


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	與成鳥互動使築巢速度加快 (Interaction with adults leads to faster nest building)
生物系統 LIVING SYSTEM	斑胸草雀 (<i>Taeniopygia guttata</i>) (Zebra Finch)
功能類別 FUNCTIONS	#物理性組成結構 #自我複製 #Physically Assemble Structure #Self-Replicate
作用機制標題	幼鳥置於成鳥群能促使斑胸草雀加快建造第一個巢的速度 (Exposure to adults as juveniles prompts zebra finches to build their first nests faster.)
生物系統/作用機制示意圖	
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
<p>介紹</p> <p>在 1867 年時著名博物學家 (naturalist) 阿爾弗雷德·羅素·華萊士 (Alfred Russel Wallace) 寫道：「我們得知鳥類是依靠本能 (by instinct) 來築巢的，而人則是透過運用理性來建造住宅的。」然而華萊士的觀察使自己完全不同意上述論點。他的論文《鳥巢的哲學》(“The Philosophy of Birds’ Nests”) 引發了長達 150 年的辯論，關於鳥類是否純粹依靠本能築巢，或者如華萊士所述「沒有經過經驗或教學」。</p> <p>2020 年 4 月，馬克斯·普朗克進化人類學研究所 (Max Planck Institute for Evolutionary Anthropology) 的研究員 Alexis Breen 博士發表了一項研究，她說該研究對於打破基因中有著整套巢穴建造技能之迷思 (myth) 提供了另一個強力的支持。許多人錯誤地推論鳥類是模仿它們所孵化的巢穴來築巢。Breen 的研究指出，如果幼鳥 (juvenile) 與成年斑胸草雀</p>	

(zebra finch) 有社交互動，則會影響幼鳥在達到性成熟 (sexual maturity) 時建造第一個鳥巢的方式——不論是從材料選擇上還是從建造速度上來說都是如此。

策略

為什麼築巢的速度和建造材料如此重要？建造鳥巢是牠們繁殖能力的關鍵。Breen 說：「很多鳥類真的在築巢的過程中被射擊過一次，甚至兩次。」。她補充說，其他種類的鳥類將快速築巢與繁殖成功率 (breeding success) 和後續的健康成長聯繫在一起。換句話說，快速地建造優質鳥巢可能攸關下一代的生死。

Breen 的實驗顯示，與成鳥進行社交互動會對幼鳥如何築巢產生兩個主要影響。其中之一是，在早年接觸成鳥會啟發幼鳥，使建造鳥巢的速度比那些沒有與成鳥互動的幼鳥快四倍。第二，當幼鳥與其出生鳥巢中不同的材料所互動時，牠們隨後會偏好以新材料用作築巢——但前提是牠們有在成鳥在場的情況下經歷過那些材料。

潛力

Breen 表示了解斑胸草雀用於築巢的學習和文化過程 (cultural process) 可能有助於我們了解其他動物如何使用工具和技術，甚至可能為我們自身的進化提供線索。

雖然華萊士對於“本能並不能規定鳥類如何築巢”的說法似乎是對的，但他認為“模仿 (imitation) 才是最重要”的想法似乎是錯的。Breen 的結果表明僅僅是成鳥的存在就比透過自己處理材料或觀察成鳥使用材料所獲得的經驗更為重要。她表示這結果與鳥類需要大量示範操作 (demonstration) 才能使用工具的假設背道而馳。「看來就算牠們需要一點，牠們也不需要太多。」。

Introduction

In 1867, the famous naturalist Alfred Russel Wallace wrote, “Birds, we are told, build their nests by instinct, while man constructs his dwelling by the exercise of reason.” His own observations of nature led him to completely disagree. His essay, “The Philosophy of Birds’ Nests,” kicked off a 150-year-long debate about whether or not birds build nests due purely to instinct—or as Wallace put it, “without teaching or experience.”

In April of 2020, Dr. Alexis Breen, a researcher at the Max Planck Institute for Evolutionary Anthropology, authored a study that she says provides “another big support for knocking down the myth that nest-building is all in the genes.” Many incorrectly assume that birds model their first nests after those they hatched into. Breen’s research indicates that if juveniles interact socially with adult zebra finches, it influences the way the young finches construct their first nests when they reach sexual maturity—both in terms of the materials they choose and how quickly they build.

The Strategy

Why do speed and construction materials matter so much? Building a nest is key to their ability to reproduce. “For many birds, they really get one shot, maybe two, at building a nest,” Breen said. She added that evidence in other bird species links rapid nest-making to breeding success and prosperity later in life. In other words, building a good nest quickly might just be a matter of life and death for the next generation.

Breen’s experiment showed that having engaged socially with adults had two major impacts on how young finches made their first nests. For one, exposure to mature birds earlier in life inspired adolescents to finish construction as much as four times faster than those without access to quality time with adults. Second, when juveniles interacted with material different than what

was in their birth nests, they later preferred the new substance for nest construction—but only when they had encountered that substance in the presence of an adult.

The Potential

Breen said that understanding the learning and cultural processes that zebra finches use to build nests may help us understand how other animals come to use tools and technology and may even provide clues into our own evolution.

While Wallace may have been right that instinct doesn't dictate how birds build nests, it appears he was mistaken about what he thought mattered most—imitation. Breen's results demonstrate that the mere presence of an adult was more important than the experience gained either through handling material themselves or from watching adults use it. She said that result went against the assumption that birds need a lot of demonstration to use tools. "It looks like if they need some, they don't need much."

文獻引用 (REFERENCES)

「我們發現幼鳥接觸無親屬關係 (unrelated) 的成鳥和單一種顏色的原材料，會導致築巢初學者對這種顏色材料的偏好 (75%) 高於初生巢 (natal-nest) 或新穎顏色材料的偏好，而缺乏接觸無親屬關係的成鳥和原材料，會導致幼鳥完成築巢的速度分別降低 4 倍及接近 3 倍...總括來說這些數據顯示，當動物在發展其技術能力 (technological competence) 時，會結合幼年時所得到的重要社會性和生態性線索。」

"We found that juvenile access to both an unrelated adult and raw material of one color led to a majority preference (75%) by novice builders for this color of material over that for either natal-nest or novel-colored material, whereas a lack of juvenile access to both an unrelated adult and raw material led to a 4- and nearly 3-fold reduction in the speed at which novice builders initiated an completed nest construction . . . Together these data imply that animals combine relevant social and ecological cues from early life when developing their technological competence."

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

Breen, A. J., K. E. Lovie, C. Guerard, S. C. Edwards, J. Cooper, S. D. Healy, and L. M. Guillette, (2020). Juvenile socio-ecological environment shapes material technology in nest-building birds. *Behavioral Ecology* 31: 892-901.
(<https://academic.oup.com/beheco/article/31/4/892/5827241?guestAccessKey=d2b75d25-eab9-4887-9a24-44f88b90d4ac>)

延伸閱讀: Harvard 或 APA 格式 (取自 AskNature 原文; 若為翻譯者補充, 請註明)

Krupin, K. (12 October, 2020). Birds Build Responsively. *AskNature*. Retrieved from: <https://asknature.org/strategy/birds-build-responsively/>

Zsembik, L. (16 September, 2020). Feedback Loop Helps Brain Teach Itself Quickly. *AskNature*. Retrieved from: <https://asknature.org/strategy/brain-acts-as-both-teacher-and-student/>

Krupin, K. (9 January, 2021). Peer-to-Peer Learning Spreads Innovations Rapidly. *AskNature*. Retrieved from: <https://asknature.org/strategy/dolphins-learn-new-behaviors-from-their-peers/>

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

<https://asknature.org/system/birds?post-type=Biological%20Strategies>

撰寫/翻譯/編修者與日期

黃瑞峰翻譯 (2021/04/07)；譚國銜編修 (2021/07/20)；張勝凱編修 (2021/08/28)；陳柏宇 (2021/09/03)

AskNature 原文連結

<https://asknature.org/strategy/interaction-with-adults-leads-to-faster-nest-building/>