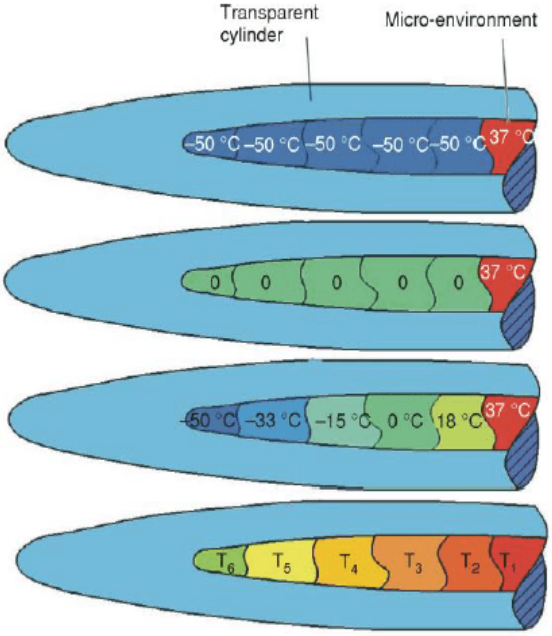
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	See-Through Polar Bear Fur Traps Light and Heat 可透視的北極熊皮毛留住光與熱
生物系統 LIVING SYSTEM	北極熊 Polar Bear
功能類別 FUNCTIONS	#保護免受溫度威脅 #應付溫度衝擊 #Protect from temperature threats #Manage thermal shock
作用機制標題	室芯纖維捕捉陽光、收集熱量並保留兩者以保持主人溫暖。 (Chamber-cored fibers capture sunlight, gather heat, and retain both to keep their owner warm.)
生物系統/作用機制示意圖 (確認版權、註明出處；畫質)	  (圖片來源:asknature)

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

當陽光照射到毛髮上時，外面會反射少量的陽光回到環境中，使熊呈現出明亮的白色外觀。 然而，大部分光穿過半透明的管，在那裡它撞擊並被核心反射。 根據光線照射到核心的角度，它會在毛髮內反彈或反彈到另一根毛髮上，並在此處重複該過程。
一些光能在此過程中轉化為熱能。 其中一些會越來越深地彈入熊的皮毛，直到最終被熊的黑色皮膚吸收，並以熱量的形式重新輻射。 緊密包裹的內部毛皮將熱量保持在動物附近，有助於保持溫暖。在北極熊的毛髮中，核心的腔室增加了額外的絕緣價值。 因此，當熊遇到它周圍的溫度升高時（例如，通過進入徘徊在 32°F (0°C) 附近的水），帶腔的毛髮核心可能可以吸收額外的熱量並保持比空心更長的時間。

When sunlight hits the hair, the outside reflects a small amount back into the environment, giving the bear a bright white appearance. Most of the light, however, travels through the translucent sheath, where it hits and is reflected by the core. Depending on the angle at which the light hits the core, it bounces around within the hair or it bounces out to another hair, where the process is repeated.
Some of the light energy transforms into heat in the process. Some of it bounces deeper and deeper into the bear's coat until it finally is absorbed by the bear's black skin, which re-radiates it as heat. The tightly packed inner fur holds the heat close to the animal, helping to keep it warm.In polar bear hair, the core's chambers add extra insulating value. As a result, when the bear encounters an increase in the temperature around it—say, by entering water hovering near 32°F (0°C)—the chambered core can absorb the additional heat and hold it for longer than a hollow-cored hair might.

文獻引用 (REFERENCES)

「北極熊的透明毛髮及其光散射中空芯的功能與光纖特性有關。光通過短距離的散射過程耦合到頭髮的纖維中，在隨後的散射過程中耦合出去，然後再次耦合到相鄰的毛髮中，依此類推，直到光消散成熱量或 被熊的黑色皮膚吸收。結果，毛皮的透明毛髮呈現白色，同時吸收了大部分入射輻射。 此外，太陽能光學技術包括一個補充策略：8000 到 12000 nm 之間的人體熱量的 IR 輻射被模擬機制有效地捕獲。」

The function of the transparent hair of polar bears with their light scattering hollow core has been associated with fibre-optical properties.
Light is coupled into the hair`s fibre via a scattering process for a short distance where soon after it is coupled out by a subsequent scattering process, just to be coupled again into a neighbouring hair and so on until the light is dissipated into heat or absorbed by the bear`s black skin. As a result, the pelt`s transparent hairs appear white, while absorbing most of the incident radiation. Moreover, the solar optical technology includes a complementary strategy: the IR -radiation of body`s heat, between 8000 and 12000 nm, is effectively trapped by an analogue mechanism.

參考文獻清單與連結 (REFERENCE LIST) **Harvard 或 APA 格式**

Mohammed Qasim Khattab(2016)Fibre-Optical Light Scattering Technology in Polar Bear Hair: A Re-Evaluation and New Results https://www.researchgate.net/publication/292175809_Fibre-Optical_Light_Scattering_Technology_in_Polar_Bear_Hair_A_Re-Evaluation_and_New_Results
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