

# 生物策略表

類別	生物策略 (Strategy)
生物策略 Strategy	水壓幫助花朵跟隨太陽的方位 (Water Pressure Helps Flowers Follow the Sun)
生物系統 Living system	植物 Plants
功能類別 FUNCTIONS	<p># 捕獲、吸收或過濾能量 # 修改尺寸/形狀/質量/體積            # 適應表型 # 對信號反應            # 感知環境中的光 (可見光譜)            # Capture, Absorb, or Filter Energy # Modify Size/Shape/Mass/ Volume            # Adapt Phenotype # Respond to Signals            # Sense Light (Visible Spectrum) From the Environment</p>
作用機制標題	<p>光強度集中激素，改變細胞中水的含量，導致植物向光源彎曲。            Light intensity concentrates hormones that alter the water levels in cells causing plants to bend toward the light source.</p>
<p>生物系統/作用機制示意圖 (確認版權、註明出處；畫質)</p>	<div data-bbox="485 1048 1414 1697"> <p><b>BIOLOGICAL STRATEGY</b>  <b>Plant Hormones Turn To The Dark Side</b></p> <p>Auxin (plant hormones) move away from light (phototropism), thereby making the shoot bend toward the sun.</p> <p>When sunlight is overhead the auxin molecules are dispersed downward.</p> <p>Once the sunlight shines at an angle the auxin molecules move to the opposite side and activate the lengthening of those cells.</p> <p>Cell elongation results in the bending of the shoot toward the sunlight.</p> </div>

## 作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

植物可以根據環境的變化改變它們的結構：這種部分或全部有機體的轉變稱為趨向性 (tropism)。各種類型的向性包括向地性 (對重力作出反應)、向觸性 (對物理接觸作出反應)、向光性 (對光作出反應) 和向日性 heliotropism (特別是響應陽光而生長或改變它們的形狀)。

各種趨向性之所以起作用，是因為環境線索會引發激素反應，導致植物細胞生長或擴張——有些比其他細胞更快。生長素是一類已知參與植物對光的反應的激素。生長素水平的增加發生在植物接受較少光照的部分，這導致這些區域的細胞通過削弱剛性細胞壁和增加細胞的水攝入量而伸長。當許多細胞在植物的陰影側擴張時，這種反應就會達到組織水平。植物可能會繼續朝著它生長的方向定向，改變它的方向以與陽光對齊，或者如果它的環境的其他方面阻止它與太陽完美對齊，則將它自己定向成與陽光成一定角度。

從植物的日光性中汲取靈感已經啟發了自導向太陽能電池板的創造，該太陽能電池板使用由材料製成的軟機器人，這些機器人會隨著水壓的變化而彎曲和移動，以面對太陽並吸收和儲存盡可能多的光。

Plants can alter their structure in response to changes in their environment: this turning of part or all of the organism is called tropism. The various types of tropisms include gravitropism (reacting to gravity), thigmotropism (reacting to physical contact), phototropism (reacting to light), and heliotropism (growing or changing their shape in response to sunlight specifically).

Tropism of all kinds works because environmental cues trigger a hormonal response that causes the plant's cells to grow or expand – some faster than others. Auxins are a class of hormones known to be involved in a plant's response to light. An increase in auxin levels occurs in the part of the plant that receives less light, which results in the elongation of cells in those areas through a weakening of the rigid cell wall and an increase in the cell's water intake. This response reaches the tissue level when many cells have expanded on the shaded side of the plant. The plant may continue to orient itself in the direction it is growing, change its orientation to align with sunlight, or orient itself at an angle to sunlight if there are other aspects of its environment preventing it from aligning perfectly with the sun.

Taking inspiration from plant heliotropism has already inspired the creation of self-directing solar panels that use soft robots made of materials that bend and move with changes in water pressure to face the sun and absorb and store as much light as possible.

## 文獻引用 (REFERENCES)

### 參考文獻清單與連結 (REFERENCELIST) Harvard 或 APA 格式

The mechanism of floral heliotropism in the snow buttercup, *Ranunculus adoneus* (Plant, Cell and Environment | 12/03/2003 | R.A. Sherry, C. Galen)

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AskNature原文連結

<https://asknature.org/strategy/flowers-follow-sun/#related-innovation>

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