



## 電子顯微鏡生態探索 Electron Microscope Eco Exploration

姓名 Name

組別 Group

日期 Date:

### 學習目標 Learning goals:

完成課程後，學生應能 After the course, students should be able to:

1. 理解光學顯微鏡和電子顯微鏡的運作原理  
Understand the operation principle of light microscope and electronic microscope;
2. 操作光學顯微鏡和電子顯微鏡作生物觀察  
Operate light microscope and electronic microscope for biological observation;
3. 仔細觀察和準確記錄 Observe carefully and record precisely;
4. 用不同的方法去驗證已有的知識 Use different methods to verify existing knowledge;
5. 與他人合作進行考察和資料整理工作 Cooperate with others to do field investigation and data processing;
6. 製作簡單科學報告 Make simple scientific report;
7. 欣賞大自然之美和尊重生物 Appreciate the wonder of nature and respect living things.

### 程序 Schedule

9:15 - 09:45	簡介 Briefing
09:45 - 10:15	野外搜集樣本 Collecting samples in the field
10:15 - 10:45	樣本處理 Sample preparation
10:45 - 12:00	電子顯微鏡觀察 Electronic microscopic observation
12:00 - 13:00	午膳 Lunch
13:00 - 14:30	電子顯微鏡觀察 Electronic microscopic observation
14:30 - 15:30	數據分析 Data analysis
15:30 - 16:15	分組匯報 Group presentation
16:15 - 16:30	討論及總結 Discussion & summary

### 儀器和工具 Equipment and tools

1	鑷子 Forceps	
2	剪刀 Scissors	
3	10 倍放大鏡 10X magnifying glass	
4	小型培養皿 Small petri dishes	
5	導電雙面膠貼 Double-side conductive adhesive tape	
6	解剖顯微鏡 Dissecting microscope	
7	濺射鍍膜機 Sputter coater	
8	掃描電子顯微鏡 Scanning electronic microscope	

### 選項 Option A. 花粉 Pollens

收集不同植物成熟的花，應包含兩種同科不同種的植物和最少三個科的植物，即最少四個品種。於解剖顯微鏡下摘下成熟雄蕊，將雄蕊於金屬載碟上的導電膠貼表面塗擦，經噴金處理後置入電子顯微鏡內觀察和攝取圖像。Collect mature flowers of different plant species. At least 2 species of the same family and 3 different families are involved. i.e. at least 4 species. Pick mature anther from the flowers and smear on the surface of conductive adhesive tape stuck to the metal stage. After sputter coating of gold, observe under electronic microscope and capture images.

	花粉所屬植物的學名 Scientific name of the pollen bearing plant	俗名 Common name	科名 Family name
1			
2			
3			
4			
5			

### 選項 Option B. 孢子 Spores

剪下具有成熟子囊堆的蕨類植物的葉，應涉及最少三個不同品種的蕨；收集最少一種蕨類植物成熟的孢子囊。於解剖顯微鏡下剪下面積約 5 x 5 mm 具最多成熟子囊堆的葉片部份，貼於金屬載碟上的導電膠貼表面；摘下蕨類植物的成熟孢子囊，貼於金屬載碟上的導電膠貼表面；經噴金處理後置入電子顯微鏡內觀察和攝取圖像。

Cut fern leaves bearing ripen sori. At least 3 different species are involved. Collect ripen sporangia from at least one species of moss. Under dissecting microscope, cut a small piece, containing highest density of ripen sori, from each of the fern leaves (~ 5 x 5 mm). Pick mature sporangia from the moss. Adhere the material to the surface of conductive adhesive tape stuck on the metal stage. After sputter coating of gold, observe under electronic microscope and capture images.

	孢子囊所屬植物的學名 Scientific name of the sporangia bearing plant	俗名 Common name	科名 Family name
1			
2			
3			
4			
5			

### 選項 Option C. 收集昆蟲 Collect insects

收集三種不同目的小昆蟲，急凍處理後置於金屬載碟上的導電膠貼表面，經噴金處理後置入電子顯微鏡內觀察和攝取圖像，特別留意觸角、複眼和足部跗節的微結構。Collect 3 species of insects belonging to different orders. After frozen, adhere to the surface of conductive adhesive tape stuck on the metal stage. After sputter coating of gold, observe under electronic microscope and capture images. Pay special attention to the micro-structure of antennae, compound eyes and tarsi.

	昆蟲名稱 Name of the insect	目 Order		昆蟲名稱 Name of the insect	目 Order
1			1		
2			2		

**選擇上列其中一個選項。Select one of the above three options.**



# 圖像分析和問題討論

## *Image analysis & discussion*



1. 選擇其中一幅電子顯微鏡攝取的圖像，簡單描述圖中的各項微結構，並指出各微結構的功能。  
Select one of the images capture by the scanning electronic microscope, briefly describe the micro-structure shown and point out the fuction of each micro-structure.
2. 比對不同分類的生物所具有的同—器官或細胞 (花粉/ 孢子囊/孢子/ 觸角/ 複眼/ 跗節)，簡單描述之間的分別，並說明這些分別與各自的生存環境、生活習性、繁殖方式、食性等的關係。  
Compare and contrast the same organ or cell owned by different living organisms, briefly describe the differences and explain how are the differences related to the living environment, habit, mode of reproduction, diet, etc., of individual living organism.