S. FINLAYSON/GIBRALTAR NATIONAL MUSEUM

The Neanderthal woman nicknamed Nana, reconstructed at the Gibraltar Museum, with feathers.

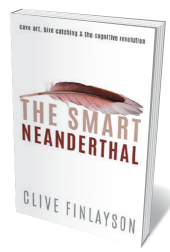
PALAEONTOLOGY

How Neanderthal minds took flight

Bernard Wood explores a claim that our nearest cousins were our cognitive equals — and that birds show it.

The stereotype of Neanderthals as uncreative and unintelligent is remarkably persistent. In *The Smart Neanderthal*, archaeologist Clive Finlayson challenges that view. His assessment is informed by archaeological evidence, including his own decades-long research on groups of *Homo neanderthalensis* that lived on and around the Rock of Gibraltar from 125,000 to just over 30,000 years ago. Intriguingly, birds form a significant part of his argument.

Finlayson, director of the Gibraltar Museum since 1991, takes aim at researchers who have interpreted the archaeological record of Neanderthals as suggesting that the species never attained the brain power of contemporary *Homo sapiens*. Sure, Neanderthals get marks for surviving at a time when the cold climate brought tundra conditions to most of Europe. But the conventional wisdom is that the modern humans who moved into Europe soon after leaving Africa some time in the past 50,000 to 70,000 years had already raised their cognitive game a notch or two, thus enabling them to prosper and eventually outwit their Neanderthal cousins.



The Smart Neanderthal: Bird Catching, Cave Art, and the Cognitive Revolution
CLIVE FINLAYSON
Oxford University Press (2019)

Gibraltar lies at the southwestern edge of Neanderthals' geographical range. Finlayson argues that discoveries his team has made at four main cave sites suggest that the species' behavioural repertoire was more sophisticated than the popular caricature suggests. He says that the Neanderthals living there had access to, and took advantage of, a much wider range of resources than their northerly cousins, including rich avian biodiversity. And he posits that an archaeologist not familiar with animal behaviour would be unable to decipher the Gibraltar Neanderthals' cognitive parity with modern humans.

The name of our closest extinct relative commemorates Joachim Neander, a seventeenth-century German poet who sought inspiration in the valley (*Tal*) of the river Düssel, which was given his name. In 1856, miners working in the valley exposed the partial skeleton of an adult human whose skull, despite once harbouring a brain much the same size as a modern human's, lacked a forehead. Some speculated, bizarrely, that these were the remains of a modern human with rickets. In 1864, Irish geologist William King recognized them as belonging to a species of extinct human relative.

Since then, a comprehensive fossil record for *H. neanderthalensis* has been established from across Europe, Central Asia and the Middle East. Differences between modern-human and Neanderthal genomes suggest a common shared ancestor between 250,000 and 500,000 years ago, and evidence for interbreeding has emerged (T. King *Nature* **555**, 307–308; 2018). Yet misinterpretations of fossils discovered in the early twentieth century led to the misconception that Neanderthals had a stooped posture, resulting in erroneous reconstructions that exaggerated their physical differences from us. The idea arose that if they looked different from us, they must have behaved differently. Until recently, a Neanderthal's life was seen as "nasty, brutish and short", to borrow philosopher Thomas Hobbes's description of the natural human lifespan.

Gibraltar's caves have provided rich pickings. In 1848, an adult cranium (retrospectively recognized as Neanderthal) was recovered from Forbes' Quarry. From the 1860s, many vertebrate fossils, and stone tools of the type found with Neanderthal fossils across Europe, were recovered from the caves. And in 1926, the pioneering archaeologist Dorothy Garrod discovered a second Neanderthal fossil — a child's cranium.

Finlayson, his wife Geraldine and son Stewart — both researchers — are passionate amateur birdwatchers, and the knowledge they have collectively amassed infuses his research on the Gibraltar fossils. In highlighting how our ancestors and close relatives interacted with birds, it reveals a long-neglected source of evidence about human and Neanderthal behaviour.

When Neanderthals occupied the Gibraltar caves, sea levels were lower. The hominins shared their habitat with a much wider variety of animals, particularly birds, than is seen today. Fragile bird bones survive well in the relatively protected atmospheres of caves, and the fossils recovered sample 160 avian species. That covers 30% of the avian species known from Europe for the time, ranging from the pine grosbeak (*Pinicola enucleator*, a finch), to ducks, choughs, larks, gannets, eagles ▶

and vultures. Finlayson suggests that tool marks left on the bones indicate that some of the species on Gibraltar were processed for food or, more controversially, for their feathers. He reminds us that birds come in many shapes and sizes, with a variety of behaviours and responses to humans, which implies that their exploitation would have required sophisticated knowledge. But he goes further, arguing that this knowledge was comparable to that drawn on by modern birders.

Not all of Finlayson's inferences (including this one) are logically sound, and *The Smart Neanderthal* would have benefited from some editorial 'tough love'. His point about the neglect of avian evidence is well taken, however. So is his reflection that most of the humdrum things we do daily do not necessarily reflect our cognitive potential. His findings from Gibraltar — with those by anthropologist Dirk Hoffmann and his colleagues suggesting that Neanderthals decorated the walls of three caves in Spain — might have exposed a cognitively advanced side of our Neanderthal cousins.

However, one swallow — or even a handful — does not make a summer. We need to find more sites in which Neanderthals were put through their behavioural paces. ■

Bernard Wood, *a palaeoanthropologist who works on the distant ancestors of Neanderthals and modern humans, is University Professor of Human Origins at George Washington University in Washington DC.*
e-mail: bernardawood@gmail.com

HISTORY

Rebellion at the Royal Society

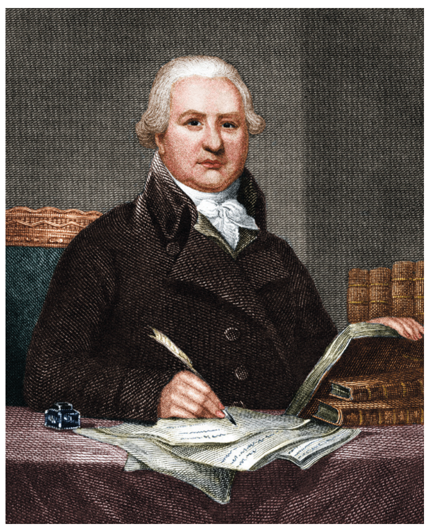
Rebekah Higgitt relishes a biography of mathematical reformer Charles Hutton.

Until the 1990s, eighteenth-century science received comparatively little attention. Historians of British science would leap from what they called the scientific revolution — culminating in the foundation of the Royal Society and Isaac Newton's achievements in the seventeenth century — to a 'second scientific revolution' in the early nineteenth. This saw the founding of a host of specialist societies (astronomical, geological, geographical, zoological). That narrative suggests that, by the eighteenth century, the Royal Society was dominated by trivial pursuits and aristocratic dilettantes rather than disciplinary experts.

Although that has since been revised, the mathematician Charles Hutton (1737–1823) would certainly have agreed, as his role in the 1780s 'Dissensions' at the Royal Society attests. Hutton saw himself as continuing Newton's legacy, applying mathematics to natural philosophy and to real-world problems, such as navigation, cartography and engineering. In *Gunpowder and Geometry*, historian of mathematics Benjamin Wardhaugh gives us the man and his method.

As Wardhaugh shows, during the Dissensions, Hutton was dismissed from his post as the society's foreign secretary. That provoked those claiming to be the real, scientific members to attack the autocratic presidency of botanist Joseph Banks, and the "train of feeble Amateurs" (as they put it) surrounding him. The rebels included mathematicians and astronomers, and a majority of active members. Banks, however, rallied his own supporters to pack the meetings and thereby defeat a series of votes aimed at limiting his power. Hutton did not return to the society until after Banks's death, in 1820.

Whereas Banks saw mathematics as little more than a tool "with which other sciences are hewd into form", Hutton championed its significance. And, as Wardhaugh puts it,



Mathematician Charles Hutton.

SHEILA TERRY/SPL

Hutton "carefully, deliberately, made himself the leading voice speaking for mathematics in English". Hutton's world was chiefly the classroom and print rather than the observatory or field. He was remarkably prolific, producing mathematical tables, textbooks, dictionaries, compendia and periodicals. These works, which ranged from elementary arithmetic to the mathematics of bridge building, leisure puzzles and historical discourses, cemented his reputation. It also gave him readers and networks, both before his election to the Royal Society and after he was excluded.

He overcame considerable obstacles, as Wardhaugh reveals. Newcastle-born, Hutton was a "pit boy turned professor" who avoided life at the coalface, eventually becoming a figure worthy of a bust (copies were produced to allow at-home "veneration" by admirers). His success began at school, where his intellectual talents were recognized. He was an unproductive coal hewer, but convinced his schoolmaster that he could command a classroom.

In this, Hutton was fortunate. Schooling in general, and mathematical education in particular, were in demand. By the age of 22, he was advertising an ambitious curriculum to cater to a range of pupils looking for specialist training in Newcastle. Wardhaugh shows why, and what sort of, mathematics was important in Georgian Britain. An education emphasizing basic principles, theory and applications in architecture, navigation, trade and engineering was promoted as both useful and a means of refining minds.

Hutton's ability as mathematician and teacher landed him one of the few available state-funded scientific positions. A public examination, private recommendations and a remorseless campaign of self-improvement led to a professorship at the Royal Military Academy at Woolwich, near London. He taught there for more than 30 years. He also became a neighbour, collaborator and friend of the astronomer royal, Nevil Maskelyne.

Through Maskelyne, Hutton contributed to key projects, including efforts to improve navigation by means of astronomy (H. Lewis-Jones *Nature* **564**, 340–342; 2018). To measure Earth's density, Maskelyne made observations of the gravitational pull of a mountain's mass; his assistant surveyed the site; and Hutton undertook arduous calculations. Yet Hutton's most original project was an experimental and mathematical investigation of ballistics, including the weight and shape of gun and projectile, the quality of gunpowder

Gunpowder and Geometry: The Life of Charles Hutton, Pit Boy, Mathematician and Scientific Rebel
BENJAMIN WARDHAUGH
William Collins (2019)