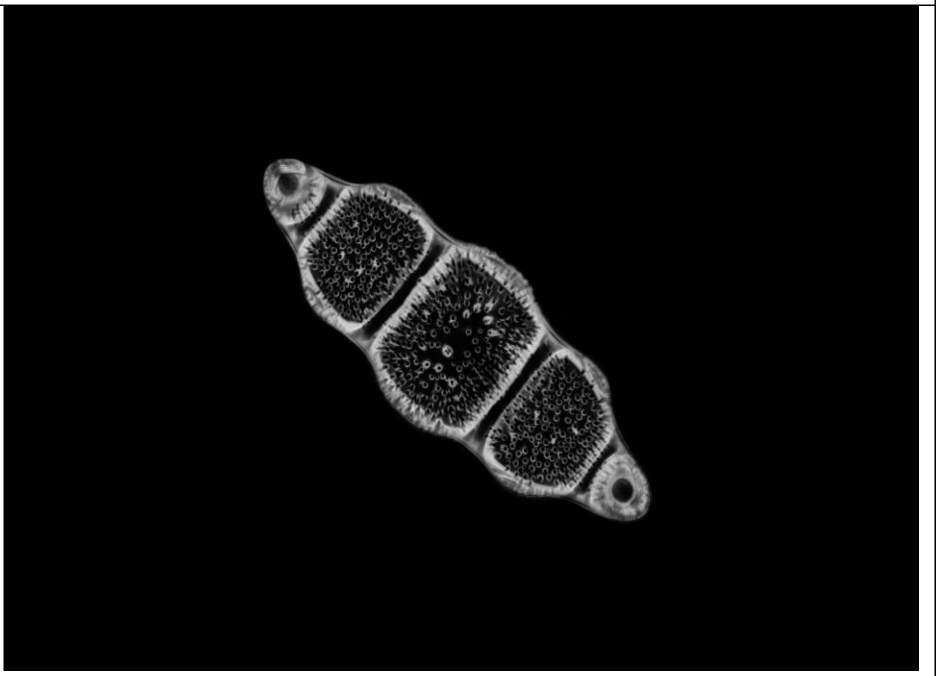
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	矽藻建造穩定而強大的玻璃屋 (Diatoms Build Glass Houses That Are Stable and Strong)
生物系統 LIVING SYSTEM	矽藻 (Diatoms)
功能類別 FUNCTIONS	#化學組裝礦物晶體 (Chemically Assemble Mineral Crystals) #化學組裝有機化合物 (Chemically Assemble Organic Compounds) #物理組裝結構 (Physically Assembly Structure)
作用機制標題	矽藻使用蛋白質來排列礦物質，形成堅固而復雜的外殼。 (Diatoms build strong, intricate cases using proteins to arrange minerals.)
生物系統/作用機制示意圖 (確認版權、註明出處；畫質)	 圖片擁有者:Mary Hoff，非商業使用
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	

矽藻這種生物會用二氣化矽 (silicona) 為自己製造一個稱為矽藻殼 (frustule) 的殼，這材料是製造玻璃和世界上大部分沙子的材料。每個矽藻殼都由上蓋和底部組成，它們就像一個糖果盒一樣組合在一起。
(Diatoms craft for themselves a shell, called a frustule, from silicona, the material that makes glass and much of the world’s sand. Each frustule consists of a top and bottom that fit together like a candy box.)

矽藻的這種糖果盒結構方式還有助於讓矽藻更靠近水面，保護矽藻免於受細菌和病毒的侵害，並將對矽藻有害的紫外線轉化為它可使用的光合作用波長。
(The way they are structured also helps keep diatoms close to the surface of the water, protects the diatom from bacteria and viruses, and converts harmful ultraviolet light into a wavelength the diatom can use to photosynthesize.)

已知蛋白質中的矽酸轉運蛋白將矽從周圍的水中轉移到細胞內的袋狀結構中，稱為二氧化矽沉積囊胞 (silica deposition vesicle)。在那囊胞中，蛋白質會將矽原子連接在一起，形成一個堅硬的結構。一些稱為 Silaffin 的蛋白質會製造出帶有小孔的碎片。還有其他的結構，稱為胸膜素 (pleuralins)，有助於連接盒子的上蓋和底部。

(Proteins known as silicic acid transporters move silicon from the surrounding water into a baglike structure inside the cell called a silica deposition vesicle. There, other proteins link silicona atoms together to form a hard structure. Some proteins, called silaffins, make bits with tiny pores. Others, called pleuralins, help connect the top and bottom parts of the box.)

還有其他物質稱為 cingulins，有助於製作緞帶結構 (band) 將盒子環繞，並固定在一起。一種稱為幾丁質 (chitin) 的糖聚合物更提供了額外的緊度。最後，矽藻用稱為長鏈多胺的有機材料覆蓋結構。科學家們認為這些物質有助於為各種不同的矽藻創造屬於自己固定的形狀。

(Yet others, known as cingulins, help make bands that wrap around the structure and hold it together. A sugar polymer known as chitin offers additional strength. Finally, the diatom coats the structure with organic materials known as long-chain polyamines. Scientists think these help create customized shapes for various species.)

文獻引用 (REFERENCES)

“這些微生物藻能夠產生高度裝飾、奇特和優雅的多孔二氧化矽細胞壁，稱為矽藻殼。這些細胞壁表現出驚人的物種特異性形狀和孔隙模式的多樣性，這使得矽藻成為十九世紀顯微鏡界非常流行的生物。 ......即使在今天，矽藻壁的高倍放大圖像仍然以其種類繁多的微米和奈米結構而令人驚嘆。此外，矽藻產生的二氧化矽細胞壁使這些單細胞藻類在海洋生態學和生物地球化學中具有獨特而有影響力的作用。矽藻矽化將海洋碳和矽循環聯繫起來：它們是地球上生產力最高的生物之一，估計佔全球初級產量的 20%。”
（來自德托馬西等人，寫於 2017：4）

“These microalgae have the ability to generate a highly ornamented, fanciful and elegant porous silica cell wall, known as the frustule. These cell walls exhibit an amazing diversity of species-

specific shapes and pore patterns, which made diatoms very popular organisms for microscopist community in the Nineteenth century. … Even nowadays, high magnification images of diatom walls continue to amaze with their huge variety of micro and nano-structures. In addition, the silica cell walls produced by diatoms give these single-celled algae a distinct and influential role in the ecology and biogeochemistry of the oceans. Diatom silicification links the marine carbon and silico cycles: they are among the most productive organisms on earth, responsible for an estimated 20% of global primary production." (Appl. De Tommasi et al., 2017:4)
參考文獻清單與連結 (REFERENCE LIST) **Harvard 或 APA 格式**
延伸閱讀: Harvard 或 APA 格式（取自 AskNature 原文；若為翻譯者補充，請註明）
生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)
撰寫/翻譯/編修者與日期
羅意婷 翻譯 (2022/4/7) ；許秋容編修 (2022/5/14)
AskNature 原文連結
https://asknature.org/strategy/diatoms-build-glass-houses-that-are-stable-and-strong/