

Neandertals' Disappearing Act

In the caves of Israel, some see these long-extinct hominids and some don't

By BRUCE BOWER

An anthropologist grappling with fossilized clues to modern humanity's origins could easily experience a recurring dream that goes something like this:

The slumbering scientist finds himself climbing a hill. At the summit, a cave appears. Out of its shadowy maw steps a Neandertal man wearing a black cape and holding a magic wand. The Neandertal wrinkles his receding forehead, stamps a beefy foot, and with a wave of his wand, *poof* — he disappears and the scientist stands in his place. The dreamer awakens with a sense of unease and an image of the Neandertal's jut-jawed smile lingering like the grin of an ancient Cheshire cat.

This evolutionary reverie represents more than the stuff of dreams. At last April's meeting of the American Association of Physical Anthropologists in Milwaukee, conflicting presentations provided a graphic illustration that Neandertals can either materialize or vanish in the Middle Eastern fossil record, depending on the perspective and anatomical comparisons used by the investigator.

In the debate over whether Neandertals coexisted with anatomically modern humans in the Middle East, some partisans claim that their critics need to wake up and smell the evidence. But the ambiguity of that evidence has left many researchers feeling a bit uneasy.

"We really don't know much at all about Neandertals and their place in human evolution," says Alan Mann of the University of Pennsylvania in Philadelphia. "Over the past few years, there's been a heightened receptivity to questioning our assumptions about Neandertals."

Explorers first stumbled onto Neandertal remains in 1856 in a quarry in Germany's Neander valley. The numerous well-preserved Neandertal skeletons found since then suggest that these hominids — members of the evolutionary family that includes modern humans — lived in Europe from around 130,000 to 35,000 years ago. The European fossils generally display "classic" Neandertal features: thick, heavy bones, sloping foreheads, bulging brow ridges and projecting jaws holding peg-like front teeth.

From the 1930s through the 1980s, a series of excavations extended the Neandertals' reach into the Middle East. On Israel's Mount Carmel, just south of Haifa, the caves of Skhul and Tabun yielded partial hominid skeletons that appeared deliberately buried. Scientists gradually accepted the robust bones at Tabun as Neandertals, while the slighter Skhul folk gained recognition as "early modern" *Homo sapiens*. More Neandertals turned up in the caves of Kebara on Mount Carmel and Amud near the Sea of Galilee. Meanwhile, investigators discovered a larger trove of early modern humans buried at the Jebel Qafzeh cave near Nazareth.

The accumulating fossil finds led many anthropologists to assume that in the Middle East and Europe, early modern humans entered the evolutionary scene after Neandertals — a closely related subspecies of *H. sapiens* — and perhaps descended from them. But that view suffered a setback when new dating techniques indicated that modern humans inhabited Qafzeh nearly 100,000 years ago, roughly 40,000 years before Neandertals camped at Kebara (SN: 2/27/88, p.138). Further dating work at Skhul and Tabun suggested that modern humans and Neandertals coexisted in the Middle East for as many as 60,000 years.

These findings supported a newly ascendant theory, which held that modern humans migrated from Africa to the Middle East and then spread throughout the world, while Neandertals — possibly a separate *Homo* species — entered the Middle East from Europe, perhaps as refugees from advancing glacial sheets, only to bite the dust as modern *H. sapiens* flourished. Studies of genetic diversity among living populations further suggested that modern humans originated in Africa around 200,000 years ago and evolved with little or no genetic input from Neandertals.

However, other investigators saw evidence in the fossils that the two hominid groups did not pass anatomical muster as separate species, and instead probably interbred to produce fully modern humans. In fact, these scientists contended, modern humans apparently evolved simultaneously in several parts of the world beginning as many as 1 million years ago.

These two lines of thought provide the backdrop for the Neandertals' current "now you see us, now you don't" act in the Middle East. The confusing situation reflects more than the vagaries of fickle fossils that accommodate different preconceived notions about human evolution. It highlights a fundamental question about hominid remains: How much and what type of anatomical variation in limited fossil collections documents the presence of genetically distinct species?

At Tabun and Kebara, Neandertals clearly existed as a species independent from early modern humans at Skhul and Jebel Qafzeh, maintains Yoel Rak of Tel Aviv University. The fossils show too many anatomical differences to argue otherwise, he says. For instance, some skulls at Kebara and Tabun approach the classic Neandertal configuration seen in Europe, while skulls at nearby Jebel Qafzeh possess modern human features, such as thinner cranial bones, a relatively vertical facial alignment and small front teeth.

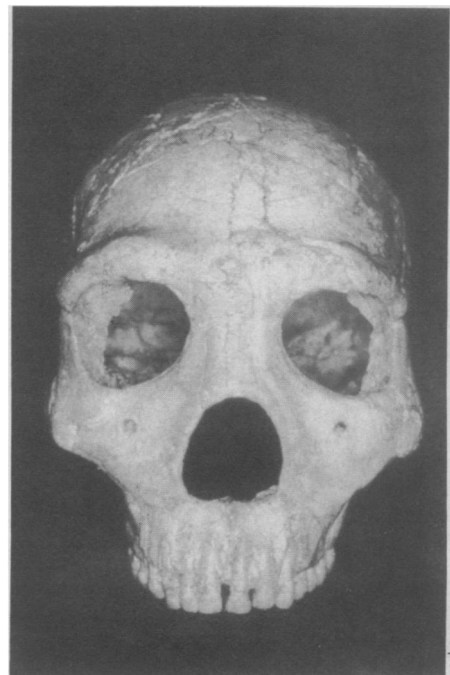
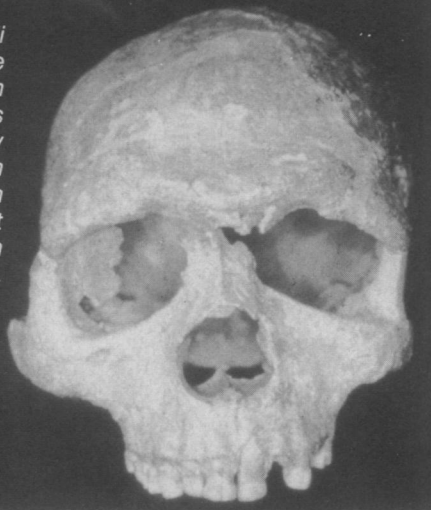
Moreover, says Rak, a nearly complete pelvis found at Kebara contrasts starkly with pelvic remains at Jebel Qafzeh. The Kebara specimen sports a long, thin bone at the front and sideways-facing thigh-bone sockets; Jebel Qafzeh fossils display a short, thick bone at the front of the pelvis and forward-facing bone sockets, two attributes of the modern human pelvis.

Rak asserts that the Kebara pelvis provided considerable balance and stability during movement or bending. Its Jebel Qafzeh counterparts absorbed greater force during movement and served as shock absorbers, much like the current human pelvis, he adds.

Rak and William H. Kimbel of the Institute of Human Origins in Berkeley, Calif., hope to uncover additional Neandertal remains during excavations at the Amud cave this month. Researchers last worked at Amud in 1964.

Bernard Vandermeersch of the University of Bordeaux in France supports Rak's classification of the Israeli fossils. Early modern *H. sapiens* in Africa must have settled in the Middle East by about 150,000 years ago, followed by periodic migrations of European Neandertals to

Adult male skulls found in two Israeli caves. Many anthropologists classify the Jebel Qafzeh skull (near right) as modern human and the Amud skull (far right) as Neandertal, but some researchers now claim that both specimens hail from an anatomically diverse group of modern humans. The argument has important implications for theories of modern human and Neandertal evolution.



the region beginning around 100,000 years ago, he suggests.

Vandermeersch acknowledges the curious nature of the archaeological remains in the Israeli caves. Both Neandertals and early modern humans buried their dead, left behind similar types of tools and engaged in comparable animal-butchery practices, showing striking cultural parallels for different hominid species.

Yet despite these similarities, Neandertals adapted in their own way to life in the Middle East, contends Ofer Bar-Yosef of Harvard University. He and Harvard colleague John J. Shea propose that Neandertals subsisted mainly on fruits, nuts and other plant foods in the forests of temperate Europe and maintained this preference after fleeing the rapidly cooling northern regions for the Middle East (SN: 3/24/90, p.189). As savannas expanded in the Middle East, modern humans with more experience in hunting mobile game may have outcompeted and outproduced the hard-luck Neandertals, although neither species possessed an intellect superior to that of the other, according to Bar-Yosef and Shea.

Bar-Yosef contends that the Middle East also served as a crossroads for migrating African and European populations, and that behavioral similarities undoubtedly developed among neighboring groups of Neandertals and modern humans.

Some investigators reject the claim that Neandertals took an evolutionary off-ramp at a Middle Eastern crossroads.

"The use of the label 'Neandertal' in the Middle East has caused confusion," says Baruch Arensburg of Tel Aviv University. "In Israel, the fossils represent one big, anatomically variable population of early modern *H. sapiens* with a Middle Eastern or African origin."

Arensburg argues that anatomical features of the Amud, Kebara and Tabun

remains vary considerably from one cave to another and in some ways resemble Skhul and Qafzeh residents more than European Neandertals. For instance, he says, the Israeli "Neandertals" often lack a pronounced bony bump at the back of the head — typically present in the European stock — and have relatively narrow nasal openings and more pronounced chins that approach those of early modern humans.

Anthropologists need to establish the frequency of specific anatomical traits among Neandertals and early modern humans, Arensburg says, since many skeletal features perform their own disappearing act, emerging only among some members of the same species. For the time being, "you can classify an individual fossil in the Israeli caves any way you want," he notes.

Milford H. Wolpoff of the University of Michigan in Ann Arbor points out that Arensburg's opinion echoes the conclusions of a 1933 monograph on the Skhul and Tabun fossils published by American graduate student Theodore McCown and the eminent British anatomist Arthur Keith. After working through conflicts over how to interpret the anatomical variation, McCown and Keith described the Mount Carmel assemblage as a single people "in the throes of evolutionary change," perhaps representing distant cousins of European Neandertals.

The entire Israeli collection falls within the boundaries of a primitive or "archaic" group of *H. sapiens*, Wolpoff argues. He rejects the alleged presence of both anatomically modern humans and Neandertals at the cave sites.

"Different populations intersected in the Middle East, and we see the remains of one people showing racial variations," says Wolpoff. "The exchange of ideas among these groups eventually resulted in their reliance on the same learned, structured behaviors." An exponential jump in the type and range of behavioral choices around 40,000 years ago — exemplified by the sudden appearance of

cave paintings and other symbolic renderings at European sites — may have more clearly heralded the emergence of fully modern humans than a large-scale anatomical realignment, he suggests.

Rak argues in response that comparable behaviors in two groups do not necessarily reflect a species-specific sharing of ideas. For instance, 10,000-year-old stone hand axes made by modern humans in Baja Mexico look virtually identical to 250,000-year-old stone hand axes produced in Africa by a direct human ancestor, *H. erectus*, yet no one lumps the two groups into one species.

Wolpoff and Arensburg's banishment of Neandertals from the Middle East "gave me the impression I was attending a session of the Flat-Earth Society," Rak remarked after hearing their presentations at the April meeting.

Other investigators tread more cautiously among the Israeli finds. "I can't call the Amud and Tabun fossils anything but Neandertals, although I don't equate them with a species distinct from early modern humans at Qafzeh and Skhul," says Fred H. Smith of Northern Illinois University in DeKalb. "The Middle East is the biggest area of puzzlement for me."

The future of the debate hinges on verification of the ages assigned to the fossils at Qafzeh, Skhul and Kebara, he observes.

Smith suggests that some of the anatomical disagreement might dissipate if researchers looked more closely at childhood growth patterns of the generally accepted European Neandertals. Some "classic" skeletal traits of Neandertal adults may in fact represent "secondary

Continued on p.363

and six assigned to cryotherapy (11 percent). The differences between the observation and cryotherapy groups were not significant, the team notes.

Even more alarming, the study hinted that flat warts progressed to dysplasia more quickly in the laser-treated patients than in the other groups. From those data, the team estimates that only 57 percent of women receiving laser surgery would remain free of dysplasia for two years, compared with roughly 82 percent of the women in the observation group and 89 percent of the cryotherapy group.

Though no malignancies were diagnosed during the study, Herndon cautions that all of the women remain at risk of flare-ups of the HPV infection.

The mechanism underlying the laser's poor performance remains a mystery. However, scientists know that after laser treatment, epithelial cells left untouched by the destructive beam proliferate rap-

idly to heal the injured cervix. Miller speculates that such cells somehow are more vulnerable to infection by any remaining HPV.

Although this "interesting and provocative" study failed to control for all the factors that could affect its conclusions, the findings raise some important questions that will require further investigation, observes Douglas W. Laube of the University of Iowa College of Medicine in Iowa City.

Other scientists warn against jumping to conclusions on the basis of one preliminary investigation. "There are 100 potential holes in this paper," says HPV expert Ralph M. Richart of Columbia University College of Physicians and Surgeons in New York City. He charges that the study's small size and the fact that the patients

were randomly assigned to treatment groups represent potentially fatal flaws. Richart recommends that women with HPV-induced flat warts continue to seek treatment, even laser surgery. (Until recently, Richart relied on laser surgery to treat cervical flat warts. Now he removes the HPV-infected growths with a newer mechanical loop.)

To address the criticism of colleagues like Richart, the Northwestern researchers plan a follow-up trial in which they will randomly assign women to various therapies and then track the outcomes.

Until then, Herndon believes the latest data strongly argue for a decidedly low-tech—and low-cost—approach to managing cervical flat warts. The cost of regular office visits to observe the status of the infection compares quite favorably, she notes, to the \$1,000 price tag for laser surgery. □

Continued from p.361

adaptations" added to a characteristic anatomical pattern among Neandertal infants and children, he says. If firmly identified, this pattern might provide a critical guidepost for evaluating juvenile skulls in the Israel caves.

Fragmentary skulls of Neandertal children, the youngest of whom died between 1 and 2 years of age, show that their heads were considerably larger than those of modern children, according to Smith and Michael Green of the University of Tennessee in Knoxville. They theorize that the accelerated growth of the Neandertal's head and body started in the womb,

representing an adaptation that minimized heat loss among vulnerable newborns entering the refrigerated world of ice age Europe. Indeed, modern populations inhabiting cold regions feature markedly greater birthweights than their counterparts elsewhere, the researchers note.

Smith and Green propose that the expansion of cartilage at the skull base may have kicked off prenatal growth acceleration, exerting considerable pressure on cranial bones and creating the relatively flat cranial bases of Neandertal adults. Cranial base flattening may also have set in motion other growth patterns—such as a projecting lower face—that

emerged more clearly after childhood.

"We need to examine developmental patterns of Neandertals," says Nancy Minugh-Purvis of the Medical College of Pennsylvania in Philadelphia. "For now, I take a wait-and-see attitude toward the question of Neandertals in the Middle East."

New evidence suggests that an evolutionary continuum from Neandertals to modern humans may indeed have operated in eastern Europe, Minugh-Purvis says. Her assertion stems from a study of a partial cranium found in a Yugoslavian rock shelter. She and Jakov Radovic of the Croatian Natural History Museum in Yugoslavia carefully pieced together fragments of the approximately 35,000-year-old specimen, which came from a child about 6 years old. Some of the fragments came from excavations conducted more than 80 years ago; others had turned up within the past decade.

Sediments at the Yugoslavian site dating to about 80,000 years ago have yielded unmistakable classic Neandertals, but Minugh-Purvis thinks this partial cranium represents a transitional hominid bridging Neandertals and modern *H. sapiens* from the same area. She notes, for instance, that the angle and size of the specimen's brain case and its moderate brow ridge fall squarely between measurements of the same traits in the two established groups.

While controversy persists over Neandertal contributions to modern human origins in eastern Europe, the evolutionary situation in western Europe remains even murkier, she adds.

"From Europe to the Middle East to Asia, there are still enormous gaps in our knowledge about Neandertal fossils," says Mann.

Like a recurrent dream, Neandertals continue to excite the imagination while retaining their mystery. □

Asian gene lines show antiquity

Fossils no longer monopolize the search for human origins. In 1987, a scientific team headed by Rebecca Cann of the University of Hawaii reported that, compared with people in other parts of the world, Africans show significantly more mutations in their mitochondrial DNA—genes inherited only from the mother. The researchers argued that these mutations accumulate at a relatively constant rate over time; their assertion led to the controversial conclusion that modern humans originated in Africa about 200,000 years ago and then spread throughout the world, developing racial differences in the process. Reports on mitochondrial DNA denied Neandertals any substantial genetic contribution to modern human evolution.

The latest mitochondrial data still support an "out of Africa" model, but Asian genetic lineages appear surprisingly old, says Rick H. Ward of the University of Utah in Salt Lake City.

Ward has examined a particularly fast-evolving segment of mitochondrial DNA obtained from 180 Indians belonging to tribes in the western United States, as well as the same mitochondrial segment obtained by other researchers from Japanese and Papua New Guineans. All three populations may have left Asia within the past 50,000 years, he says.

Assuming a relatively conservative DNA mutation rate, Ward finds that the three mitochondrial lineages originated between approximately 110,000 and 140,000 years ago. Considerable genetic diversity apparently accumulated in each lineage prior to migration out of Asia, he adds.

Overall, however, modern humans exhibit far more genetic similarities than differences, Ward points out. "Genetic changes over the last 50,000 years have been small compared with human cultural changes," he maintains.

— B. Bower