

台灣的仿生農業技術發展與運用

從仿生學的角度思考農業的進化

興藝峰生技農業公司 楊洵 副總



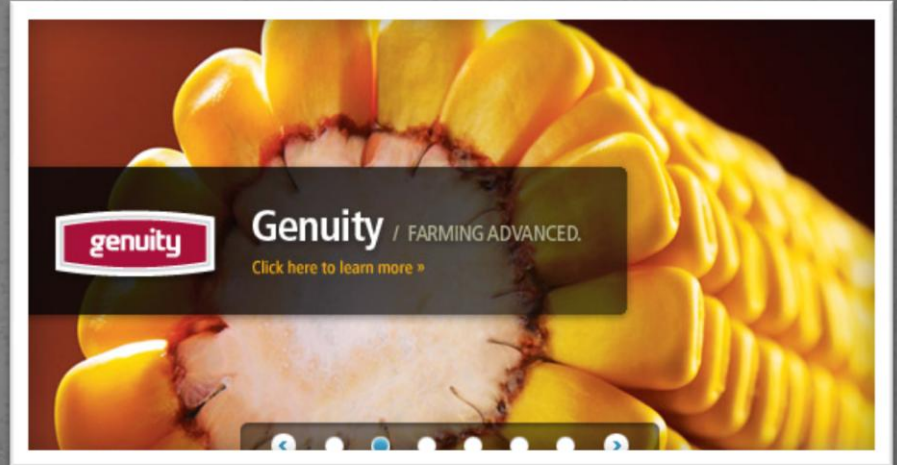












滴灌、溫室、水耕、基改



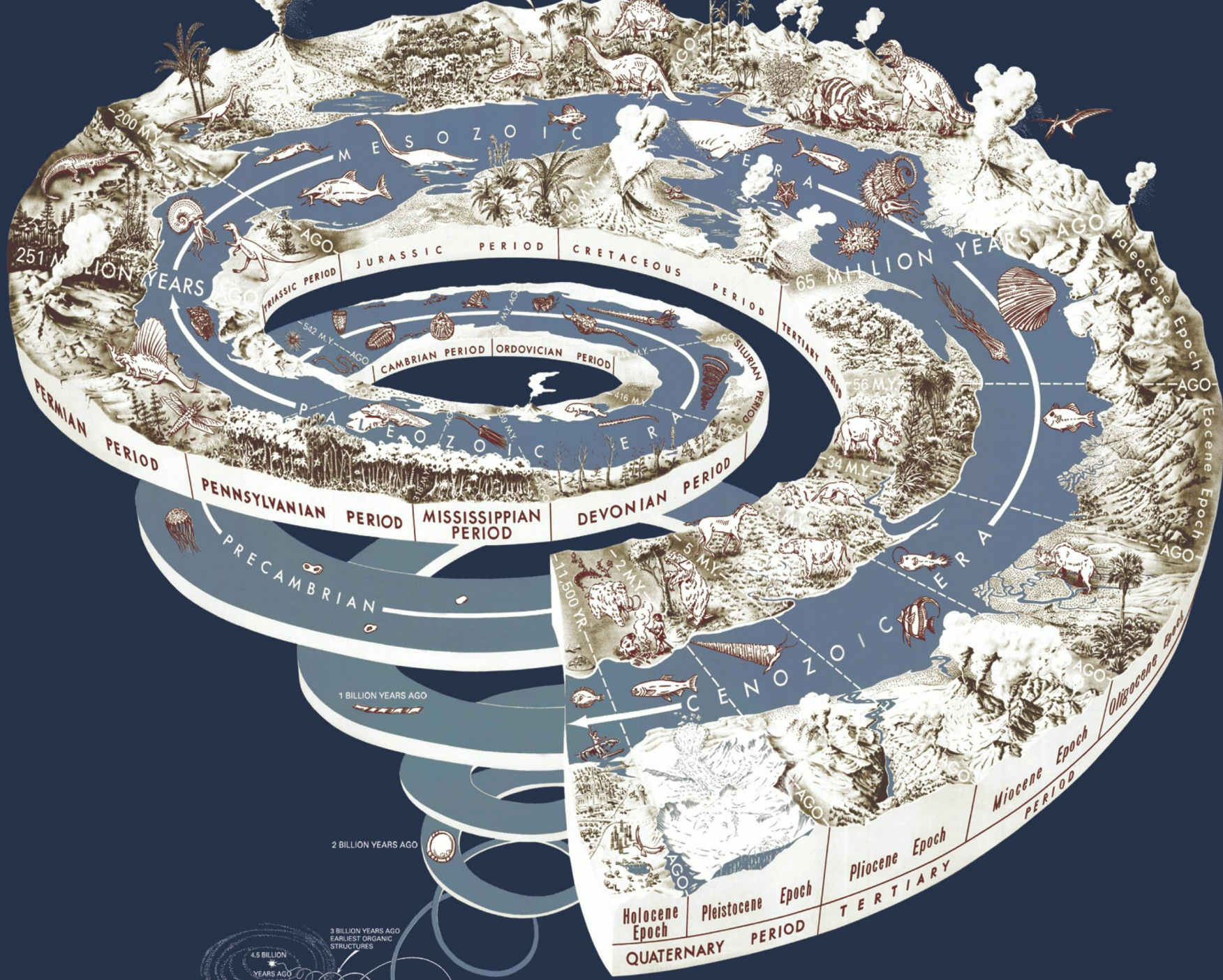




Ashes to ashes, dust to dust (Genesis 2:7, 3:19)

「你必汗流滿面才得餬口，
直到你歸了土，因為你是從
土而出的。你本是塵土，仍
要歸於塵土。」(創 3:19)







Level 1：漫灌、澆灌 表層土壤的滲透作用





Level 1：渦蟲
扁蟲動物總門(Platyzoa)
無循環系統



表層滲透
體積小
無器官



草履蟲
(paramecium)



An aerial photograph of a large agricultural field during the preparation phase. The field is divided into numerous parallel rows of furrows, which are narrow channels of soil. These furrows are filled with water, creating a series of long, narrow, blue channels that stretch far into the distance. The soil between the furrows is a rich, dark brown color. In the background, a line of bare trees marks the edge of the field under a clear, light blue sky. The overall scene illustrates a furrow irrigation system.

Level 1.5 : 溝灌 furrow irrigation

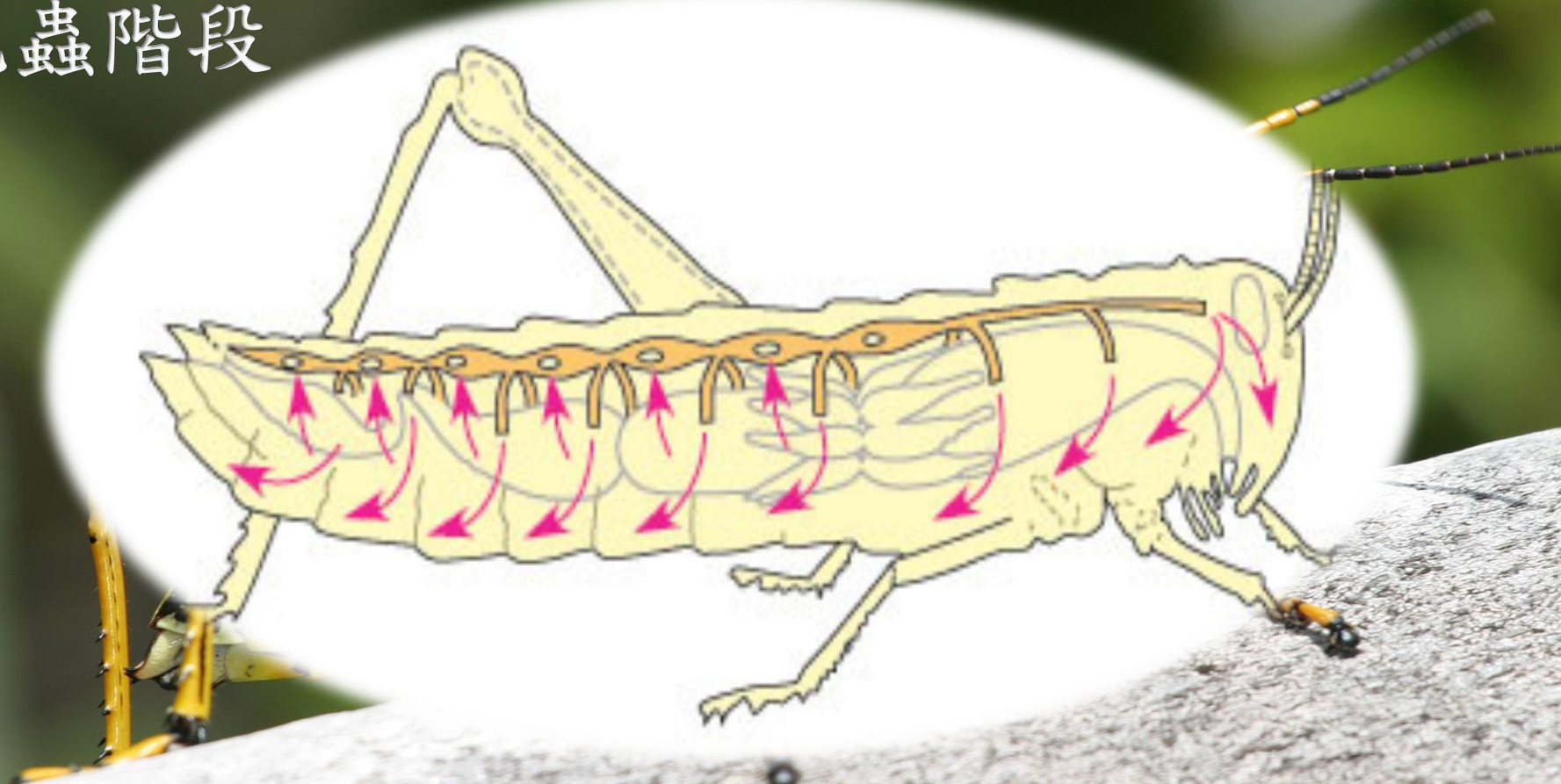


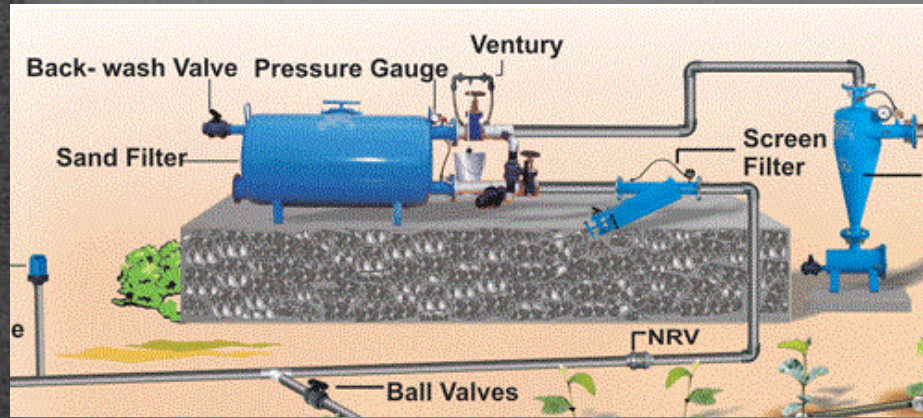
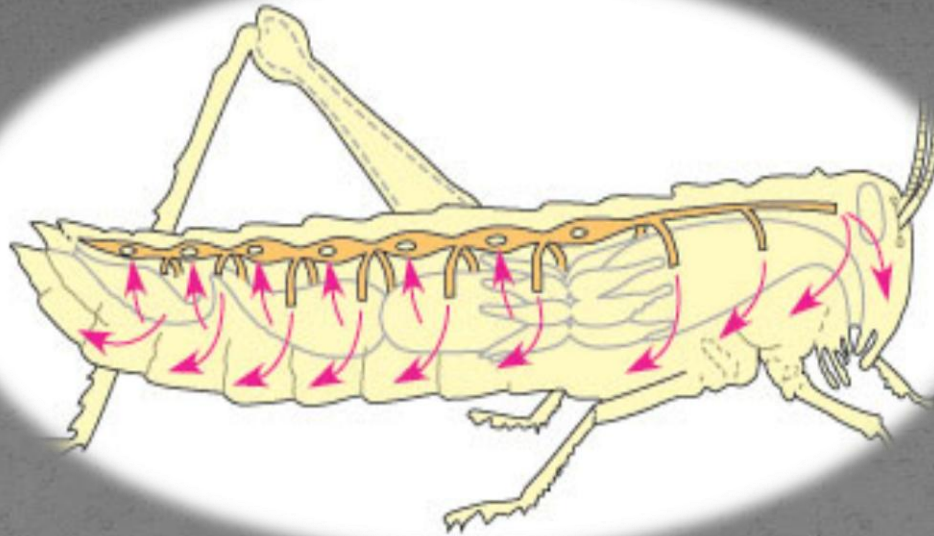
Level 1.5：無循環
消化循環兩用腔
水母Jellyfish
腔腸動物門(Coelenterata)
無循環系統生物



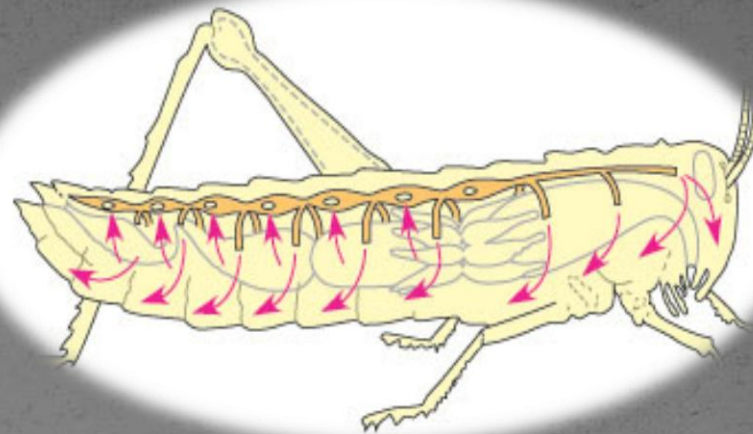
無循環系統
依靠消化循環兩用腔
體積稍大
無器官

Level 2.0：開放循環
有心肌、動脈（無微血管）
昆蟲階段





滴灌



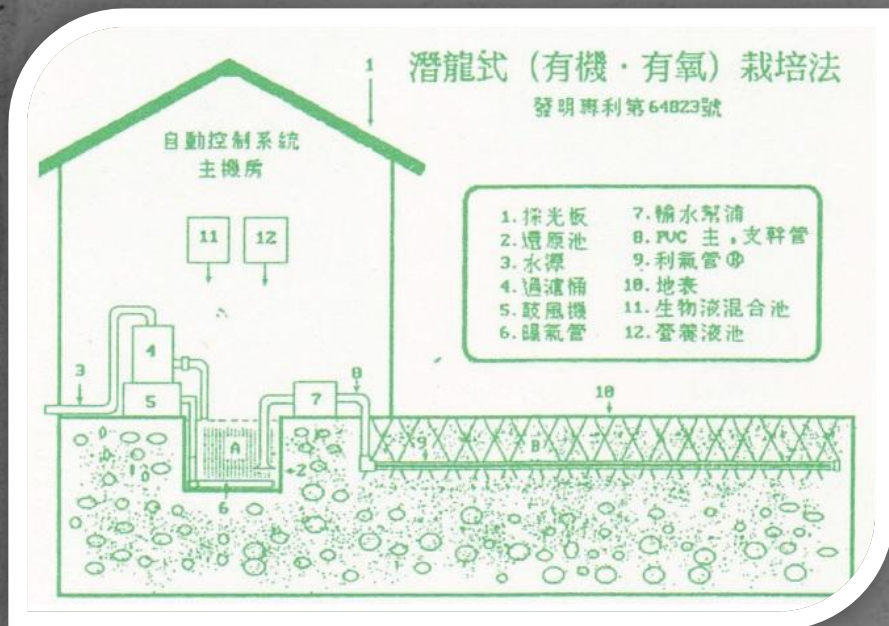
點狀灌溉



仿微血管系統(Leaky pipe)

模擬雨林環境1994

國外地下灌溉系統PMH

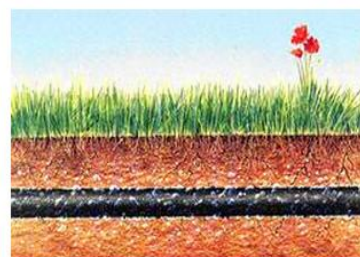


What is sub surface irrigation?

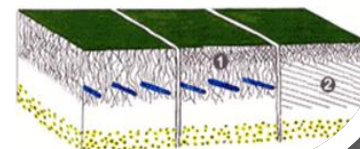
Subsurface irrigation or sub irrigation allows the precise application of water, nutrients and other agro-chemicals directly to the root zone of plants.

Irrigating underground is one of the most efficient ways to water plants. Subsurface irrigation reduces evaporation, wind drift, over spray, vandalism and as such can save substantial amounts of water.

The depth and placement of the drip-line depends on the soil and need of the plant being irrigated. Water moves by capillary action through the soil, 150-750mm beneath the soil surface, forming a continuous wetted layer at the root zone.



Porous membrane hose



最大昆蟲

VS

最大動物

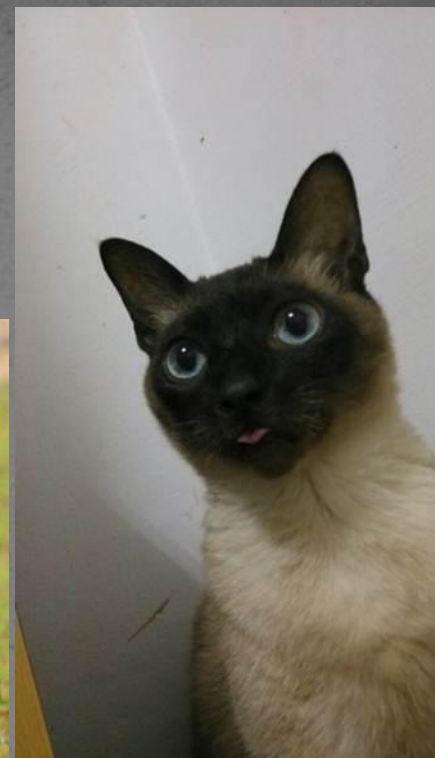
泰坦大天牛
Titan Beetle
0.3kg



非洲象
4000kg



Level 3：閉鎖式循環 脊索動物門

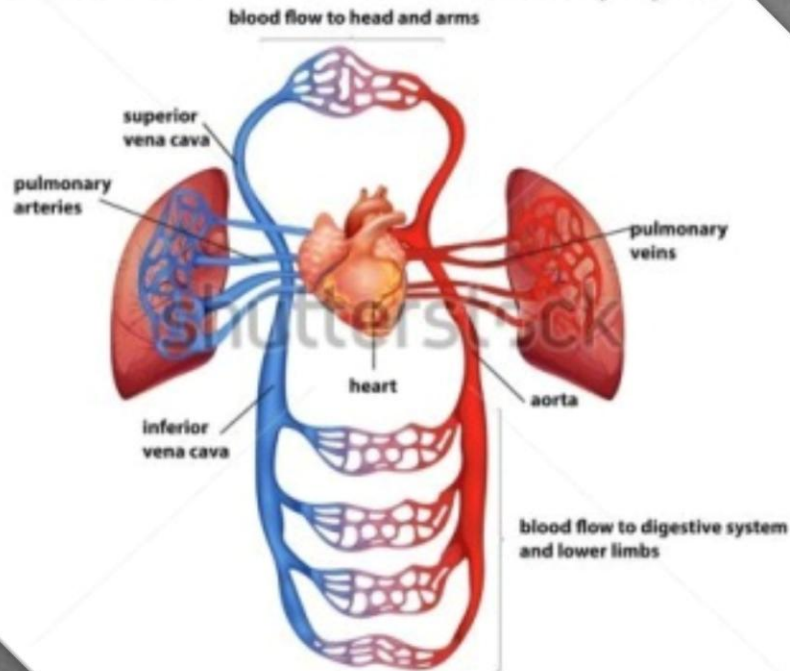


Level 3：閉鎖式循環

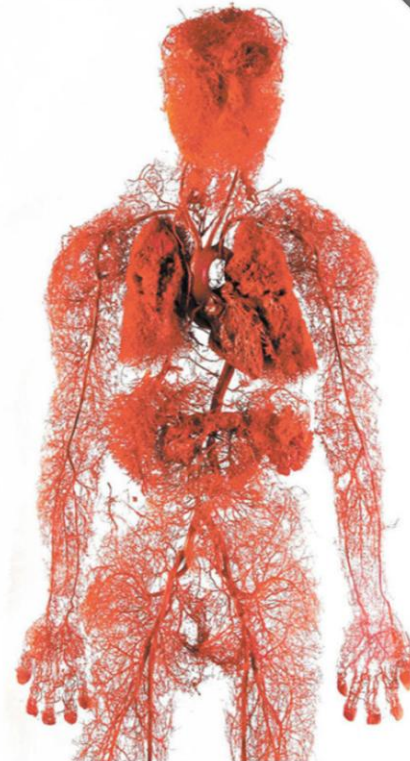
人類(脊索動物門 哺乳綱 靈長目 人種)

出現微血管、完整心臟

Blood Flow in Human Circulatory System

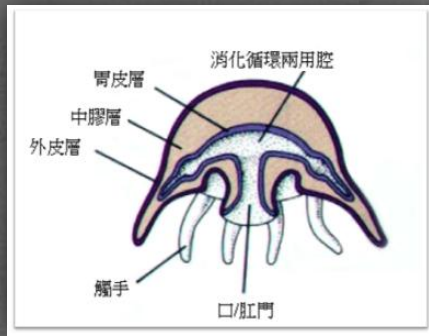


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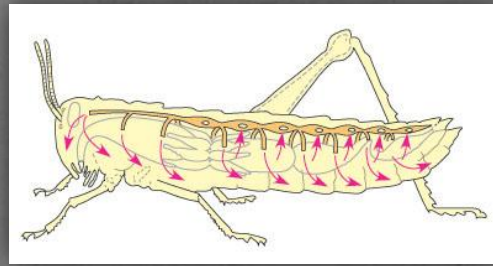


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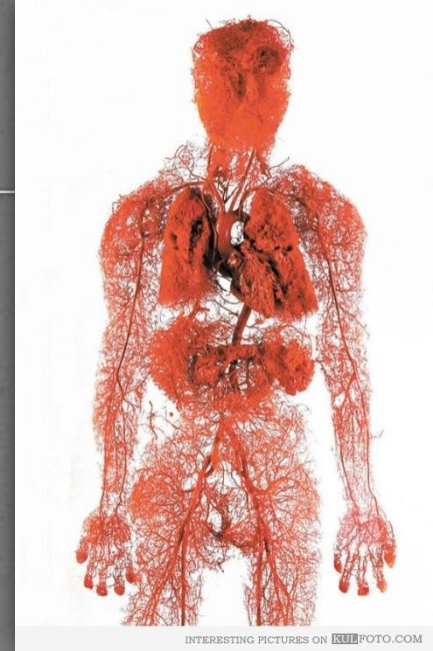
Level I

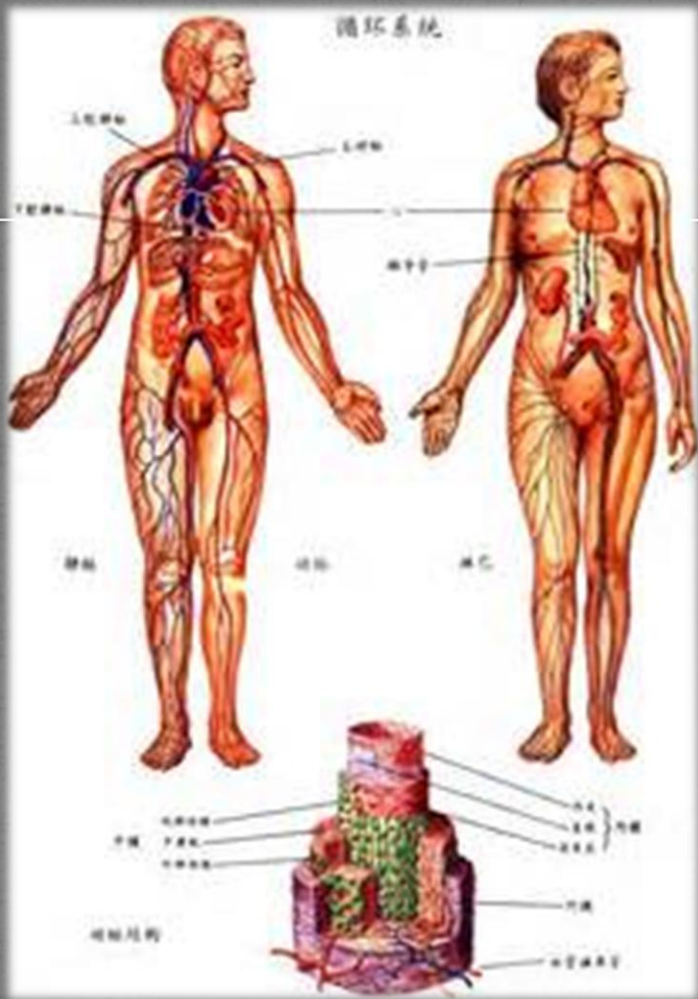


Level II



Level III ?



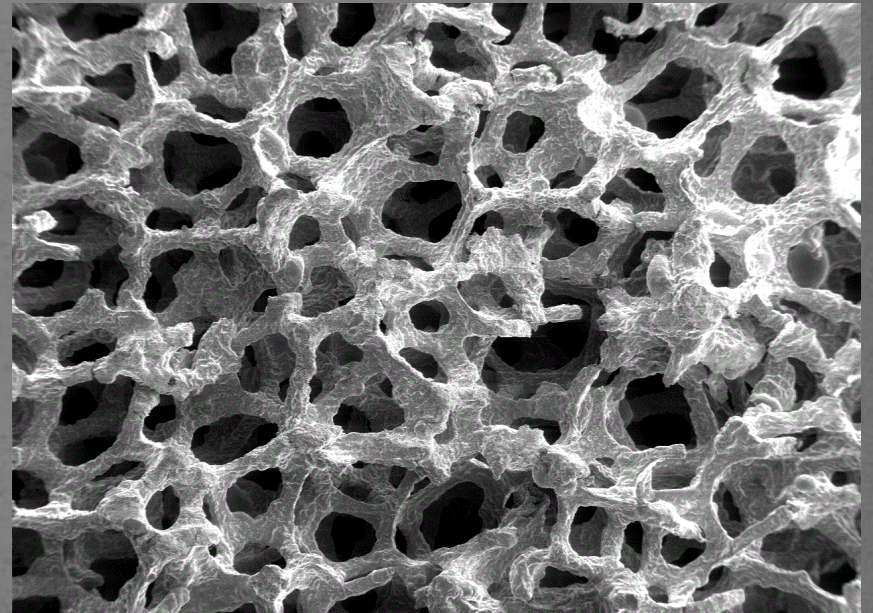


類似微血管的多孔性材料

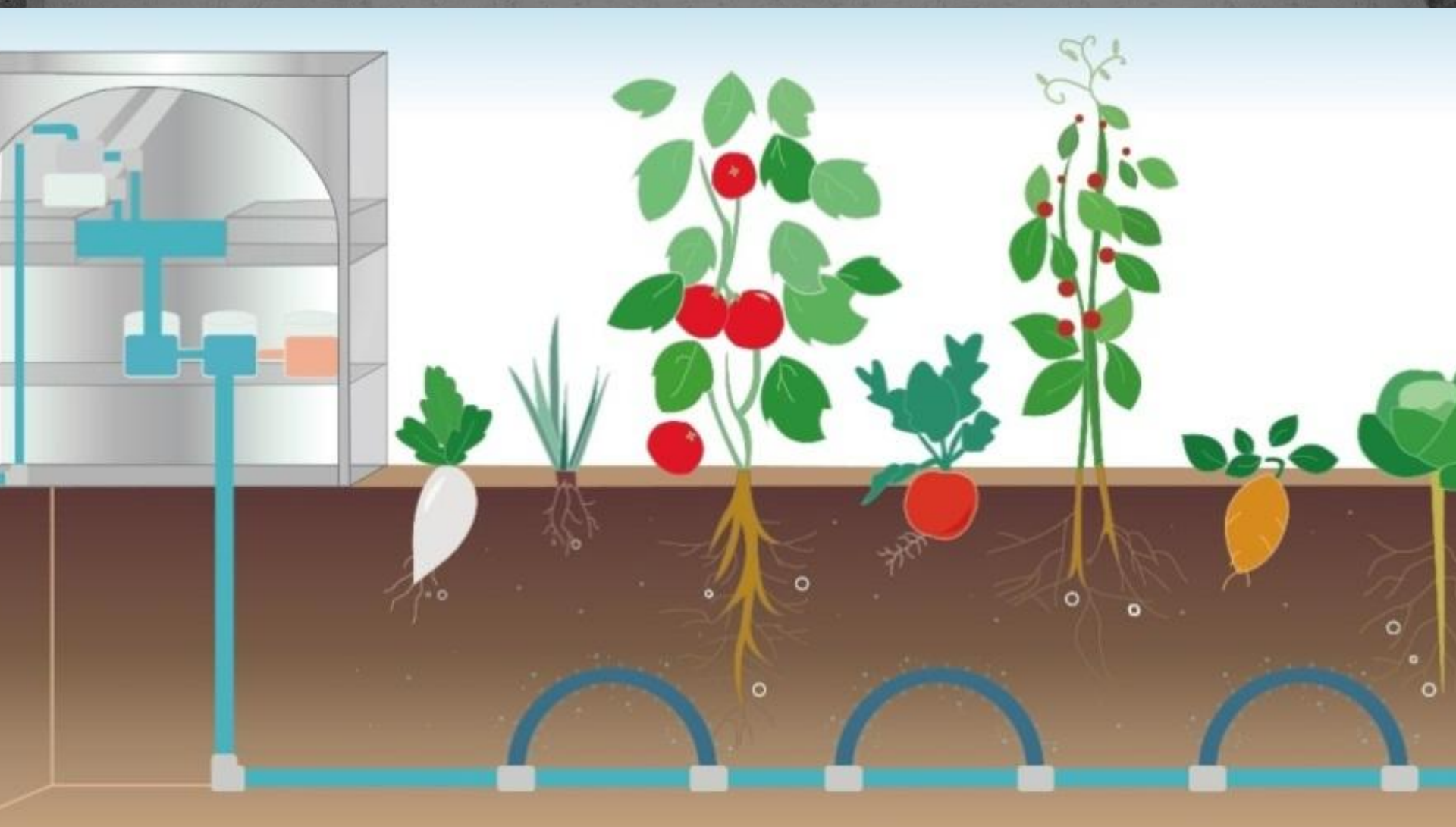
Leaky Pipe



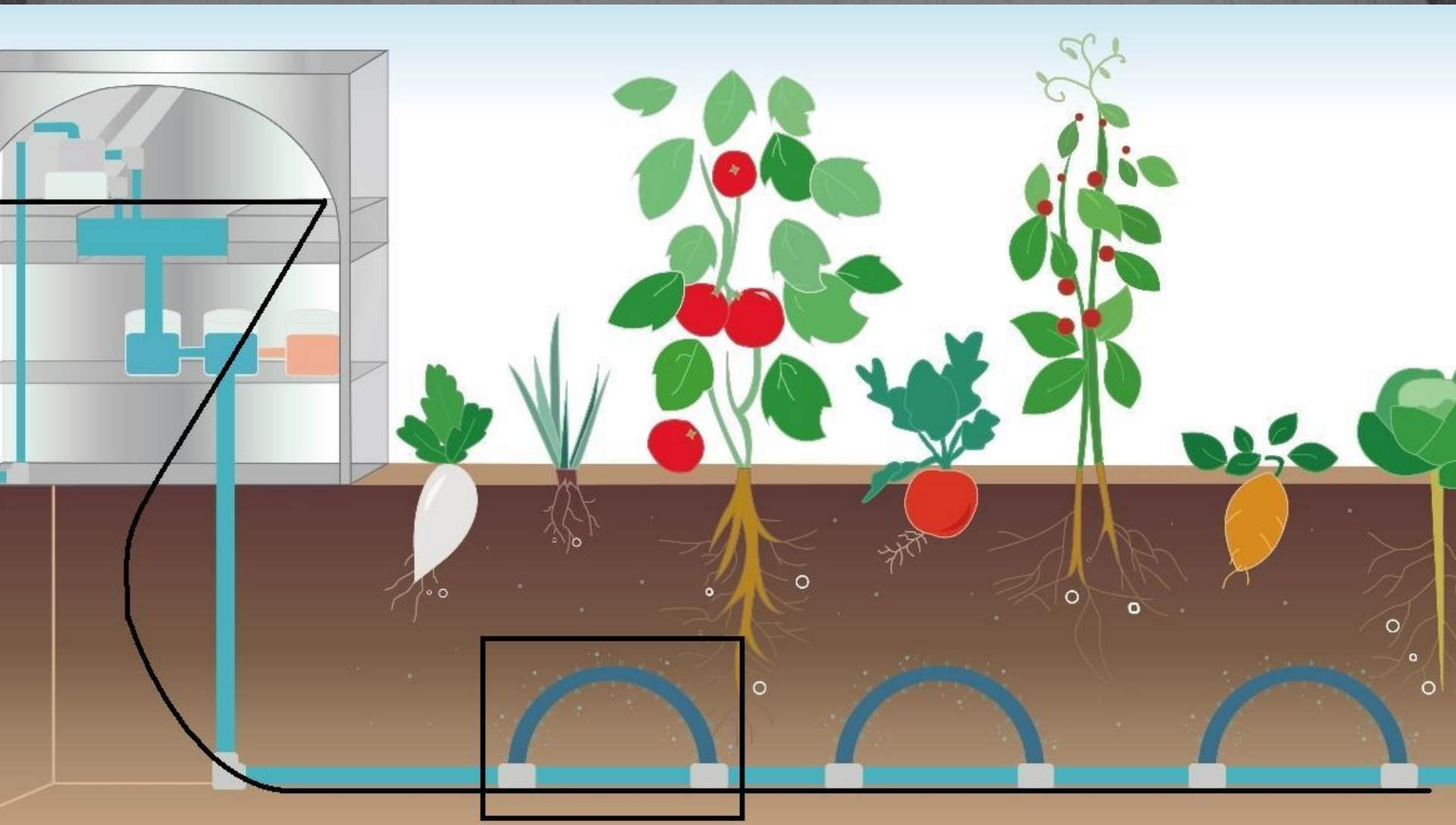
Porous Materials



ClassIII 模擬動物、人體的閉鎖式 地下灌溉系統 & 模擬器官



ClassIII 模擬動物、人體的閉鎖式 地下灌溉系統(弓形組件、乙型配置)



舒適怡人的乾燥氣候
comfortable dry climate



2012 屏東農業生物科技園區



心房
混合桶

心室肌
馬達

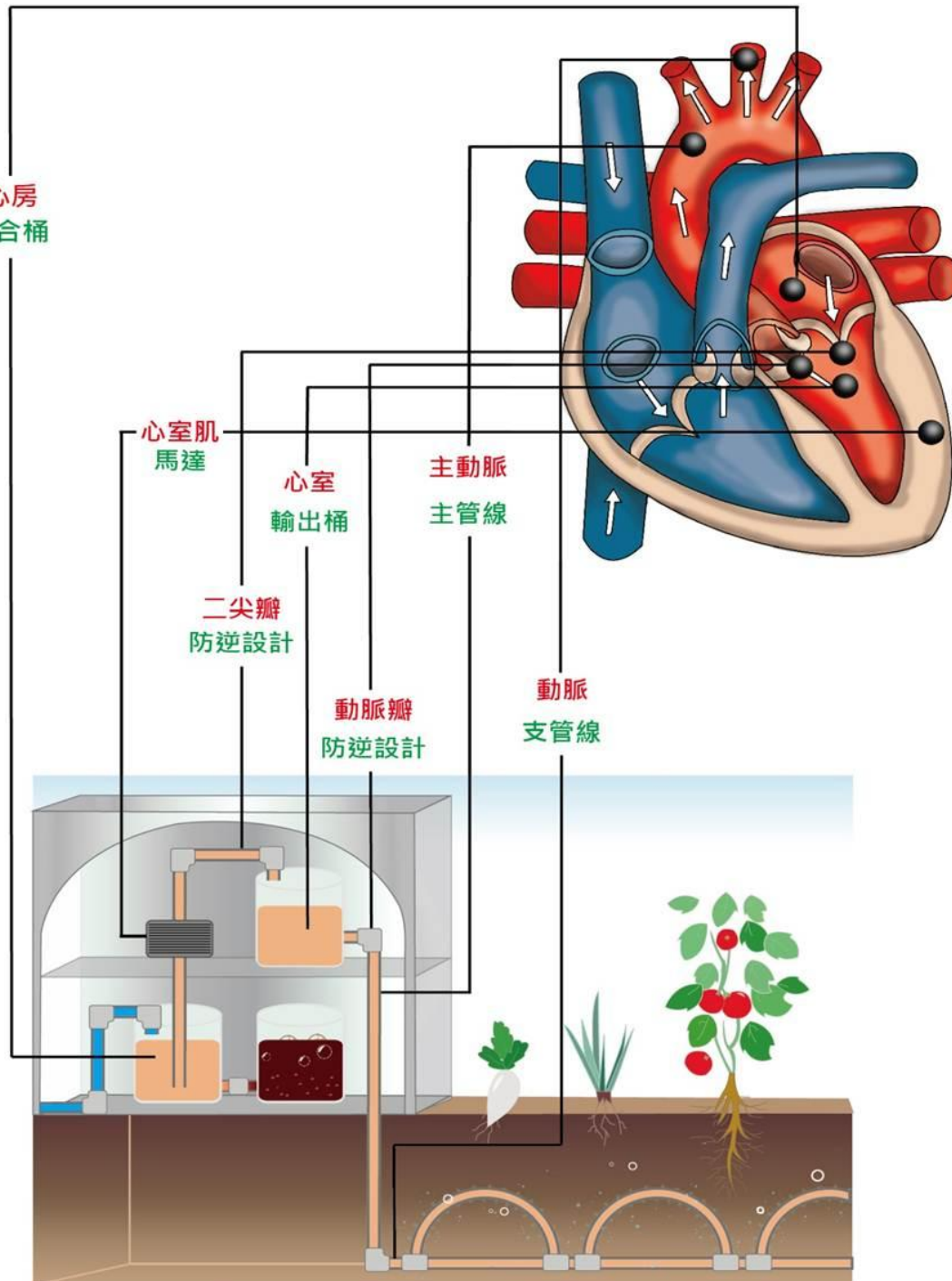
心室
輸出桶

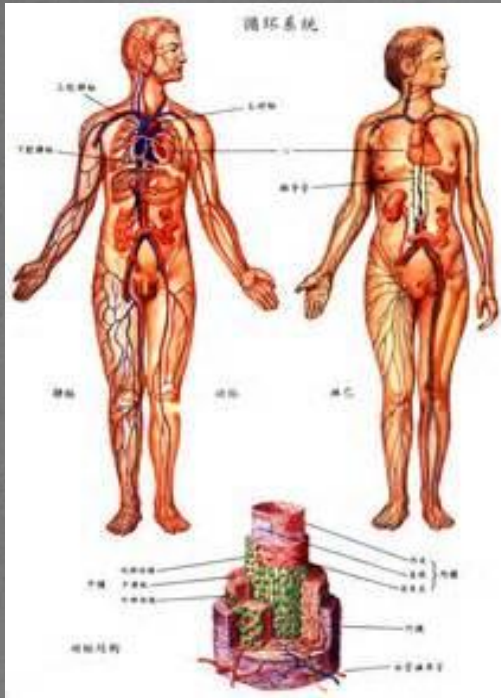
主動脈
主管線

二尖瓣
防逆設計

動脈瓣
防逆設計

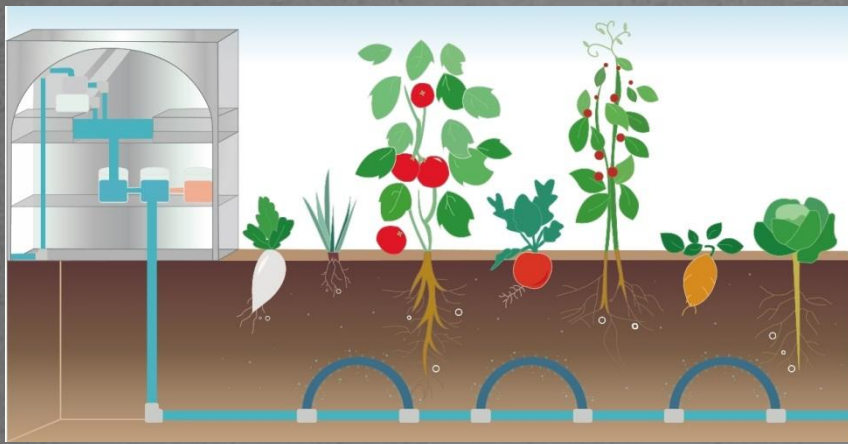
動脈
支管線





仿呼吸系統翻耕

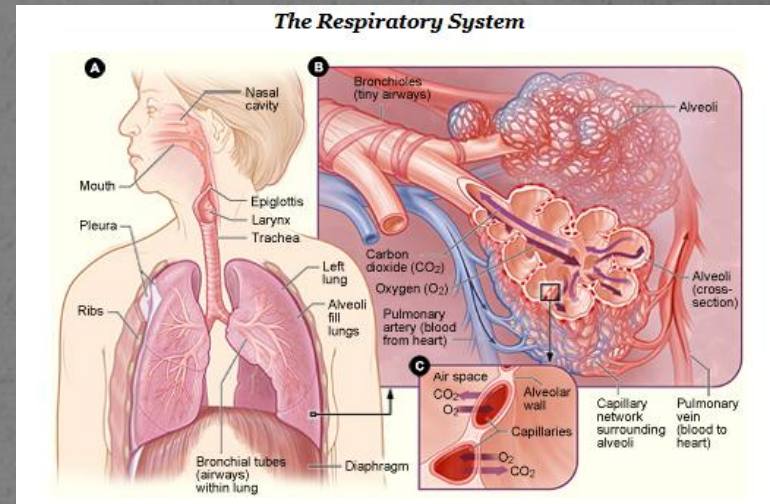
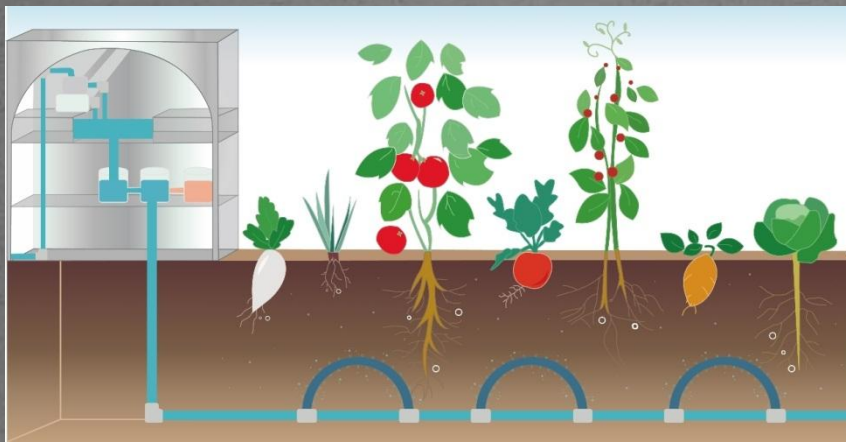
Respiratory system of soil



- Type I 微生物產氣翻耕
- Type II 仿呼吸:空氣翻耕

仿呼吸翻耕

Respiratory system of soil



- Type I 微生物產氣翻耕
- Type II 仿呼吸:空氣翻耕













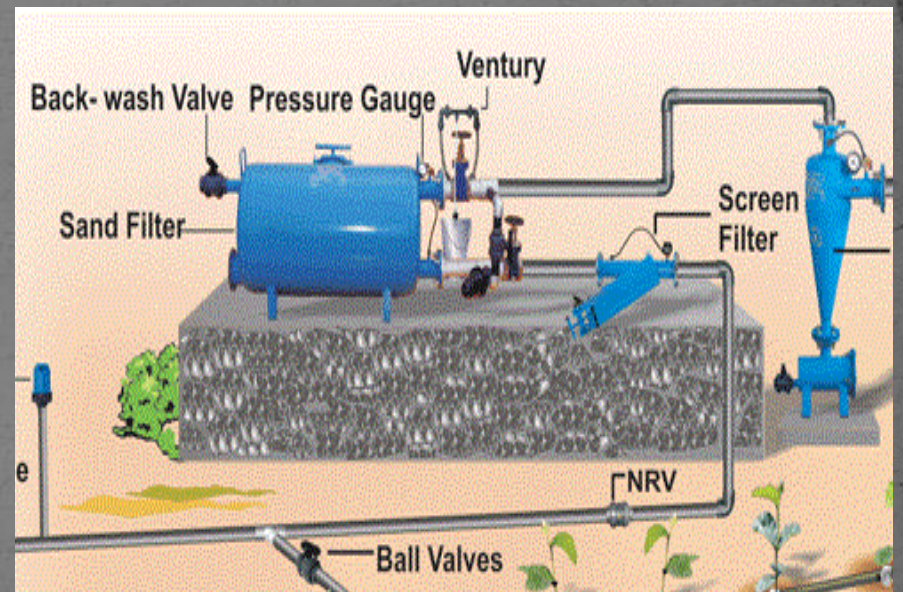




丹參







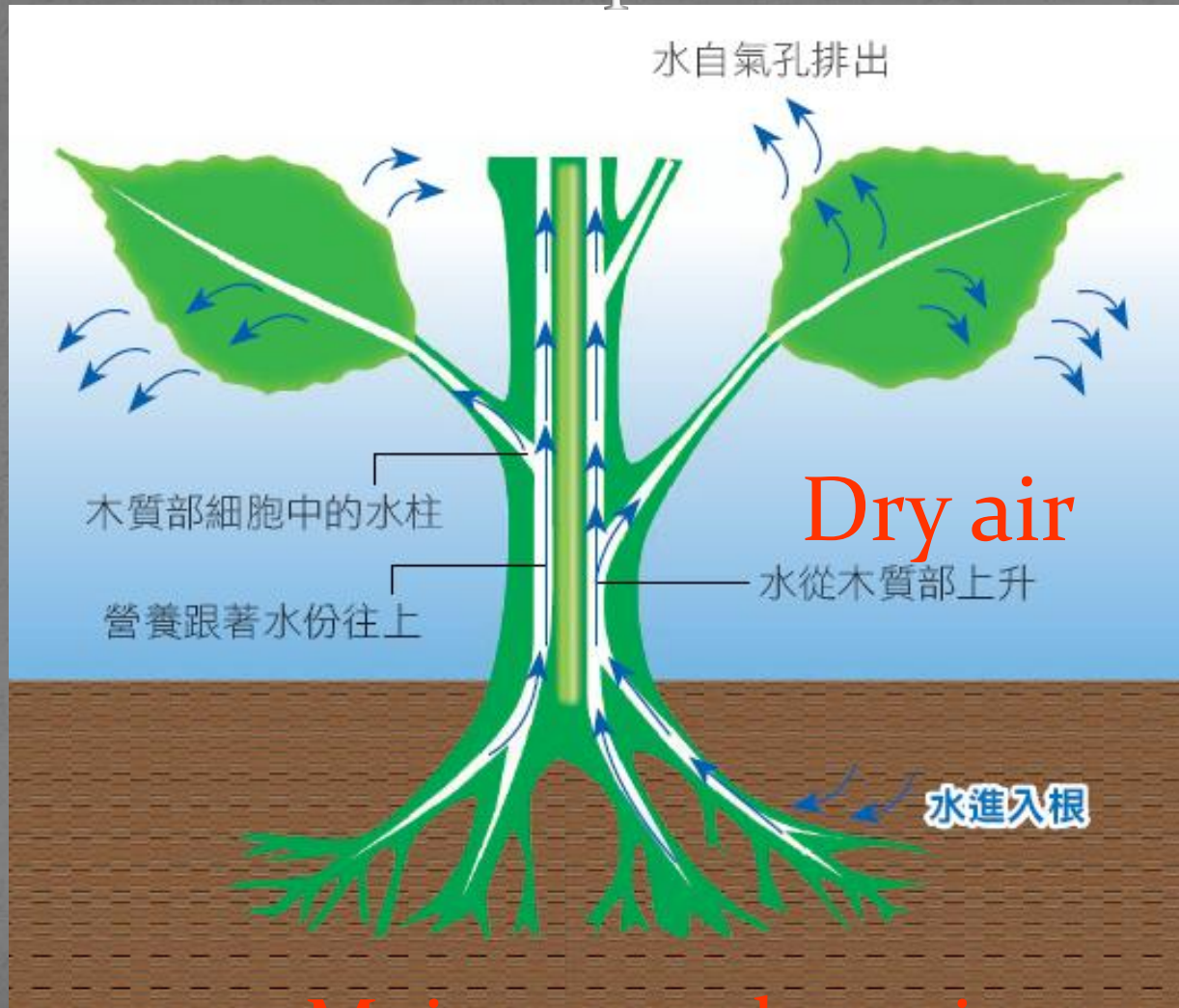


十字花科



強化營養吸收

Nutrition absorption enhanced



Moisture and nutrient

	仿生農法		一般有機		慣行農法	
	維生素C (mg/L)	硝酸鹽 (mg/L)	維生素C (mg/L)	硝酸鹽 (mg/L)	維生素C (mg/L)	硝酸鹽 (mg/L)
青江菜	3483.33	1510.00	-	-	1556.67	2615.00
地瓜葉	2176.67	643.33	1226.67	913.33	1493.33	1770.00
小松菜	1903.00	1016.67	1673.33	2940.00	-	-
菠菜	1893.33	173.67	1590.00	210.00	-	-
油菜	2523.33	1020.00	-	-	1330.00	1440.00
高麗菜	803.33	466.67	456.67	253.33	653.33	876.67
山萵蒿	1736.67	716.67	-	-	-	-
A菜	1500.00	1153.33	-	-	-	-



2005

仿生農業前期實驗
無農藥化肥,有機生產
無環控狀態

生長優勢

- → 生長加速
- → 植株變大
- → 產量提昇
- → 抵抗力變強
- → 環境適應力提昇
- → 品質提昇
- → 營養濃度提高（維他命、微量元素、特殊成份...等）
- → 更加美味、滋味豐富

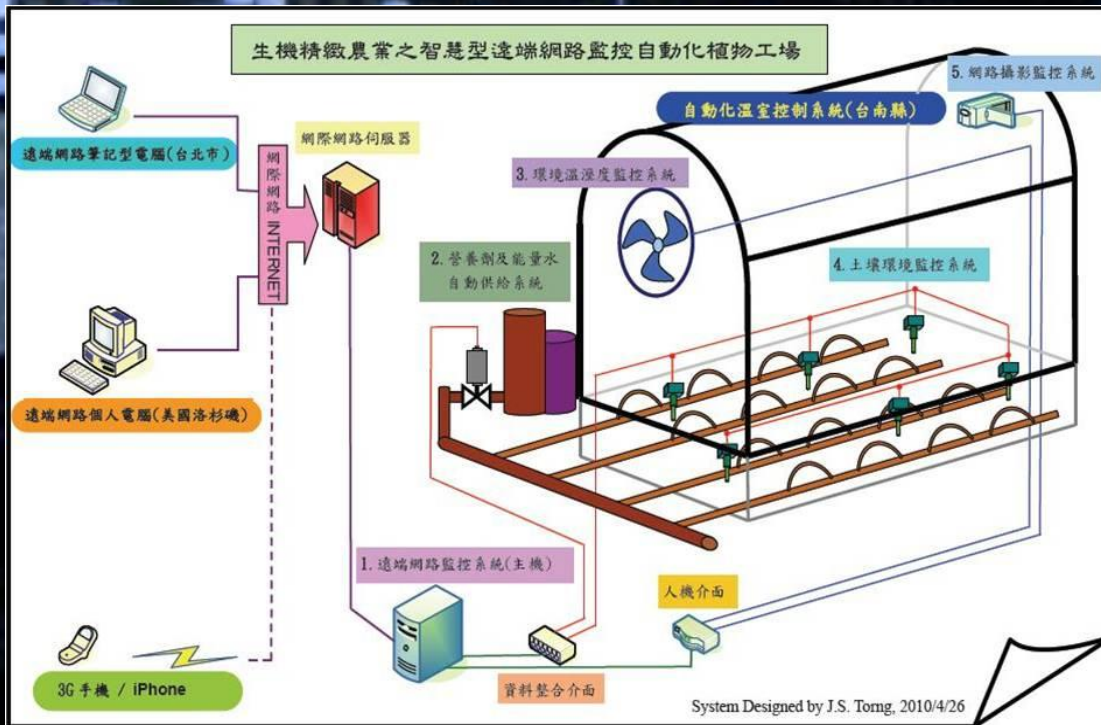






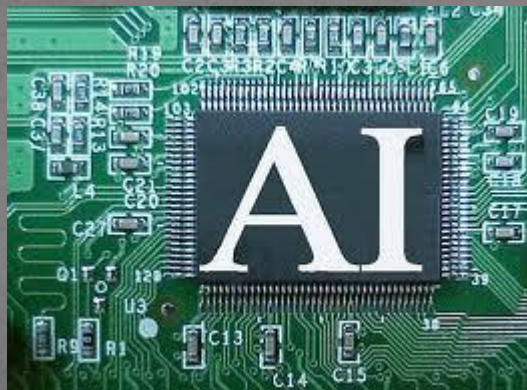
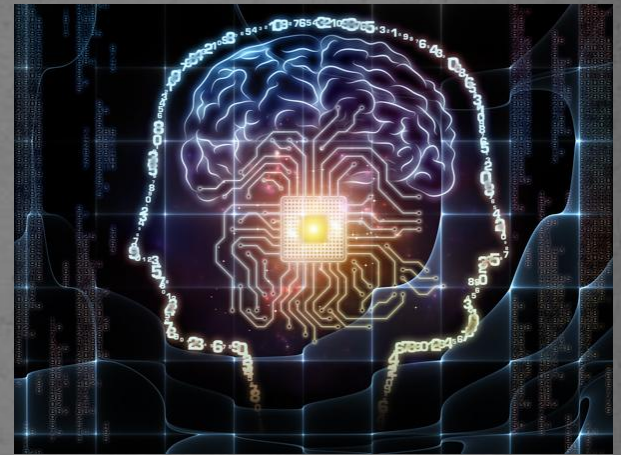


Next : A.I. System Cloud Connection



階段五：人類—人工智慧

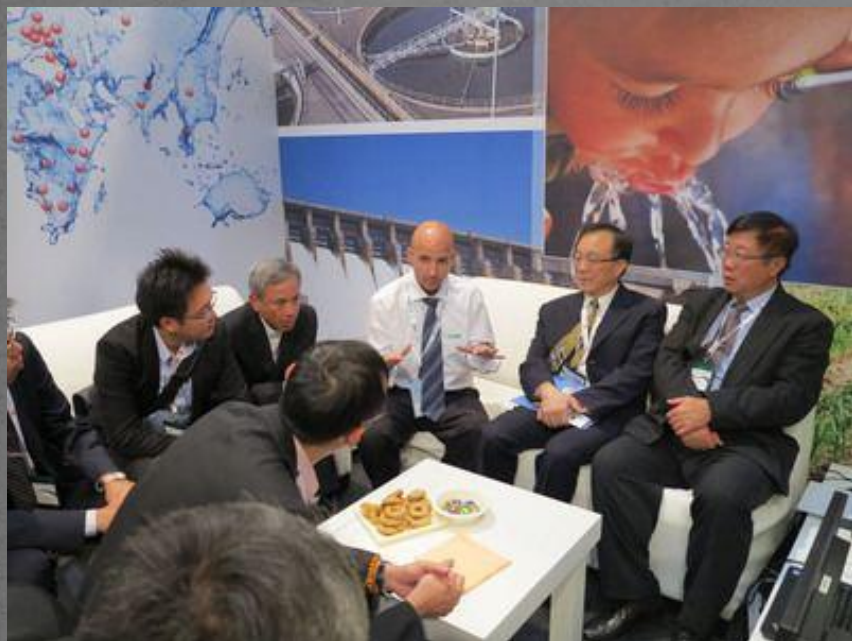
- 60兆細胞 vs 70兆人口
- 人工智慧、神經系統
- 雲端科技、網路串連
- 環控技術
- 21世紀農業技術的進化與革命
- 仿生學於農業的首度農業成功運用



屏東農業生物科技園區2012

台以農業交流(陳保基)

系統內觀



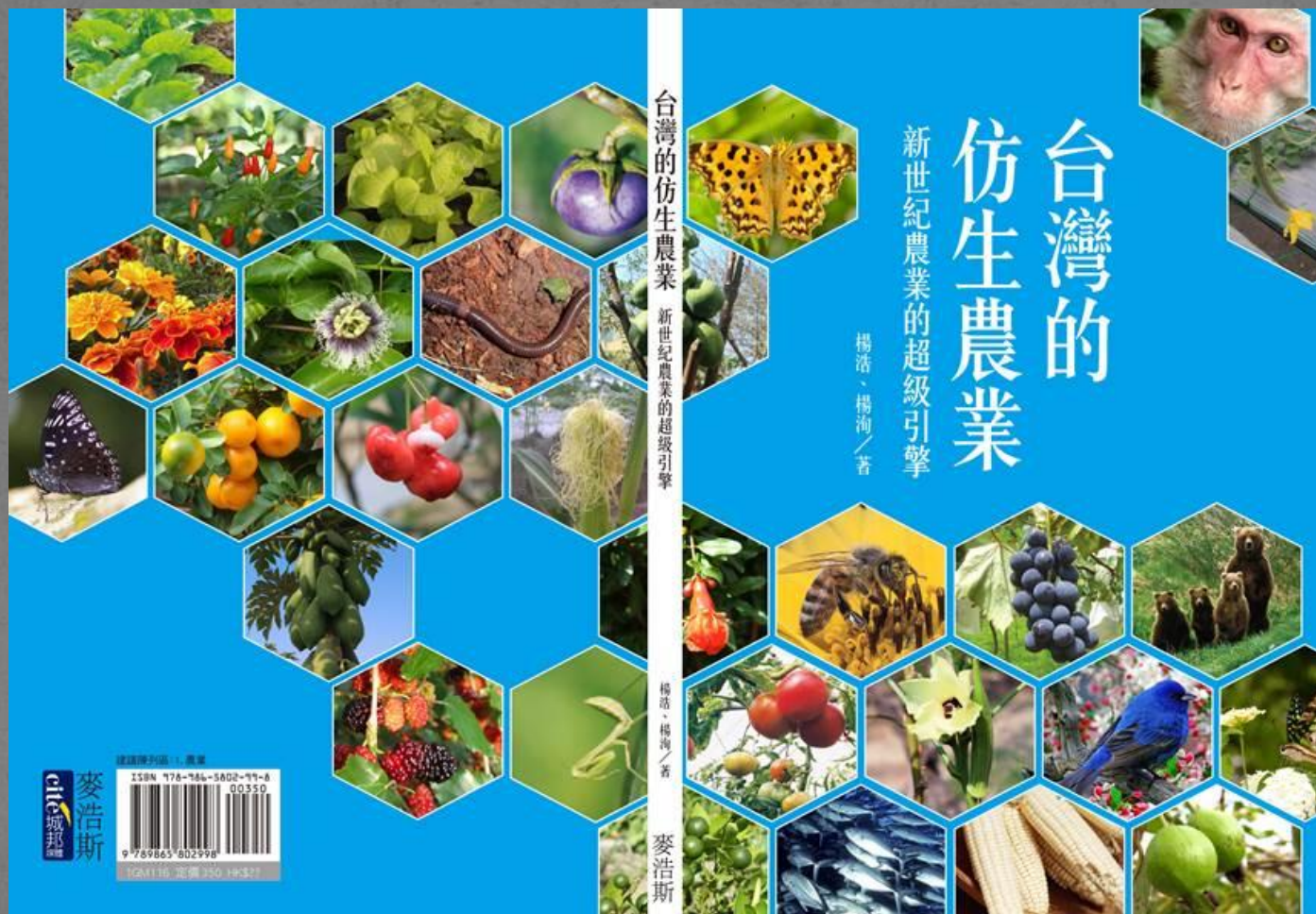
以色列農業部長



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