BOOK REVIEWS

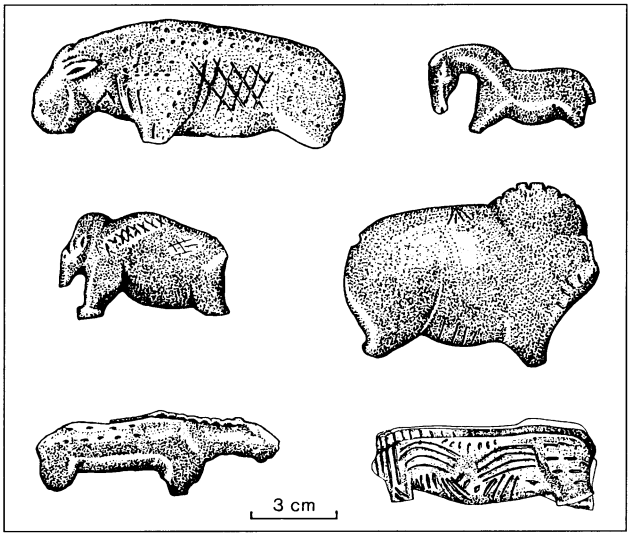
Middle Paleolithic People

The Neanderthal Legacy. An Archaeological Perspective from Western Europe. PAUL MELLARS. Princeton University Press, Princeton, NJ, 1996. xxii, 471 pp., illus. $69.50 or £49.50.

The Neanderthals are the most famous and best-understood group of nonmodern fossil people. More than 70 sites scattered across Europe and western Asia have yielded a few nearly complete skeletons and numerous fragmentary bones from more than 275 individuals. Everywhere, the sites appear to date from between about 150,000 and 35,000 years ago. Yet older European sites contain fossils that anticipate the Neanderthals, and it is now widely agreed that Europe was their evolutionary cradle. There is considerable dispute, however, about their evolutionary fate. Some specialists believe that they evolved directly into modern Europeans, while others argue that they were extinguished when modern humans swept into Europe from an Afro-Asian source 45,000 to 40,000 years ago. An intermediate position is that Neanderthals and modern invaders interbred and that living Europeans are the resultant hybrids.

The "Neanderthal debate" has raged for decades, but recent discoveries have narrowed its terms, and closure is on the horizon. Thus, virtually all specialists agree that the Neanderthals were physically unique in the subspheroidal shape of the skull when viewed from behind, in the extraordinary forward projection of the midfacial region, and in details of mastoid and occipital anatomy. In these features and others, they differed not only from modern people but also from their African and East Asian contemporaries. Most important, fresh fossil discoveries and radiometric dates show that when the Neanderthals were nearing their apogee 100,000 to 80,000 years ago, the occupants of Africa and its immediate southwest Asian margin (Israel) were far more modern in appearance. Add to this genetic studies that place the last shared ancestor of living humans in Africa later than 300,000 years ago, and it becomes highly improbable that the Neanderthals played a major role in modern human origins. Debate continues because the fossil and genetic observations are circumstantial, and it can always be argued that they are being forced into a preconceived mold or that additional evidence will produce a different conclusion. No amount of fossil or genetic evidence may ever produce full consensus, but in *The Neanderthal Legacy* Paul Mellars shows that a third source—archaeology—also strongly suggests that the Neanderthals represent an evolutionary sidetrack.

The archaeology of the Neanderthals began in southwestern France more than a century ago, and there is no region of Europe where it is more fully developed, thanks to an abundance of rich cave and rock-shelter sites and to the continuing high standard of French Paleolithic archaeology. Following the French lead, archaeologists throughout Europe now commonly use the term "Middle Paleolithic" to describe the artifacts made by the Neanderthals and "Upper Paleolithic" to describe those made by their anatomically modern "Cro-Magnon" successors. Mellars painstakingly synthesizes archaeological research at more than 50 Middle Paleolithic sites in southwestern France and then compares the results to those obtained at an even larger number of regional Upper Paleolithic localities. His exhaustive survey documents five unequivocal contrasts: (i) Middle Paleolithic people made a much smaller range of discrete stone artifact types than their successors, and in general these types are more variable (less standardized) in form; (ii) Middle Paleolithic people much more rarely obtained flint from sources located more than a few kilometers from their sites; (iii) Middle Paleolithic people seldom if ever used bone, ivory, or shell to make points, awls, or other formal artifacts that abound in Upper Paleolithic sites; (iv) Middle Paleolithic people also rarely if ever manufactured beads, pendants, or other items of personal adornment that distinguish even the earliest Upper Paleolithic sites, and they left no other compelling evidence of the art (or "symbolism") for which the Upper Paleolithic is justly famous; and (v) Middle Paleolithic sites have provided little if any evidence for structures or for spatial segregation of activities, although unambiguous "ruins" and organized living areas, often focused on central hearths, are commonplace in Upper Paleolithic sites.



"Animal figurines carved from mammoth ivory from the early Aurignacian [Upper Paleolithic] levels in the Vogelherd cave in southern Germany." [From *The Neanderthal Legacy*]

Mellars notes that in each respect the Middle Paleolithic recalls the preceding Lower Paleolithic, whereas only the Upper Paleolithic closely resembles historical stone-age cultures. He also stresses that the contrasts do not involve simply averages within widely overlapping ranges. Rather, they are highly discrete, and they pertain even when comparisons are limited to the latest Middle Paleolithic and the earliest Upper Paleolithic. Finally, he emphasizes that the Upper Paleolithic appeared abruptly across Europe, that available dates tentatively place it earlier on the east (before 40,000 years ago) than on the west (about 40,000 years ago), and that its earliest (Aurignacian) manifestation was artifactually more uniform over most of Europe than the Middle Paleolithic cultures it replaced. To Mellars, the sum implies that early Upper Paleolithic artifacts mark a Cro-Magnon invasion that quickly extinguished the Neanderthals. He speculates that Cro-Magnon success was founded on superior cognitive and communicative abilities, but he admits that this reasoning is circular, for it rests on archaeological rather than on physical (neurological) evidence.

Not all the evidence lines up perfectly. In particular, Mellars points out that Neanderthals apparently produced the Chatelperronian Upper Paleolithic culture that occupied western France and northern Spain

for perhaps two or three millennia around 40,000 years ago. The intrusive Aurignacian Upper Paleolithic culture appeared nearby at about the same time, and three sites actually contain interfingering Chatelperronian and Aurignacian layers. There could be no better evidence of contemporaneity, perhaps even contact. The Aurignacian eventually supplanted the Chatelperronian, just as it had the Middle Paleolithic elsewhere, but the Chatelperronian implies that Neanderthals could at least mimic Upper Paleolithic behavior. Those who believe the Neanderthals disappeared without issue are then faced with the vexing question, If Upper Paleolithic culture was clearly superior and Neanderthals could imitate it, why didn't they acculturate more widely, with the result that they or their genes would have persisted much more conspicuously into Upper Paleolithic times?

Some archaeological readers will undoubtedly complain that Mellars has applied an explicitly evolutionary perspective to the archaeological record and that other perspectives might produce different conclusions, including the conclusion that there can be no conclusion because archaeological interpretation is inevitably a product of personal judgment applied to circumstantial evidence. However, in this sense, archaeologists are like jurors, who also are often forced to decide between competing interpretations of circumstantial, even ambiguous or partially contradictory evidence. For those who believe it's possible to determine what happened to the Neanderthals and who are willing to accept the judicial model, Mellars has produced an exceptionally thorough, well-reasoned, and compelling brief.

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Approaching the Future

Rethinking Science as a Career. Perceptions and Realities in the Physical Sciences. SHEILA TOBIAS, DARYL E. CHUBIN, and KEVIN AYLESWORTH. Research Corporation, Tucson, AZ, 1995. 157 pp. Paper, $2.50.

As the U.S. educational enterprise begins to grapple with the current forces of change, this consideration of the prospects for those trained in the physical sciences is indeed timely. While many will question its high reliance on anecdotes, few can reject the seriousness of the issues it addresses. Many may regard it as an unbalanced attack on the academic enterprise, but few will be able to deny that we are at high risk of alienating future scientists if alterations are not made.

The authors clearly state the bases for their concern: the market for scientists is variable (for example, by economic sector and by region) and not free, being affected by governmental intervention through federal support, and a coherent plan is needed for universities to deal with supply and demand. The authors assert that for people trained in science not finding a job in science means "society and the science community as a whole will pay the penalty for wasted training, opportunities foreclosed, and productivity forgone." To avoid such an outcome they issue a direct call for change: "We believe the new generation of physical scientists cannot be created only in the image of the old. That is a prescription for obsolescence and betrayal."

The book explores career issues for physical scientists by a "purposive" (nonrandom) sampling of groups—including scientists and managers working in academia and in industry and degree recipients from several colleges—with an interest in the issues. Unfortunately, an "interest in the issues" and the reliance on self-reports mean focus on those disturbed by the current situation and advocating change. The voices of defenders of the existing system are only heard as caricatures. Thus, this book is not a balanced examination of existing views but an indictment of the present system by which physical scientists are trained.

The book begins with an analysis of problems confronting the science educational enterprise. The authors conclude that the current situation of shrinking support for academic science and changing job market is more likely structural than cyclical. They correctly appraise the educational enterprise shaped by Vannevar Bush's *Science: The Endless Frontier* as no longer appropriate and conclude that one needs to consider the nature of the demand for scientists in terms of both skills and numbers. After reviewing the perspectives of various leaders in the U.S. academic research enterprise, in a chapter with the heading "Persistence of perceptions from a bygone era," they conclude, "University scientists owe it to their students to prepare them to cope with new challenges in new settings where they can experience the same satisfaction that their professors found . . . in an earlier era."

The chapters devoted to "scientists in midcareer" and "today's physical scientist as job applicant" suffer from the limited and skewed data. However, the anecdotal quotes that condemn the existing system for poorly preparing and treating its graduates have a poignant ring of truth and will probably lead many to conclude that a more systematic study would reach similar conclusions: there is a need for significant change in our educational approach.

The remainder of the book deals with restructuring supply and demand. The authors devote one chapter to changing Ph.D. training, echoing others' suggestions favoring broadening of the curriculum, breaking down of disciplinary barriers, and structuring of programs for careers other than in academia. A chapter on "reinventing the master's degree and revitalizing undergraduate programs" explores various dual degree options (for example, combining an undergraduate degree in physics and a master's in business). Here the authors elaborate their belief that science training can be useful in a whole range of careers. In both chapters, they conclude that the number of new programs attempting to address new challenges is very small given the seriousness of the situation.

In their concluding chapter, the authors develop their basic belief: "we believe not only that scientific skills will be increasingly vital in the years ahead, but there is a reservoir of good will for science yet to be tapped." They proceed to describe a series of federal policies on funding, career broadening efforts, enhanced career (job placement) services, and public relations actions that could improve the job market for graduates. They recognize that the specific proposals are suggestive rather than comprehensive. However, the underlying call for an activist approach to restructuring the demand for technical training is provocative and worthy of serious consideration. Clearly, a strong case exists that our nation cannot face the many challenges that lie ahead without a public that understands, appreciates, and therefore supports science. Furthermore, technically trained people can add value not only as scientists but in all enterprises (both public and private) that will face an increasingly technically sophisticated future.

This book will probably not change the minds of the defenders of the status quo or provide much new information for those already convinced change is necessary. The authors' unrealistic demand for a system that provides job security for scientists has an element of elitism and weakens their case. Nevertheless, we all would be making a big mistake if we ignored the serious nature of the concerns underlying their analysis. We need to find ways to address them without doing harm to the many strengths of the existing system.

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