

Box 1 Neanderthal prehistory

Neanderthals are the best known group of early hominids; they lived in Europe and parts of Asia, and survived until about 30,000 years ago. Hominid specimens from about 300,000 years ago already had some characteristics of Neanderthals, but it is not known how much further back their roots go. Some early humans entered Europe at least 800,000 years ago, but later technological innovations shared with other regions suggest that new populations may have entered the continent.

Better known are the later, 'classic Neanderthal' specimens from the last glaciation. The features of these Neanderthals, who were around from about 100,000 to 30,000 years ago, are more uniform than those of earlier populations, suggesting that there may have been a

population crash (with a subsequent 'bottleneck') around the start of this period¹⁵. All Neanderthals were strongly built, with long, low crania and large faces. Damage to their skeletons attests to the fact that their lives were hard. If they were as carnivorous as seems likely, they would have had many encounters with dangerous prey.

After 150 years of debate, and despite a steady flow of new knowledge, the Neanderthals' position alongside anatomically modern humans remains uncertain¹⁶. The means by which Neanderthals were eventually replaced by modern humans is fiercely contested, as is the degree of genetic separation. Many specialists see Neanderthals as a distinct species, contributing little to either the gene pool or the culture of later populations.

But modern human and Neanderthal remains, genetics and tool traditions all show intriguing continuities¹⁷.

Less controversial is the new willingness to admit that Neanderthals had qualities that showed their 'humanity'. For example, Neanderthals are contenders for the first display of caring behaviour: a crippled individual at Shanidar in Iraq was clearly sustained by the support of others. But it is not easy to pick out behavioural patterns that were distinctive of Neanderthals — burials, bone-based tools and symbolism are all found earlier in populations of anatomically modern humans. The continued debate over the relationship between Neanderthals and modern humans is stimulating, but should not mask enormous advances in dating, genetics and other forms of analysis. **J.A.J.G.**

lithic era and falls within the range of radio-carbon dating. Climate change has seemed less important because different Neanderthal populations successfully made distinct adaptations to different regions¹¹, and these adaptations remained roughly the same for 200,000 years¹².

But climate may have its moment again. The dramatically spiky record from ice cores in the interval from 60,000 to 40,000 years ago, together with pollen evidence, implies that steppe environments moved up and down rapidly from southeast Europe to the far north, and suggests that climate change could have been crucial in promoting population movement and cultural change. In 'warmer' parts of the ice age, as Pavlov *et al.*¹ show, fauna-rich steppe environments and humans apparently reached the Arctic. During colder intervals, wooded environments gave way to steppe even in Greece¹³. In the Last Glacial Maximum, 20,000 years ago, conditions were so ferociously cold that even modern humans were driven down towards the south of France¹⁴. Indirectly, such responses may help to explain the southward expansion of Neanderthals into the Middle East around 60,000 years ago, and (perhaps) the similar spread of Upper Palaeolithic Aurignacian human populations around 30,000 years ago.

The new finds¹ show that humans had a hold on the north, if only for a short time. Although there are questions to be answered,

the artefacts illustrate both the capacity of early humans to do the unexpected, and the value of archaeologists researching in unlikely areas. ■

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Pay for the Internet

The collapse of many Internet dotcom companies reflects the deep unease of many consumers at trusting their credit-card numbers to the insecurity of the Internet. How, then, to bring alive the Internet's commercial potential? Micro-payments have somehow not taken off. Daedalus reckons that a consumer will trust to the Internet what he might lose on a bet — maybe US\$50 or so. Rogue sites that charge more than this, in one or many payments, must be discouraged.

DREADCO Financial Services is therefore inventing a special low-limit card or cheque for Internet use. Their small limit cannot be overexploited, so the risk is low. It may feature an exact cut-off negotiated automatically with the company beforehand.

Thus the great dream — that of our own personal library from the Internet — would come true at last. The big publications, like *Nature* and *The Times*, will continue as before, for those who need them. But people who visit their websites, and those of all other publications too, will note those articles that seem interesting, and amass them for small proportional payments, controlled by the DREADCO card. A software 'gopher' could do this or haggle over it all the time. It would store its haul on a hard disk, a vast improvement on a stack of old papers. Occasionally you might glance at the screen to see what you had caught, and you could print out your results. Those for whom citations are magical, in support of personal glory, would relish the chance to amass them. The whole media scene would be one vast newspaper or magazine, with perfect indexing, no wasted time, and maybe the deletion of items no longer of interest.

Why doesn't this happen now? The academic media are deeply divided about how freely to release their papers onto the Internet, or what time delay to adopt before doing so. But once most publishers had taken the plunge, the worth of any delay would soon be shown by market forces, clear to everyone. Daily newspapers would lose value in a few days, and weeklies in a few weeks; academic journals of more lasting value should hold that value longer. Daedalus reckons that when a journal has amassed more citations than it quotes itself, its value starts to decay. But journal publication would remain useful, partly because editorial scrutiny weeds out the nonsense, and partly because anyone specializing in the area is better off subscribing to the journal. **David Jones**