Neanderthal Lifeways,
Subsistence and Technology
Vertebrate Paleobiology
and Paleoanthropology Series

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Neanderthal Lifeways, Subsistence and Technology

One Hundred Fifty Years of Neanderthal Study


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Preface

The year 2006 was declared *Jahr des Neanderthalers* by the state of Nordrhein-Westfalen to commemorate the 150th anniversary of Johan Carl Fuhlrott’s discovery of the famous human fossils in a small cave in the Neander Valley near Düsseldorf. Two major exhibitions were devoted to the jubilee, one “Roots//Wurzeln der Menschheit” at the Rheinisches Landesmuseum Bonn and the other one “Leben in Extremen” at the Westfälisches Landesmuseum in Herne.

The scientific community celebrated the jubilee from 21–26 July 2006 in Bonn with the international congress “150 Years of Neanderthal Discovery”, organized by Wighart von Koenigswald (paleontologist at the University of Bonn) jointly with paleoanthropologists Friedemann Schrenck (Senckenberg Institute and University of Frankfurt) and Silvana Condemi (CNRS, Paris). More than 200 colleagues from all over the world came to Bonn, representing all relevant scientific disciplines, such as paleontology, biological anthropology, archaeology, geology, physical geography and genetics.

The results of the talks presented are published in two volumes in the Vertebrate Paleobiology and Paleoanthropology series, one devoted to Neanderthals and related aspects of paleontology and the evolutionary relationship between Neanderthals and modern humans and this volume about the archaeology of Neanderthals, chronology and paleoenvironments.

The editors of this volume would like to thank many people who made this publication possible.

Andreas Maier, Stefan Heidenreich and Götz Ossendorf (all from Cologne) arranged the contributions and helped in communicating with authors and reviewers.

We sincerely thank all colleagues who supported the publication with their reviews and comments: Michael Bolus (Tübingen), William Davies (Southampton), Katerina Harvati (Tübingen), Miriam Haidle (Heidelberg), Alexandra Hilgers (Cologne), Olaf Jöris (Neuwied), Wighart von Koenigswald (Bonn), Laura Longo (Ferrara), Shannon MacPherron (Leipzig), Thomas Martin (Bonn), Oliver Sass (Innsbruck), Daniel Schyle (Cologne), Marie Soressi (Leipzig), Sylvain Soriano (Paris), Leif Steguweit (Erlangen), Thomas Terberger (Greifswald), Thomas Tütken (Bonn), Thorsten Uthmeier (Cologne), Stefan Veil (Hannover), Sarah Wurz (Cologne), Joao Zilhão (Bristol). Most of our colleagues mentioned above had to read the manuscripts more than once, and many of them did additional editorial work, which improved the quality of the texts. Many thanks to all of them!

We would like to thank the series editors, Eric Delson and Eric Sargis, and Tamara Welschot and Judith Terpos at Springer, for their patience and for continuous encouragement during the preparation of this volume.

July 2010

Nicholas J. Conard
Jürgen Richter
Contents

1 Introduction ............................................................................................................ 1
    Nicholas J. Conard and Jürgen Richter

Part I  The Chronological Framework: Long Time Sequences

2 When Did the Middle Paleolithic Begin? ............................................................. 7
    Jürgen Richter

3 Neanderthals and Monkeys in the Würmian of Central Europe:
   The Middle Paleolithic Site of Hunas, Southern Germany .......................... 15
    Wilfried Rosendahl, Dieta Ambros, Brigitte Hilpert, Ulrich Hambach,
    Kurt W. Alt, Maria Knipping, Ludwig Reisch, and Brigitte Kaulich

4 Neanderthals in the Cold: Middle Paleolithic Sites from the
   Open-Cast Mine of Garzweiler, Nordrhein-Westfalen (Germany) .......... 25
    Thorsten Uthmeier, Holger Kels, Wolfgang Schirmer, and Utz Böhner

5 Neanderthal Occupation in the Verdon Valley
   (Haute-Provence, Southeastern France) .................................................... 43
    Jean Gagnepain and Claire Gaillard

6 Dating Small Heated Flint Artifacts:
   A New Thermoluminescence Technique ................................................... 53
    Daniel Richter

Part II  Neanderthal Subsistence and Raw Material Procurement

7 On Neanderthal Subsistence in Last Interglacial Forested
   Environments in Northern Europe ............................................................ 61
    Sabine Gaudzinski-Windheuser and Wil Roebroeks

8 Diet and Ecology of Neanderthals: Implications
   from C and N Isotopes
   Insights from Bone and Tooth Biogeochemistry .................................... 73
    Hervé Bocherens
9 Management of Paleoenvironmental Resources and Exploitation of Raw Materials at the Middle Paleolithic Site of Oscurusciuto (Ginosa, Southern Italy): Units 1 and 4

Paolo Boscato, Paolo Gambassini, Filomena Ranaldo, and Annamaria Ronchitelli

Part III Neanderthal Cognition and Technological Knowledge

10 Neanderthal Technoeconomics: An Assessment and Suggestions for Future Developments

Steven L. Kuhn

11 Blade Production in the Early Phase of the Middle Paleolithic at Bapaume-Les Osiers (Pas-De-Calais, France): Comments on the Distinction between the Early and Late Phases of the Middle Paleolithic

Héloïse Koehler

12 The Lithic Production System of the Middle Paleolithic Settlement of Le Fond des Blanchards at Gron (Yonne, France)

Vincent Lhomme, Elisa Nicoud, Marina Pagli, Aude Coudenneau, and Roxane Rocca

13 Technological Analysis of the Bifacial Tools from La Micoque and Its Implications

Gaëlle Rosendahl

14 Handedness in Neanderthals

Natalie T. Uomini

Part IV Neanderthal Social Organization and Land Use

15 The Social and Material Life of Neanderthals

Clive Gamble

16 Stability in the Intermittence

A Spatio-Temporal Approach to Mousterian Behavior in the Near East Based on the Technological Analysis of Lithic Industries of Complex VI3 at Umm el Tlel (Central Syria)

Antoine Lourdeau

17 Territorial Mobility of Neanderthal Groups: A Case Study from Level M of Abric Romaní (Capellades, Barcelona, Spain)

María C. Fernández-Laso, María G. Chacón Navarro, María D. García-Antón, and Florent Rivals

18 Level G of Las Fuentes de San Cristóbal (Southern Pyrenees, Spain)

Availability of Lithic Resources and Territory Management

María D. García-Antón, Leticia Menéndez Granda, and María G. Chacón Navarro
## Part V  Cultural Adaptation Among the Last Neanderthals

19  The Demise of the Neanderthal Cultural Niche and the Beginning of the Upper Paleolithic in Southwestern Germany ........................................... 223
Nicholas J. Conard

20  Level 14 of Bajondillo Cave and the End of the Middle Paleolithic in the South of the Iberian Peninsula ................................................................. 241
Miguel Cortés Sánchez, Juan F. Gibaja Bao, and María D. Simón Vallejo

21  The End of the Middle Paleolithic in the Italian Alps
  *An Overview of Neanderthal Land Use, Subsistence and Technology* ............ 249
Marco Peresani

22  Technological Behavior and Mobility of Human Groups Deduced from Lithic Assemblages in the Late Middle and Early Late Pleistocene of the Middle Rhône Valley (France) ........................................... 261
Marie-Hélène Moncel

Index .......................................................................................................................... 289
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The present volume resulted from papers presented at the Neanderthal anniversary conference held in Bonn in 2006, 150 years after the discovery of the famous human fossils by Johann Carl Fuhlrott. The editors arranged the papers in five groups according to major research topics concerning Neanderthal lifeways.

The first group is devoted to the chronology of Neanderthal culture which is practically the same as the Middle Paleolithic. The introductory chapter of this section, by J. Richter, evaluates the consequences of recent corrections of the Middle Pleistocene chronology. It has turned out that mere counts of soils represented in loess sections no longer produce reliable correlations with Quaternary interglacials and that the post-Holsteinian time span has shrunk by 100 kyr or so since the Holsteinian interglacial was re-dated to around 300 ka instead of 400 ka as previously thought. Nevertheless, there is still some evidence for early Middle Paleolithic assemblages up to 300 ka old though the number of candidates has decreased. The paper provokes revisions of matching chronologies all over Western and Eastern Europe.

Another chronological turnover comes from Quaternary paleontology, since W. Rosendahl et al. made new radiometric dating available for the important archaeological and paleontological sequence of Hunos (Northern Bavaria), which is well-known not only for its Neanderthal remains but also for its monkeys, indicating very moderate climatic conditions at the time of sedimentation. This time range has now been re-dated to be only 100 ka old instead of the much older age formerly estimated. How can the Hunos fauna, including its Wurmian monkeys, be contemporaneous to the nearby lower layers of the important sequence from Sesselfelsgrotte in the Altmühl Valley, only 80 km to the south? If this is true, we have to account for considerable regional variation within the glacial period.

This is also indicated by recent loess research, as Uthmeier et al. carried out in the Quaternary sediment cover of the Rhineland lignite mines west of Cologne. It turns out that Middle Paleolithic humans were not only present during phases of moderate climate, but obviously visited the area even under the cold and dry OIS 4 climate (around 50 ka) when dust darkened the sky and loess accumulation was at its maximum.

By contrast, rock shelters in the southwestern Alps-Maritime region close to the Cote d’Azur have only been occupied during severe climates, interglacial occupations being totally missing from the Baume Bonne cave and the neighboring sites of Sainte Maxime and Abri Breuil, as reported by Gagnepain and Gaillard. Baume Bonne is of special interest because it yields one of the longest chronological sequences ever observed in European rock shelters, stretching over 300,000 years according to radiometric dating.

Because absolute dating is still critical in settings older than those accessible by the radiocarbon technique, alternative approaches are most welcome. D. Richter, who is now able to date individual, small, heated artifacts of siliceous materials, solves an old problem of the thermoluminescence dating method that previously required samples of considerable size. This improved method now makes it much easier to find adequate samples for dating.

The second group of chapters elucidates the relationship of the Neanderthals to their environment, producing nutrition and raw material for workmanship. Gaudzinski-Windheuser and Roebroeks focus particularly on the nutritional behavior of Eemian (last interglacial) Neanderthals who preferably exploited large animals, as prey were more dispersed and large meat portions were desired. This contrasts with glacial nutritional patterns focused on medium sized ungulates occurring in large herds.

Bocherens’ paper summarizes direct evidence for preferred Neanderthal prey derived from stable isotope analysis.
of fossil human bone. He found that mammoth and woolly rhino served as major sources of protein during the middle Weichselian (OIS 3) in what is now Belgium. Compared to Gaudzinski and Roebroeks’ paper, we are facing an unexpected result, only partially mirrored by the usual ratio of faunal remnants found in glacial assemblages, which tend to be dominated by ungulates. This might either indicate considerable regional variation or suggest that the OIS 3 nutritional patterns fit the interglacial model proposed by Gaudzinski and Roebroeks.

A detailed case study of Neanderthal environmental management comes from central Italy, presented by Boscato et al. The Oscurosciuto case attests for the classic glacial pattern of predominant medium and large sized ungulate exploitation, as illustrated by abundant *Bos primigenius* and some horse remains. The associated lithic industries are differentially of either Levallois or discoid character. The study displays behavioral patterns of very late Neanderthals, around 40 ka.

The third group of papers is devoted to technology. Research of the last two decades has focused on the *chaînes opératoires* recipes involved in artifact production and in economical evaluation of raw material management, as summarized by Kuhn in the introductory paper of this section. On the other hand, intra-assemblage variation has widely been neglected, thus excluding from our knowledge, ideas about intra-group variability among Neanderthals.

At Bapaume, near Amiens in Northern France, *chaînes opératoires* re-analysis of the technological features of this 195 ka old assemblage yielded clear proof for blade technology applied along with Levallois concepts. This is of some importance, as Middle Paleolithic blade technology has often been seen as a later feature, connected with early Weichselian assemblages. Bapaume being much earlier, it still resembles Weichselian examples in many aspects. Consequently, Koehler argues, the evolutionary hypothesis that blade technology mirrors technological progress in the Middle Paleolithic is no longer valid. This matches the new dating from the Rheindahlen B1 assemblage from the German Rhineland, where blades were produced approximately at the same time (see Uthmeier et al).

At Le Fond des Blanchards near Sens, Northern France, *Lhomme* et al. have found the only example of late Middle Paleolithic usage of Quina *chaînes opératoires* in northern France, along with Levallois concepts. Reindeer and horse hunters discarded these assemblages under harsh climatic conditions of the first Weichselian glacial maximum of OIS 4 to the interplenal glacial of OIS 3. This is exactly the time span when the Quina concept is best documented in southwestern France.

Along with Levallois, discoid, Quina and blade concepts, the bifacial concept is an important aspect of Middle Paleolithic technology. In her technological and typological re-analysis of the famous layer 6 of La Micoque, G. Rosendahl ends up with a pessimistic view of the Micoquian. To her, the term appears ambiguous, because some authors have used it as a huge cultural dump, and, by contrast, others restricted it to particular Central European occurrences connected with the last glacial and the *Keilmessergruppen*.

Were all those technological tricks carried out by the left or the right hand? *Uomini* asks this question, discussing mainly data about asymmetry and lateralization in Middle Paleolithic tools. As a result, it turns out that Neanderthals were right handed just like us.

The fourth group of papers is about the usage of space and connected social structure of Neanderthals. In his introductory paper, *Gamble* argues for Neanderthal social patterns distinctively different from modern humans. The idea of social containers, material and virtual, plays a central role in this paper, explaining Neanderthal behavior by bottom-up social processes rather than by top-down processes of growing social stratification, usually understood as evolutionary progress.

A social container, as proposed by Gamble, may constitute territorial behavior, as thoroughly analyzed by *Lourdeau* in his study about technology, site function and spatial behavior among Neanderthals of central Syria. At Umm-el-Tel, people repeatedly settled on the banks of a spring, yielding archaeological evidence from an early Weichselian wet phase around 70 ka. In his contribution, Lourdeau combines technological and spatial approaches to argue for relative stability in the use of space by Neanderthals within this case study.

Relative stability is also presumed by *Fernández-Laso* et al. for Iberian Neanderthals at approximately the same time. The long stratigraphic sequence from Abric Romani, 50 km from Barcelona, delivered abundant archaeological and environmental data for the time range between 70–40 ka, indicating that Neanderthal land use was restricted to an area of only 20 km around the site.

At the southern fringes of the Pyrenees, the late Middle Paleolithic site of San Cristobal (ca. 50 ka) delivered comparable results, as reported by *García-Antón* et al. Again, the spatial range did not extend much more than 20 km from the site, land use having been restricted mainly to the neighborhood of two adjacent river valleys.

These examples, taken from Syria and Northern Spain, seem to illustrate extraordinary restricted land use, focused on very small areas in contrasting with the evidence from Central and Eastern Europe, where Féblot-Augustins (1997) has documented raw material procurement from sources as far away as 200 km and spatial ranges that were probably larger. Do such differences reflect higher carrying capacities for the reported case studies from Syria and Spain, allowing for smaller mobility ranges?
The fifth group of papers is devoted to cultural adaptation of the last Neanderthals, thus approaching the question of why they were replaced by modern humans.

This may have proceeded rapidly as indicated by the Swabian evidence, reported by Conard. While essentially the same set of resources had been exploited by both Neanderthals and modern humans, their technologies and artifacts argue for a radical break rather than evolutionary transition. This paper argues that the conservative cultural niche of Neanderthals may have played a greater role in their demise than biological differences between them and modern humans.

Such a replacement might also have proceeded step by step, reaching some areas at a very late time. One of these refuge areas could have been the Malaga coast, since thermoluminescence dates level 14 of Bajondillo Cave may indicate (Cortés Sánchez et al.). Here, dates of 28 ka come from the uppermost Middle Paleolithic levels, covered by an Aurignacian occupation dated to 33 ka (uncal. \( ^{14} \text{C} \)) or 28 ka (TL), this being the only Aurignacian south of Joao Zilhão’s Ebro frontier (Zilhão 2000).

Just the opposite, early replacement by modern humans, is attested for the southern fringe of the Alps, where Fumane Cave delivered one of the earliest examples of an Upper Paleolithic (Proto-Aurignacian or Fumanian) occupation. Peresani’s analysis of late Neanderthal behavior in this neighborhood, immediately preceding the Upper Paleolithic period, reveals a differential settlement system with low residential mobility and a high degree of technological variability. Interestingly, Levallois production seems to focus on the production of elongated blanks during the last phase of the local Middle Paleolithic.

While the Italian Neanderthals were behaving progressively, their southern French neighbors saw no reason for any kind of revolution. The central Rhône Valley, described by Moncel’s contribution, has always been a favorable place to live. Neanderthals continuously occupied the area between OIS 9 and OIS 3, without much technological change. Residential mobility was always high and restricted within small territories. At the end of the Middle Paleolithic, continuity remained a more significant feature than change within the local Neanderthal society, thus very strongly contrasting with the situation in northern France.

With this volume the reader will see many innovative and exciting aspects of contemporary research on Neanderthals. 150 years after their discovery, research about our closest evolutionary relatives continues to provide insights into the behavioral patterns that for many tens of thousands of years characterized the human condition in western Eurasia. By extension, this kind of research provides us essential information on the evolution of the genus Homo and makes a major contribution to defining who we are today.

References


Part I

The Chronological Framework: Long Time Sequences
Chapter 2
When Did the Middle Paleolithic Begin?

Jürgen Richter

Abstract The Middle Paleolithic has widely been understood as the epoch of the Neanderthals, including early (Pre-Neanderthals) and classic Neanderthals. The onset of the Middle Paleolithic has conventionally been defined as the time when the Levallois concept of flake production became a dominant and regular feature in stone artifact assemblages. The same “Levallois generalization” seems to have started after the Holsteinian interglacial and before the Drenthe ice advance. New radiometric dating for the Holsteinian (now around 300 ka) and Drenthe (now around 150 ka) indicates the ages for some early Middle Paleolithic assemblages to be much younger than previously thought. Regional chronologies need re-evaluation based on the new, shorter chronological model.

Keywords Middle Paleolithic • Chronology • Levallois • Discoid • Quina • Drenthe ice advance • Holsteinian interglacial

Introduction

The Middle Paleolithic began around 300 ka (Delagnes et al. 2007) and is generally looked upon as the cultural stage of Pre-Neanderthal and Neanderthal man, classic Neanderthal humans having only occurred after 130 ka. This means, classic Neanderthals were only responsible for the second half of the Middle Paleolithic. Moreover, the extinction of Neanderthal man around 30 ka coincides with the end of the Middle Paleolithic.

The term Middle Paleolithic is of quite recent origin: In 1836, C.J. Thomsen defined the Stone Age, the Bronze Age and the Iron Age as the three principal ages of prehistory. In 1865, J. Lubbock introduced the terms Paleolithic and Neolithic (the time when polished stone artifacts came into use), thus subdividing the Stone Age. In 1897, G. de Mortillet subdivided the Paleolithic into the stages Chelléen, Acheuléen, Moustérien, Solutréen, Magdalénien and Tourassien (the last one later omitted). A further subdivision into Paléolithique inférieur (including Acheulean and Mousterian) and Paléolithique supérieur (Upper Paleolithic) was made available by 1912 (Breuil 1912). Several decades later, the term Paléolithique moyen came into use for the last stage of what was earlier called Paléolithique inférieur. Only after the 1950s, the term “Middle Paleolithic” became widely accepted as indicating the period between Lower Paleolithic and Upper Paleolithic.

Definition of “Middle Paleolithic”

Nowadays, we understand the Middle Paleolithic as the time when lithic assemblages came into use which were characterized by the predominance of tools made on flakes from standardized flake production such as the Levallois concept, the discoid concept or the Quina concept of flake production. Occasionally, Middle Paleolithic lithic industries may also display bifacial tools (Bosinski 1967; Richter 1997) and blades (Conard 1992), sometimes as a dominating component.

As one possibility, the first occurrence of assemblages dominated by the Levallois concept (the Levallois Generalization) has often served as a chronological marker for the onset of the Middle Paleolithic (Bosinski 1967). The disappearance of the Levallois concept (Boëda 1994) and its substitution by blade production as the predominant or exclusive production concept (accompanied by a whole range of other Upper Paleolithic innovations) indicates the end of the Middle Paleolithic.

As a second and third possibility, the first appearance of the discoid concept (Boëda 1995) and of the Quina concept (Bourguignon 1997) of flake production may be taken as a common feature of the Middle Paleolithic age, although there are also some rare examples of those technological
concepts to be of much earlier age (Delagnes and Meignen 2006). The emphasis is on the predominance, not on the first occurrence of complex, standardized flake production. Although somewhat vague, this seems the best practical way to separate the Middle Paleolithic from the earlier Paleolithic, because it prevents multiple claims for particular early occurrences of the Middle Paleolithic which would then be based on unique pieces of Levallois (or discoid etc.) character. Such unique Levallois occurrences have been attested at Cagny la Garenne, Orgnac 3 and at Atelier Comment in the Somme Valley, for example (cf. Soriano 2000).

The Time Range of the Middle Paleolithic

According to the mentioned definition, the Central European Middle Paleolithic lasted from 300 to 30 ka and spanned over three major glacials and two intersecting interglacials (Fig. 2.1): MIS 8 (Early Saalian glacial, sensu lato), MIS 7 (interglacial), MIS 6 (Saalian glacial, sensu stricto, including the Drenthe and Warthe stages), MIS 5e (Eemian Interglacial) and a part of the Weichselian Glacial, including MIS 5d, 5c, 5b, 5a, 4 (Early Weichselian Glacial including the first maximum of the Weichselian glaciation) and finally the first half of MIS 3 (Interpleniglacial between MIS 4 and MIS 2). Within the time range of the Middle Paleolithic, Pre-Neanderthal and Neanderthal man emerged (cf. Serangeli and Bolus 2008); Modern Man appeared in the Near East (around 90 ka) and in Europe (around 40 ka) and Neanderthals were extinct (around 30 ka).

Early sites from the very beginning of the Middle Paleolithic are scarce, if compared with the number of sites known from the younger part of the Middle Paleolithic.

New Chronological Insights

The question when the Levallois Generalization (as preferred indicator for the onset of the Middle Paleolithic) took place is closely connected with problems of the Middle Pleistocene chronology. Here, the correlation between the global climatic calendar on the one hand, as represented by the oxygen isotope stages from deep sea and ice cores, and corresponding terrestrial evidence on the other hand has been subject to permanent debate. Three major issues have resulted from the debate of the last years which essentially changed the chronological scheme of the Middle Pleistocene:

1. The Holsteinian is only 300 ka old, not 400 ka (Geyh and Müller 2005).
2. The Drenthe glacial advance took place only 150 ka, not 250 ka (Litt et al. 2007).
3. The correlation one interglacial soil – one MIS interglacial warm phase has been rejected as a general rule (Schirmer 2002).

Recent datations of the Holsteinian type site at Bostel, near Hamburg in Northern Germany, proved the “Holstein” botanical sequence to be around 300 ka old, thus coinciding with MIS 9 (Geyh and Müller 2005). The Holsteinian displays the most favorable interglacial climate during the Middle Pleistocene. Bilzingsleben (Central Germany), with its late Homo heidelbergensis fossils, and the lower horizons of Schöningen date to the Holsteinian period. All over Europe, Holsteinian and/or MIS 9 assemblages clearly belong to the Lower Paleolithic, characterized by Acheulean handaxes or simple flake technologies (“Clactonian”) in Western Europe and by simple flake technologies (“Clactonian”) in Central Europe.

The subsequent period, the interface from the MIS 9 Holsteinian interglacial to the MIS 8 glacial, is well documented at the Schöningen site. The find horizon of the famous wooden spears has been dated to the very beginning of the post-Holsteinian glacial (MIS 8), although still controversially debated (Thieme 2007; Litt et al. 2007; Voormolen 2008). The lithic assemblage still demands for proper evaluation. At the present time it is not entirely clear whether Lower or Middle Paleolithic attributes prevail in the assemblage.

In Europe, the earliest truly Middle Paleolithic assemblages, dominated by the Levallois concept, seem to occur during MIS 8, the cold phase after the MIS 9 interglacial. The climatic deterioration of MIS 8 has recently been identified with the Fuhne glaciation, newly defined by (Eissmann 1994) as the major glaciation preceding the Saale sensu stricito (Drenthe and Warthe) glaciation which is now argued to be of MIS 6 age. Matching evidence comes from new radiometric measurements that date the principal Drenthe (Lower Saale sensu stricito) continental ice advance, the largest continental Europe ever saw, at around 150 ka (Litt et al. 2007).

Impact of the New Chronology on the Possible Onset of the Middle Paleolithic

The new chronological framework has caused serious uncertainty about the age of some well-known reference sites, which are usually looked upon as examples of the earliest Middle Paleolithic. All sites which are connected with the datation of the Holsteinian or the Drenthe maximum extension of the Scandinavian ice shield need re-evaluation. Moreover, dating based on counts of losses and soil horizons appears to be doubtful now.
Fig. 2.1 Chronological scheme of the European Middle Paleolithic according to the tentative new correlations of the Drenthe ice advance with MIS 6 and the Holsteinian interglacial with MIS 9. Triangles indicate important volcanic eruptions attested in European sequences. Human fossils in CAPITALS.
Paleolithic archeological horizon is securely stratified, underlying the Drente gravels, which previously gave reason to date the archaeological find horizon to early MIS 8, but might now be either MIS 8 or as young as MIS 6. The Markkleeberg assemblage combines bifacial tools (handaxes and bifacial scrapers) with highly developed Levallois products of various kinds (Mania 1997). Markkleeberg was formerly accepted as one of the earliest Middle Paleolithic sites in Europe, attributed to the Jungacheuléen (Upper Acheulean). Accidentally, Markkleeberg was also attributed to the Lebenstedter Gruppe (Bosinski 1967), which term had been synonymously used along with Jungacheuléen. As the eponymous site, Lebenstedt, has since been proved to be middle Weichselian and part of the Central European Micoquian (Richter 1997), Markkleeberg must be removed from the Lebenstedter Gruppe (Bosinski 2008), if this term should any be used, because Markkleeberg is more than 100 ka earlier than Lebenstedt.

Another problem arose when double and triple interglacial soil formations were recognized, as has recently been done in the Rheindahlen Loess sequence by W. Schirmer. It turns out that three subsequent Loess and soil formations do not represent a full glacial/interglacial cycle each (cf. Bosinski et al. 1966; Klostermann and Thissen 1995), but two of them belong to the younger part of (triple) interglacial MIS 7 and one of them belongs to MIS 5e, but mixed with the Holocene soil (Schirmer 2002). Whereas the soil sequence had previously been dated by simply counting the soil formations (last soil – MIS 5e, second-last soil – MIS 7, third-last soil – MIS 9), it now appears to represent a much shorter period from MIS 7 to MIS 5e, the Rheindahlen B3 assemblage of Moustrian-Ferrassie type dating to the middle MIS 7 interglacial and the Rheindahlen B1 Middle Paleolithic blade assemblage (Rheindahlen) to the last warm phase of MIS 7 (Ikinger 2002; Richter 2006).

Further re-evaluation is needed for two most important loess sequences in Europe: Achenheim (Heim et al. 1982; Junkmanns 1991; Bosinski and Richter 1997; Bosinski 2008) and Korolevo (Haesaerts and Koulakovskaya 2006), which both seem to display the interface between Lower and Middle Paleolithic.

At Achenheim (Fig. 2.2) the interface appears between the layer 20 complex (Lower Paleolithic with some Middle Paleolithic components, such as limaces) and layers 19, 18 and 17 which show similarities with the Moustrian of Ferrassie type. In the same stratigraphic portion, mammoth and woolly rhino occur for the first time. Dating of the Achenheim sequence has always been based on the count of Loess accumulation stages, given that one Loess horizon equals one glaciation. Thus, the Lower to Middle Paleolithic interface occurred in the third loess accumulation phase from top. The loess accumulation phases were stratigraphically distinct by intersecting humic horizons or soil formation processes. According to the count of loess accumulation phases, the lower to middle Paleolithic interface at Achenheim would date to MIS 8, formerly identified as the lower Rissian (Saalian) glaciation. Of course, we presently know that MIS 7 can contain up to three soil horizons. If more than one soil complex would belong to stage 7 at Achenheim, then layer 18 would represent stage 7.1 (cf. Fig. 2.1) and layers 20c to 29 would become much younger, being possibly of an Intra-MIS 7 or MIS 8 age, and the whole transitional portion (layers 20 to 17) of the stratigraphy would date to the second half of the long MIS 7 interglacial.

At Korolevo (Fig. 2.3), the Lower to Middle Paleolithic interface appears between the archaeological horizons VIe and Vb. The first occurrence of the fully developed Levallois concept in layer Vb has usually been dated into MIS 9, around 300 ka. Recently; Paul Haesaerts has corrected this estimation. He would place all early Middle Paleolithic horizons present at Korolevo (V, Va and Vb) now into MIS 7 (Haesaerts and Koulakovskaya 2006). The Korolevo sequence is, as a whole, most important for the discussion about the evolution of the Levallois concept, because the lower horizons, such as VIe (formerly dated to an inter-Mindel, MIS 11 interglacial) displays all attributes of a kind of proto-Levallois concept. This is characterized by roughly prepared cores wider than long, thus comparing to the Victoria West cores in eastern Africa. The particular technological features found at Korolevo might indicate a very early local invention and evolution of the Levallois concept.

With the new chronological results in mind, it becomes clear that tracing earliest Middle Paleolithic sites can neither rely on counts of subsequent soil formations/subsequent Loesses nor on simple one-to-one correlations of MIS interglacials and terrestrial loess or soil formations. Additional evidence is needed, such as for example radiometric dates, paleoenvironmental and mineralogical (such as chemical finger-print) correlations. Tephra markers, windblown ashes from volcanic eruptions, yield excellent chronological evidence, because they allow for firm stratigraphic correlation (if two or more sequences display the same tephra marker), and they are themselves datable by particular radiometric methods.

An Early Middle Paleolithic Site Preceding the “Wehrer Kessel Tephra”: Ariendorf 1

In the Middle Rhine area, the best early Middle Paleolithic stratigraphy comes from the Ariendorf gravel pit (Bosinski et al. 1983; Turner 1997). Here, 150 m² of the Ariendorf 1 site were excavated in 1982/1983 from the lowest level of Loess LD I (Fig. 2.4). Ariendorf 1 has been dated to MIS 8, because the site must be older than the overlying soil horizon, followed by another Loess layer (LD II) and by the “Wehrer Kessel” tephra layer (ARI-BT1) dated to around
Fig. 2.2  Loess sequence at Achenheim (Compiled from Junkmanns 1991; Bosinski and Richter 1997). Layers 1–30 (After Wernert in Junkmanns 1991) combined with sol 74 and sol 81 (After Heim et al. 1982). Faunal remains from elephants (a: *Elephas antiquus*; b: *Elephas trogontheri*; c: *Mammutthus primigenius*) and rhinos (a: *Dicerorhinus merckii*; b: *Stephanorhinus hemitoechus*; c: *Rhinocerus tichorhinus*). Archaeological occurrences (a: Lower Paleolithic pebble tools; b: Levallois technology; c: Middle Paleolithic sidescrapers; d: Middle Paleolithic convergent scrapers; e: bifacial tools)
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Fig. 2.3 Loess sequence at Korolevo, revised chronology (Compiled from Haesaerts and Koulakovskaya 2006). Arrows indicate the stratigraphic position of archaeological horizons (AH). Sediments are: hatched: soils; plain: Loess. Symbols see Fig. 2.2
When Did the Middle Paleolithic Begin?

220 ka. Around 250 ka (MIS 8; Bosinski and Richter 1997: 10), humans were present at the site situated close to a small brook. One hundred and twenty-six stone artifacts have been found, made of quartz, quartzite and lydite coming from river gravels. Refittings of artifacts not only demonstrate core reduction at the site, but at the same time point to an in situ preservation of the assemblage that includes prepared cores of Levallois character. Scrapers and denticulated pieces were found among the retouched tools, and horse, mammoth, woolly rhino, red deer, bovid and wolf were among the faunal remains. The 1982 excavations uncovered a second, younger archeological site (above the “Wehrer Kessel” tephra) within the MIS 6 Loess of the Ariendorf sequence. Only one retouched tool was found among 37 stone artifacts, comprising some cores, but mostly flakes made of lydite, quartz and quartzite along with bones of mammoth, woolly rhino, horse, red deer, bovid and wolf. The find scatter has formerly been interpreted as a dwelling structure, but has since been demonstrated to be a natural pit which may have attracted human activities (Turner 1997).

Fig. 2.4 Loess sequence at Ariendorf. The “Wehrer Kessel” tephra gives a terminus ante quem of 220 ka for the early Middle Paleolithic assemblage Ariendorf 1.
Conclusion

The last two decades of research saw major corrections in the middle Pleistocene chronology of Europe. When the oxygen isotope chronology was initially correlated to terrestrial archives, this was often done in a very simplistic way underestimating specific problems connected with different kinds of archives, different kinds of dating and regional differences. Moreover, new radiometric data from the Holsteinian type site and from the Drenthe ice advance along with the detection of multiple interglacial soils (namely within MIS 7) have led to a shorter chronology for the first half of the Middle Paleolithic. In some cases, early Middle Paleolithic assemblages, who had previously been dated to MIS 8, have skipped now to MIS 7 and MIS 6. This means, assemblages like Markkleeberg, Rheindahlen B3 or Korolevo Vb might rather represent more advanced stages of the Middle Paleolithic rather than its initial stage.

Consequently, the question arises whether MIS 8 belonged rather to the late Lower Paleolithic than to the early Middle Paleolithic age. This would place the lower to middle Paleolithic transition around 250 ka. On the other hand, there are Middle Paleolithic assemblages which are resistant to the mentioned chronological corrections, because their dating relies on independent arguments, as, for example, stratigraphic linkage to tephra chronologies.

References

Chapter 3
Neanderthals and Monkeys in the Würmian of Central Europe:
The Middle Paleolithic Site of Hunas, Southern Germany

Wilfried Rosendahl, Dieta Ambros, Brigitte Hilpert, Ulrich Hambach, Kurt W. Alt, Maria Knipping, Ludwig Reisch, and Brigitte Kaulich†

Abstract The site of Hunas is a cave ruin, filled with bedded sediments up to the roof. About 20 m sediments from the top down were excavated and yielded Middle Paleolithic artifacts as well as numerous faunal remains, including Macaca. With a single human molar, the site is one of the rare Neanderthalian localities in Germany. New TIMS-U/Th dating of speleothems at the base of the profile indicate that the whole sequence was not deposited during the late Middle Pleistocene as previously thought, but during the last glacial. According to the new chronological results, Hunas is the only place which shows the coexistence of man and monkey in the Würmian of Central Europe. The Macaca remains are the most recent evidence of magots in Central Europe so far.

Keywords Homo neanderthalensis • Macaca • Late Pleistocene • TIMS/U-Th • Enviromagnetism • Bavaria • Cave

Introduction

The site of Hunas is located 40 km east from Nuremberg/Bavaria (Fig. 3.1) and lies in a limestone quarry on the eastern slope of a hill, 520 m above sea level. The limestone is a dolostone of Middle Kimmeridgian (Malm Delta) age. The karstification of the Franconian Jura dates back to the Neogene. In the limestone quarry of Hunas no other caves or karstic fissures with archaeological or paleontological finds are known.

The cave ruin was discovered in 1956 by Florian Heller from Erlangen University, Institute for Paleontology and was investigated in the following years up to 1964 (Heller 1983). From the top of the hill, the excavation opened just the upper part of a stratigraphic sequence which comprises altogether 20 m thick sediments and included abundant faunal remains as well as several archeological levels. In anticipation of the complete destruction of the site – the quarry has been reactivated in 1982 – new excavations have been started in 1983 (Reisch and Weissmüller 1984) and are still going on (Groiss et al. 1998; Kaulich et al. 2006).

Stratigraphy

The cave ruin is filled with bedded sediments up to the roof. The roof is collapsed, covering the sediment-filling and obstructing the cave entrance. The extent of the room and the dimensions of the entrance are unknown. The sediment filling has been opened vertically by the blasting-front of the quarry. About 12 m sediment from the top down were investigated (Fig. 3.2) with modern methods in the recent excavation since 1983 (Ambros et al. 2005). The sequence shows a series of sediments of various compositions (Table 3.1). The sediments are mainly built by fine grained sand and silt, sometimes mixed with dolostone blocks (roof falls) of different size. The sediment colors vary between different brown, grey and yellowish color shades.
About 140 different taxa have been found in Hunas (Ambros et al. 2005). More than 50% are mammals, nearly 30% birds, 10% mollusks and 5% reptiles and amphibians. The majority belongs to living species. The macrofauna is dominated by the family of the bears (Hilpert 2006). The most important paleontological finds belong to primates. The macrofauna known up to now is listed in Table 3.2.

Most of the mammals are micromammals, including Chiroptera, Insectivora, Lagomorpha, as well as the rodent families Sciuridae, Castoridae, Dipodidae, Muridae, Cricetidae and Microtidae, the most abundant family with 18 species (Heller 1983; Carls et al. 1988). Due to the distribution of each species, multiple changes of climate are reflected in the Hunas stratigraphy. It begins, from bottom to top, with a phase showing temperate to warm climate and vegetation in the layers P-L with Muscardinus avellanarius, Apodemus sylvaticus, Clethrionomys glareolus, Pitymys subterraneus and other forms of mixed deciduous woodland. The lack of these forms indicates a significant colder climate in the following layer (Kunt) but their reappearance in the next layers (Kmitte – H) testifies again favorable moderate humid and warmer climatic conditions. In the layers G2 and G1 – G3 is represented very poorly in the excavation since 1983 – a clear and rapid change to colder and dryer conditions turns up, indicated by Lemmus lemmus, Dicrostonyx guelmi, Microtus gregalis or Microtus oeconomus. G1 with coarse, sharp-bordered rock debris portrays the coldest climatic phase within the whole stratigraphy. The covering layers – only small remains of Hellers layer F and nothing of layers A – D are left – indicate an improvement of the climate.

Altogether we are facing a gradual development from an ending warm phase to a significant cold climate. Investigations in pollen and charcoal confirm this opinion. Less pollen are conserved in the detrital layers of Hunas. A small series from layer F with spruce (Picea abies), pine (Pinus silvestris) and birch (Betula sp.) represents open woodland vegetation with many herbs showing a cold to cool climate. Charcoal out of layer L results from a piece of yew (Taxus baccata) which was often used for spears or other weapons in prehistory. Pollen from layer P, a spelothem, indicates a warm and wet climate with mixed deciduous forests.

**Paleoanthropology**

As mentioned above, the most important paleontological finds belong to primates, i.e. *Macaca* and *Homo neanderthalensis*. Five remains of *Macaca sylvanus* ssp., the Pleistocene subspecies of Recent magot (*Macaca sylvanus*), were found in the cave ruin Hunas till the end of the excavation campaign 2006 (Groiss 1986; Ambros 2003; Ambros et al. 2005). The first evidence of *Macaca* in Hunas, a right M3, was found in 1985 in layer H (Groiss 1986). The second find, made in 1987 in layer H, was a left M3 (Fig. 3.3), probably of the same individual. Other finds from a much lower stratigraphic level (layer K) are a fragment of a M2 (in 2000) and a dp3 (in 2001). Checking undetermined material of layer H from the excavation of Heller (1956–1964) in winter 2000/2001, a fragmentary right third metatarsal could be determined as a *Macaca* remain. These five remains belong to at least two, probably three individuals. Three of the teeth and the metatarsal represent adults; only one tooth is from a very young individual. This deciduous premolar was not broken through the maxillary bone and therefore belongs to an animal younger than 3 months (Starck 1990).

Magots or Barbary Macaques (*Macaca sylvanus*) belong to the genus *Macaca* (macaques). The genus includes nearly 20 species with numerous subspecies, e.g. *Macaca mulatta* (Rhesus Macaque) and *Macaca fuscata* (Japanese Macaque). All members of the genus live in Asia with exception for *Macaca sylvanus*. These species today has a patch-like distribution in Northwestern Africa; in the Atlas range of Morocco and Algeria. In modern Europe there are some semi-domesticated populations of the magot, e.g. the colony at the rock of Gibraltar.

The oldest known macaques belong to the species *Macaca libyc.a* living in the Miocene of Egypt. Macaques have existed in Europe since the Late Miocene (Rook et al. 2001). In the