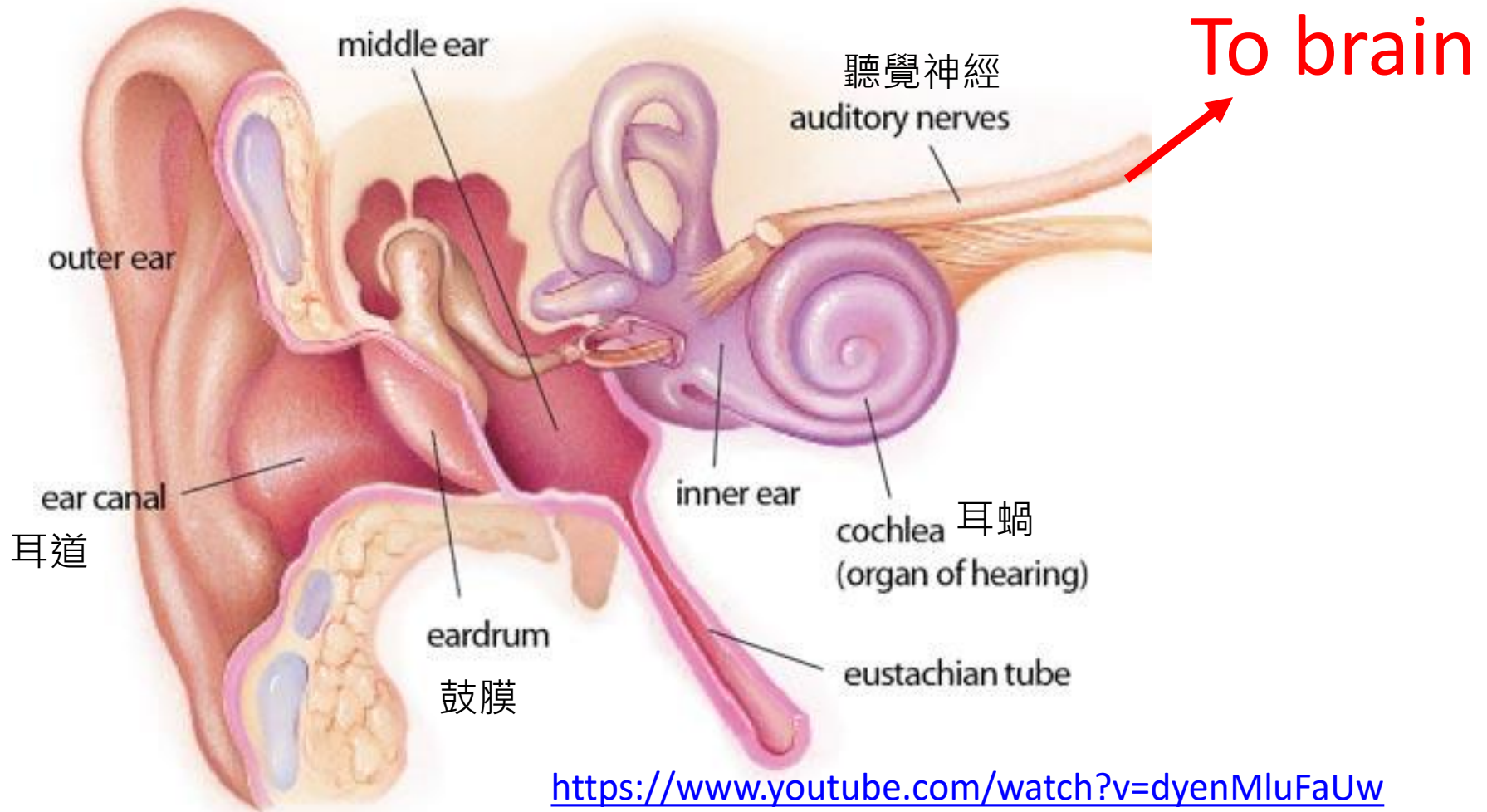




Engineering Design Process (EDP) 工程流程

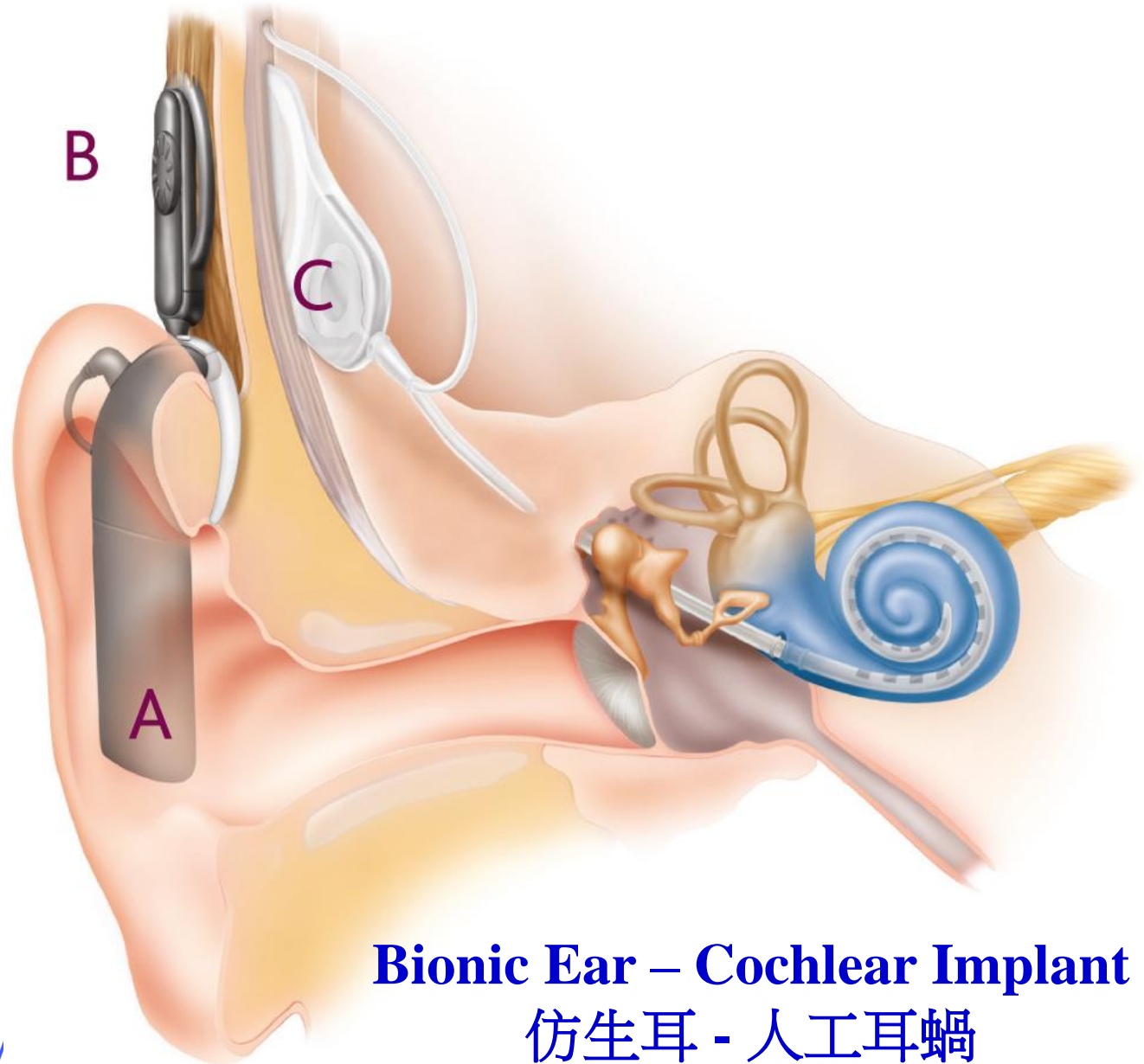






<https://www.youtube.com/watch?v=dyenMluFaUw>

<https://www.youtube.com/watch?v=cn6pgt7NrcE>



Bionic Ear – Cochlear Implant
仿生耳 - 人工耳蝸



Cristiano Ronaldo SIXPAD Commercial



殘疾? 超人?



殘疾? 超人?

倫理! 道德!



Am I normal?



Why don't they install a pair of "superlegs"?

Run without "Superleg"
better don't run!



- More than 130 swimming world records have been broken from 2008 through 2009 (being believed) by the use of these high-tech swimsuits
- Nearly every medal winner at 2008 Summer Olympics made use of the high-tech swimwear, which was seen as the catalyst behind the “technological arms race” in professional swimming competitions including the 2009 World Championships
- But as of the beginning of 2010, the International Swimming Federation (FINA) have **unanimously voted to ban** the use of these suits in official competition



Study
Think
Explore
Master

