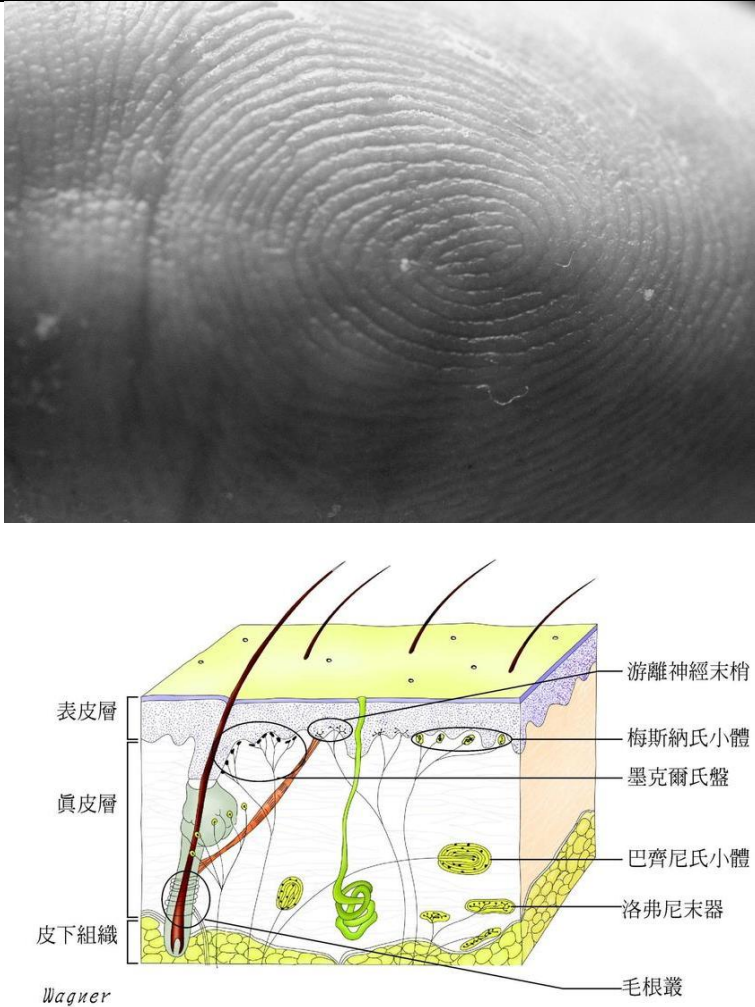


生物策略表

<p>類別</p>	<p>生物策略 (Strategy)</p>
<p>生物策略 STRATEGY</p>	<p>指尖增加觸覺敏感度 (Fingertips Increase Sensitivity to Touch)</p>
<p>生物系統 LIVING SYSTEM</p>	<p>人類 (<i>Homo sapiens</i>)</p>
<p>功能類別 FUNCTIONS</p>	<p>#感知生命系統中的觸覺和機械力 #Sense Touch and Mechanical Forces in a Living System #感知生命系統中的形狀和樣式 #Sense Shape and Pattern in a Living System</p>
<p>作用機制標題</p>	<p>透過指尖皮膚表面下的機械受器以增加觸覺敏感度 (Fingertips increase touch sensitivity due to mechanoreceptors underneath the surface of the skin)</p>
<p>生物系統/作用機制示意圖 (確認版權、註明出處；畫質)</p>	 <p>The image consists of two parts. The top part is a grayscale close-up photograph of a human fingerprint, showing the intricate ridges and valleys. The bottom part is a color cross-sectional diagram of human skin, illustrating various mechanoreceptors. Labels on the right side of the diagram include: 游離神經末梢 (Free nerve endings), 梅斯納氏小體 (Meissner's corpuscle), 墨克爾氏盤 (Merkel's disc), 巴齊尼氏小體 (Pacinian corpuscle), 洛弗尼末器 (Lofgren's organ), and 毛根叢 (Hair root plexus). On the left side, the layers of the skin are labeled: 表皮層 (Epidermis), 真皮層 (Dermis), and 皮下組織 (Subcutaneous tissue). The name 'Wagner' is written at the bottom left of the diagram.</p> <p style="text-align: center;">圖 7-1 皮膚感覺接受器</p>
<p>作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)</p>	

人類的指尖可能是動物世界中最敏感的皮膚區域，他們可以區別光滑表面和僅被嵌入 13 奈米深圖案之間的感覺。這是因為指尖表面的突起使人類能夠區分各種紋理、材料、溫度和壓力。雖然每個人都有獨特的突起紋路（即指紋 fingerprint），但該紋路對觸覺並不重要。紋路下方是機械受器，一種對觸覺刺激 (tactile stimulus) 作出反應的感覺感受器。指尖沿表面或材料移動引起的摩擦會刺激機械感受器，然後將觸覺信息傳遞到大腦。

在哺乳動物皮膚的光滑（無毛）部分有四種主要類型的機械感受器：層狀小體 (lamellar corpuscle) 觸覺小體 (tactile corpuscle)、默克爾神經末梢 (Merkel nerve endings) 和球狀小體 (bulbous corpuscle)。層狀小體對振動和壓力的變化作出反應，而觸覺小體對輕觸特別敏感。默克爾神經末梢對壓力和位置的一般變化以及深度靜態觸摸（例如邊緣和整體形狀）做出反應。球狀小體對皮膚拉伸和物體在皮膚上的滑動很敏感，因此提高了抓握力。

Human fingertips are probably the most sensitive skin areas in the animal world; they can feel the difference between a smooth surface and one with a pattern embedded just 13 nm deep. This is due to epidermal ridges on the surface of the fingertip, which allow humans to differentiate between a wide range of textures, materials, temperatures, and pressures. While each person has a unique pattern of ridges (i.e. fingerprints), the pattern is not crucial to the function. Just underneath the ridges are mechanoreceptors, a type of sensory receptor that responds to tactile stimulus. Friction caused by movement of the fingertip along a surface or material stimulates the mechanoreceptors, which then transmit the tactile information to the brain.

There are four major types of mechanoreceptors on smooth (non-hairy) parts of mammalian skin: lamellar corpuscles, tactile corpuscles, Merkel nerve endings, and bulbous corpuscles. Lamellar corpuscles respond to changes in vibration and pressure, while tactile corpuscles are particularly sensitive to light touch. Merkel nerve endings respond to general changes in pressure and location, as well as deep static touch, such as edges and overall shape. Bulbous corpuscles are sensitive to skin stretching and slippage of an object against the skin, allowing for improved grip.

文獻引用 (REFERENCES)

四種主要類型的封裝機械受器專門為中樞神經系統提供有關觸摸、壓力、振動和皮膚張力的訊息：梅斯納小體、巴齊尼氏小體、默克爾椎間盤和洛弗尼小體。這些受體統稱為低閾值（或高靈敏度）機械感受器，因為對皮膚的微弱機械刺激也會誘導它們產生動作電位。所有低閾值機械受器都由相對較大的有髓軸突支配，確保中樞觸覺訊息的快速傳輸。

“Four major types of encapsulated mechanoreceptors are specialized to provide information to the central nervous system about touch, pressure, vibration, and cutaneous tension: Meissner’s corpuscles, Pacinian corpuscles, Merkel’s disks, and Ruffini’s corpuscles. These receptors are referred to collectively as low-threshold (or high-sensitivity) mechanoreceptors because even weak mechanical stimulation of the skin induces them to produce action potentials. All low-threshold mechanoreceptors are innervated by relatively large myelinated axons, ensuring the rapid central transmission of tactile information.” (Purves et al. 2001).

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Feeling small: exploring the tactile perception limits

Scientific reports. 3(2617): 1-6. | Skedung L, Arvidsson M, Chung JY, Stafford CM, Berglund B, Rutland MW.

Mechanoreceptors Specialized to Receive Tactile Information

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延伸閱讀: Harvard 或 APA 格式

哺乳動物

哺乳動物類 (“乳房”)：蝙蝠、貓、鯨魚、馬、人類

哺乳動物佔地球上所有動物的不到 1%，但它們包括一些最著名的物種。我們親身了解了一些使哺乳動物獨一無二的特徵，例如有毛髮、能夠出汗以及通過乳腺產生乳汁。另一個關鍵的共同特徵是一組高度專業化的牙齒。例如，與鯊魚或鱷魚不同，它們的牙齒通常大小和形狀都相同，哺乳動物在頷骨的不同區域具有不同形狀的牙齒，以針對特定的食物或覓食策略。

Mammals

Class Mammalia (“breast”): Bats, cats, whales, horses, humans

Mammals make up less than 1% of all animals on earth, but they include some of the most well-known species. We know first-hand some of the characteristics that make mammals unique, like having hair, being able to sweat, and producing milk through mammary glands. Another critical shared feature is a set of highly-specialized teeth. Unlike sharks or alligators, for example, whose teeth are generally all the same size and shape, mammals have differently shaped teeth in different areas of the jaws to target specific foods or foraging strategies.

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://asknature.org/?s=&p=0&hFR%5Bpost_type_label%5D%5B0%5D=Biological%20Strategies&hFR%5Btaxonomies_hierarchical.system.lvl0%5D%5B0%5D=Animals%20%3E%20Vertebrates%20%28Mammals%2C%20Fish%2C%20Birds%2C%20Reptiles%29%20%3E%20Mammals

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AskNature 原文連結

<https://asknature.org/strategy/fingertips-increase-sensitivity-to-touch/>

<https://asknature.org/wp-content/uploads/2017/08/finger-print-Jimmy-Smith-bw-crop-2160x1502.jpg>