

*No, that's not a Neanderthal to the left.
Yet there was a time when Homo
sapiens Neanderthalens was viewed as lit-
tle more than a shambling, apelike
beast. For a more recent view of our evolu-
tionary predecessors, turn the page.*

ARTICLE BY SHARI RUDAVSKY

THE SECRET LIFE OF THE NEANDERTHAL

PAINTING BY BRAD HOLLAND

The band of Neanderthals stopped outside the cave, and a lone male peered in. Looking around, he noticed that previous occupants, a taller, more graceful group, had left some remnants: smoldering coals, scattered garbage, and a smooth, shell-shaped pendant, purpose unknown. Finding no food, the Neanderthals trekked on, traversing miles of rocky terrain in less than a day. By late afternoon, they'd begun to track a goat. One of the males plunged on top of the animal, wounding it with his crude but heavy spear; the animal thrashed, but the male hung on until the goat died. Uttering a series of meaningful grunts, the Neanderthal band settled down for the night. One of the females built a fire, while another scraped the hide with a sharpened stone. A gray-haired male propped his arthritic leg above a grassy knoll. Devouring the remains of dinner, this Neanderthal family had no way of knowing their future: The rest of their stay on Earth would be arduous and brief.

A time machine and camcorder top the wish list of every scientist hoping to unravel the secret life of the Neanderthals—long viewed as a bumbling people who evolved rapidly (and thankfully) into our direct ancestors. But though today's paleoanthropologists lack the knack of time travel, they have recently acquired access to the next best thing: remarkable new dating technology that is slowly bringing the life and times of early hominids into bold relief. Based on state-of-the-art dating techniques such as thermoluminescence and electron spin resonance, researchers have come up with an increasingly detailed picture of the Neanderthals and how they lived.

No longer viewed as an evolutionary lout, the Neanderthal depicted today is a kinder, gentler, more successful individual with a range of unique cultural characteristics including sophisticated hunting practices and an intimate and elaborate social life.

In addition, paleoanthropologists now believe that Neanderthals coexisted with our direct ancestors, early modern humans, for a longer time span than ever before suspected. This revelation has thrown a monkey wrench into the story of hominid evolution, for if Neanderthals were not our direct ancestors, then who were they?

Scientists have been puzzling over this question since 1856, when quarry workers in the Neander Valley near Düsseldorf, Germany, found pieces of skull in the rock. Considering the way quarry workers go at limestone with picks and shovels (not at all like modern archaeologists, who tiptoe about with scalpels and toothbrushes), it's a wonder that any fossils remained. As University of Chicago anthropologist Richard G. Klein tells the story, the quarry owner thought the bones came from a bear, but he turned them over to Carl Fuhlrott, a local schoolteacher, who pronounced them human, albeit unusual.

Further discoveries over the next 120 years ensured Neanderthals a place right next to modern humans on the evolutionary continuum. According to early paleoanthropologists, hominid evolution occurred incrementally, with the Neanderthal just one of many forms that led to humans today.

As more Neanderthal remains were unearthed, anthropologists also pieced together startling aspects of Neanderthal life. By the 1950's, researchers could cite definitive fossil evidence of tool use, fire use, and hunting and gathering techniques. And in perhaps the most extraordinary find of that decade, archaeologist Ralph

Solecki unearthed a Neanderthal skeleton covered with pollen at the Shanidar site in Iraq. The so-called flower burial sparked a debate still unsettled today. The hard-liners argued that Neanderthals buried their dead only to discourage scavengers and eliminate odor. The flower spores, they held, had drifted into the graves purely by chance. But a new group of researchers, increasingly convinced of Neanderthals' basic *humanity*, cited the pollen as evidence of a ritual Neanderthal burial in which survivors draped flowers over the deceased.

Evidence for the new and improved Neanderthal, one that inhabited the earth for at least 100,000 years and lived side by side with early modern man, has been accumulating since 1980, when archaeologist Eitan Tchernov of Hebrew University in Jerusalem started dating the hominid remains found in three Israeli caves. Since Tchernov could find no dating techniques appropriate to the task at hand, he devised a method of his own. By approximating the dates of rodent bones found in the same layer as human bones, he created a biostratigraphy, an evolutionary time chart based on fossils. Using biostratigraphy, Tchernov and Ofer Bar-Yosef, now a professor of anthropology at Harvard University, set the ages of the *Homo sapiens* found in the Qafzeh and Skhul caves at 80,000 to 100,000 years old, about twice as old as anyone suspected. They dated the Neanderthal-like remains found in the third cave, Kebara, at 50,000 years. According to these figures, Neanderthals were not ancestral to us at all.

Anthropologists immediately protested the accuracy of these dates, saying the biostratigraphy did not provide reliable information. However, in the past few years, two new techniques have confirmed the Israeli results.

One technique, called thermoluminescence (TL), is particularly valuable for dating non-organic artifacts such as burnt rocks and tools. The TL technique works because objects accumulate electrons over time, yet release electrons whenever they are burned. An accumulation of electrons may be measured by the intensity of light an object emits when it is burned. By heating a previously burnt object—for instance, a flint fired in a Neanderthal hearth a hundred thousand years ago—and then measuring the energy emitted, researchers can estimate the time that has passed since the object was burnt the first time around.

Experienced with TL, French physicist H el ene Valladas of the French National Center for Scientific Research decided to help the Is-

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NEANDERTHAL

CONTINUED FROM PAGE 44

raelis out. Dating prehistoric flints from the three caves with the help of this precise technique, Valladas's findings were clear: Flints used by prehistoric *Homo sapiens* at Qafzeh were about 92,000 years old, while flints used by Neanderthals at Kebara were much younger—50,000 to 60,000 years old, at most.

The dates were also confirmed for organic materials such as tooth enamel, bone, or fossilized pieces of grain, thanks to another high-tech method known as electron spin resonance, or ESR. In ESR dating, paleoanthropologists send a sliver of material to the laboratory, where physicists grind it up and expose it to a strong magnetic field. The magnetic field reacts in direct proportion to the number of trapped electrons that a sample contains. The older the fossil, the more upset the magnetic field becomes.

To Tchernov and Bar-Yosef's delight, ESR dating provided further support for their dates. Their conclusion: Neanderthals did not lead to early modern humans but, rather, were their counterparts. "Modern-looking hominids were

contemporary with the Neanderthals," says Bar-Yosef, "in the same way we are contemporary with people in Paris."

Because Neanderthals and humans are not directly related, it makes sense that their fossils seem distinct, even to the untrained eye. According to Lewis Binford, professor of anthropology at Southern Methodist University, the Neanderthal skeleton looks as though someone took a human skeleton and compacted it into a shorter, broader frame. A skull with a jutting brow topped this stocky body, obviously built to maximize endurance and resist bone damage. "Our anatomy is that of a walker; the Neanderthals' was that of a gymnast," says Binford. "Their whole way of coping with the world was action, not tools." Adds Robert Franciscus, a doctoral student in anthropology at the University of New Mexico, "Neanderthals were really using their bodies. Compared to them, modern humans are basically wimps."

But new theories and research techniques now go beyond the merely obvious, helping researchers flesh out some of the Neanderthals' best-kept physical secrets as well. According to Franciscus, for instance, the robust Neanderthal body may have served as a blanket of warmth against the cold, ob-

viating any need for fitted clothing. Instead, Neanderthals probably relied on animal hides and their truncated limbs and broad noses to protect them from the frigid weather of the Ice Age.

In fact, Franciscus has shown in a recent study, Neanderthals living in colder climates had abbreviated limbs. To reach this conclusion, he measured the brachial indices of their arms—the relative length of the forearm to the rest of the limb—and found that as warmth increased, limb length increased. Interestingly enough, notes Franciscus, legs did not show as much regional disparity as arms. "Perhaps with their legs, the Neanderthals were responding less to climatic stresses than biomechanical ones," Franciscus says.

The Neanderthals' diminutive bodies suggest that they may have suffered not just from climatic stress, but also from nutritional stress, according to Mary Ursula Brennan, an anthropologist at New York University. Originally trained as a nurse, Brennan drew on modern nutritional knowledge to recreate the health of early hominids from their dental remains.

If people do not receive sufficient nutrients in the first seven years of their lives, Brennan explains, their teeth do not develop fully, a condition known as



"I don't know what it means but I like the looks of it."

hypoplasia. Aware that this health problem might show up in our prehistoric predecessors, Brennan wound up totting an X-ray machine the size of a bread box throughout France. Her mission: X-raying hominid dental remains in museum storage areas to check for hypoplasia. Of the more than 300 Neanderthals she has tested, 40 percent suffered from hypoplasia, a good indication that resources were scarce. The early moderns showed a hypoplasia rate of only about 30 percent. Further evidence came from a small sample of Neanderthals she studied who were on average about four inches shorter than their successors.

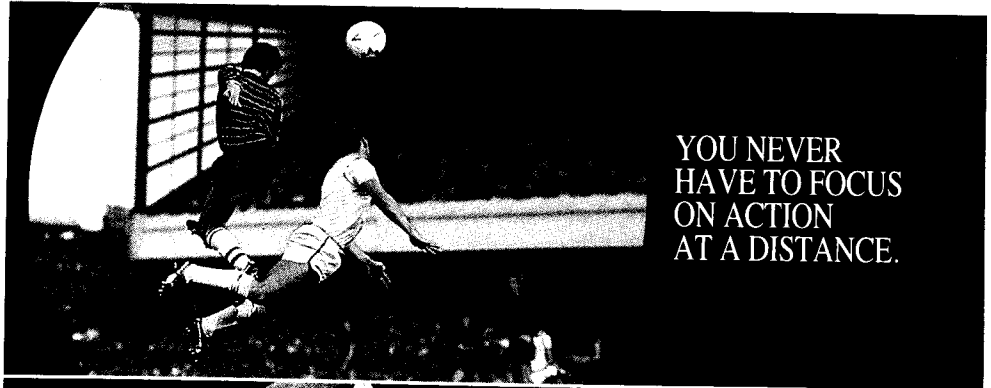
"Neanderthals' short stature may have been an adaptation to low nutrient availability," Brennan concludes. "If they were living in areas where there was not enough food, people who needed fewer calories would survive because they were receiving sufficient nutrition. People born with genes for tallness would require more calories and die. So within a few generations, everyone's shorter."

While resources may have been scarce, bones found near Neanderthal remains indicate that these individuals did manage to find some sustenance.

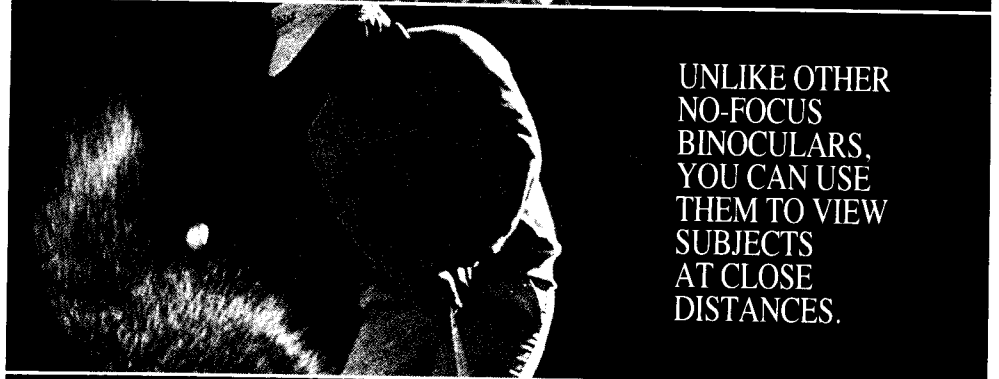
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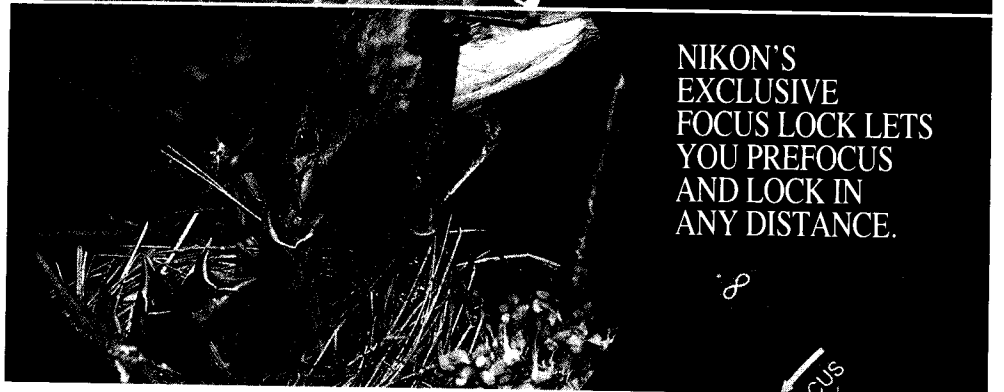
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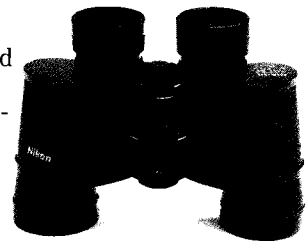
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Based on the diets of modern hunter-gatherer societies, paleoanthropologists believe the Neanderthals would have subsisted on plant foods supplemented with meat. Some anthropologists speculate that Neanderthals were "hunter-blunderers" who scavenged the landscape. But according to the latest research, Neanderthals were persistent hunters who downed their prey by brute force. This conclusion comes from University of Michigan anthropologist Loring Brace, who has done a detailed study of skeletal and muscular stress in both Neanderthals and *Homo sapiens* to see which areas would be most likely to break in an encounter. He discovered the Neanderthal skeleton is adapted to resist such injuries as broken bones or dislocated shoulders, which would help them triumph in a battle of strength. Brace concluded that Neanderthals wrestled their prey to death. "The Neanderthals were put together on a heroic scale," Brace says. "For that to have been maintained, there have to have been hunting stresses. They must have literally come to grips with the family dinner."

Other recent studies have attempted to trace the life cycle of Neanderthals, following individuals from birth to death. Erik Trinkaus, professor of anthropology at the University of New Mexico, for instance, has analyzed about 20 complete Neanderthal skeletons as well as fragments from other skeletons. Using a technique known as histomorphometric analysis, Trinkaus ground up thin slices of Neanderthal bone and placed the resulting powder on slides under a microscope. Trinkaus checked the bone powder for signs of maturity. By comparing the maturity of the Neanderthal bones with that of mammals alive today, Trinkaus estimated the age of each skeleton upon death. A definitive pattern emerged: Neanderthals rarely lived more than 40 years, with both sexes dying at the end of the female's reproductive cycle.

"What you have, then, is no post-menopausal survival," Franciscus says. "Most of all, there would have been no grandparenting." In modern hunter-gatherer societies, grandparents lend a much-needed hand with child rearing. Without grandparents to help care for them, Neanderthal children might have been more precocious than their early modern counterparts, Franciscus suggests.

The absence of grandparents, say other researchers, would have ramifications for the society as a whole. In modern hunter-gatherer societies the elderly are responsible for passing on knowledge of the environment and religious

lore, says anthropologist Randall White of New York University. "The idea that you have a Neanderthal group composed of people only to age forty means you have a group of a radically different social fabric. You're missing an entire generation."

But the overriding question when it comes to Neanderthal relationships for many people remains where they should hang on our family tree. Two years ago a group of Berkeley scientists thought they had shown we still had Neanderthal genes. Today anthropologists are not sure. Did the Neanderthals interbreed with the early modern humans who shared their land for at least 10,000 years? Or did Neanderthals have no interaction with modern humans until, ultimately, the humans wiped them out?

Physical distinctions would have been a sufficient obstacle to interbreeding between humans and Neander-

● Did
Neanderthal genes
flow
into the evolutionary
mainstream,
or did early man just
wipe
Neanderthals out? ●

thals, says NYU's White. Modern baboon species—which never interbreed—show fewer skeletal differences than Neanderthals and *Homo sapiens*, he points out. This comparison supports the hypothesis that Neanderthals did not become integrated into our gene pool.

Adds Tchernov, "Perhaps early modern humans and Neanderthals were separated by such profound cultural differences they did not interbreed at all."

Even if there was no genetic cross-over, no interbreeding, adds Bar-Yosef, we still don't need bloody scenarios to account for the Neanderthals' demise. "Simple inability to compete with modern humans in terms of finding food and shelter and reproducing could have finished Neanderthals off once and for all."

Yet because no clear-cut answers exist, researchers in the field may allow their biases to color their perception. Bar-Yosef charges that some of his colleagues are "Westerncentric," preventing them from accepting that Neander-

thals and our ancestors belonged to the same species. "Our image of early *Homo sapiens*, based on the concept of a man painting in a cave, is too limited," he says. "It's only particular to certain parts of Europe. What was happening in the rest of the world?"

Bar-Yosef contends that Western anthropologists may be all too quick to assume that Neanderthals contributed nothing to our gene pool, mostly because they do not want to admit a relationship with somewhat unsavory hominids.

Milford H. Wolpoff of the University of Michigan at Ann Arbor takes an even harder line, vehemently insisting that Neanderthal genes did flow into the evolutionary mainstream. Part of the proof, he says, is as plain as the noses on the faces of Charles de Gaulle, Jimmy Durante, or any number of British knights. "These large noses are Neanderthal features," Wolpoff asserts. "If all modern humans descended from a group of Africans who began migrating northward between one hundred and two hundred thousand years ago, as some anthropologists claim, I am hard-pressed to explain the origin of these noses. No African, ancient or modern, has a nose like that."

Perhaps it is the subtle familiarity of the Neanderthal face that continues to enthrall us today. Scientists are not the only ones to let emotions dictate their view of Neanderthals. Erik Trinkaus, who once wrote what he refers to as a "pedestrian" dissertation on the structure of Neanderthal feet, says the general public also reads the evolutionary record selectively.

"People really seem to want to claim the Neanderthals as relatives," Trinkaus says. "Their fossils have been known for almost one hundred fifty years, but our picture of them changes with the times: In the 1930's very few people thought the Neanderthals were cannibals, though there was some evidence for that belief. Then, in the 1940's, in the wake of World War II, without any new fossil evidence, Neanderthals were turned into cannibals to explain the nastiness of the Nuremberg trials. Hollywood in the 1950's perpetuated a brutish caricature of Neanderthals. And during the 1960's and 1970's, Neanderthals became flower children after the Shanidar Cave discovery."

But no matter who the Neanderthals were and where they went, one thing is for sure: Their impact on the environment was minimal. Says White, "They were never milking the environment for more than it would give them. In some ways you can argue they were more successful than their successors in the Upper Paleolithic or ourselves." ∞