

A New Research Project To Investigate The Chronology Connected With Neanderthal Climate Preferences And Tolerances In The North-East Black Sea Region

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Abstract

In 2002 the UK Natural Environment Research Council (NERC) decided to invest £2 million in a four-year initiative called EFCHED (Environmental Factors in the Chronology of Human Evolution and Dispersal) to look at whether changes in climate during the Pleistocene have influenced human evolution and dispersal across the globe. Projects were approved that focused on a range of themes which together combined the study of hominid and human remains (palaeoanthropology), stone tools and settlement structures (archaeology), the environmental record of past climate change (palaeoecology), and a range of scientific dating techniques (chronology). This paper discusses one project – the northeast Black Sea EFCHED project – which has focused on the chronology of late Middle Palaeolithic archaeological sites in southern Russia and the Ukraine in the context of a changing steppe woodland environment, in order to determine the extent to which Neanderthals may have been warm or cold-adapted. In this paper we outline the rationale of the research and set out the avenues of probable investigation, prior to the production of new field and laboratory data from the region.

Key Words: LATE MIDDLE PALAEOLITHIC, NEANDERTHAL CLIMATE PREFERENCES AND TOLERANCES, BLACK SEA LITTORAL, SOUTHERN RUSSIA, UKRAINE, CHRONOLOGY, PALAEOENVIRONMENT

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Background to the Research – the EFCHED initiative

In 2002 the UK's Natural Environment Research Council (NERC) launched a four-year thematic programme with the aim of integrating and strengthening UK research in human evolution and dispersal⁴. The underlying rationale to the initiative and its timing was an acute awareness that future studies of human evolution would need to be more closely tied to the ecological and environmental expertise underpinning Quaternary science. In particular, it was felt important that research among the disciplines of palaeoanthropology, archaeology and palaeoecology needed to be more fully integrated if the overall field of human evolutionary studies was to advance significantly. Moreover, the importance of chronology to all facets of the studies was also evident.

It was envisaged that EFCHED would be highly interdisciplinary in its approach, consisting of two parallel pathways. Firstly, the constituent projects would acquire and analyse new field data, thereby making a contribution to human evolution and Quaternary science. Secondly, they would exploit existing datasets from archaeology, palaeoanthropology, palaeoecology, as well as genetics, in the context of making such information more readily available by means of conventional and electronic forms of dissemination. The key question that EFCHED was established to investigate was *'what impact did environmental factors have on human evolution and dispersal?'* The purpose of establishing a thematic programme was to encourage research that formulated and tested hypotheses on several chronological and spatial scales that bear on the causal relations between environmental and climatic change and human evolutionary patterns - genetic, morphological, behavioural and cultural. The schematic model (**figure 1**) shows how the relationship between environment and evolutionary change (both biological and cultural) lies at the heart of EFCHED. Once temporal change was included, the three main elements to the programme – human evolution and dispersal, past environments, and time – are readily discernible.

The Legacy of the Stage 3 Project

To a degree, the present northeast Black Sea EFCHED Project, and the EFCHED initiative itself, share common roots arising from developments in the 1990s. In late

⁴ Details of the EFCHED initiative may be found at the following NERC web address:
<http://www.nerc.ac.uk/funding/thematics/efched/>

1995 Sir N.J. Shackleton and T.H. van Andel conceived the establishment of a Stage 3 Project (by which was meant the Oxygen Isotope Stage 3 – OIS-3). Launched in the following year at a Godwin Conference in Cambridge, the Stage 3 Project drew on two independent fields of inquiry (van Andel 2003a, 1), firstly the existence of a strong interest – both in the academic community and in the wider public – in the demise and replacement of Neanderthals by anatomically modern humans, and secondly the recognition of the potential importance of hitherto unknown, frequent major climate oscillations in the Greenland ice cores for the last glacial period between 60-30 ka BP. These rapid climate fluctuations, termed Dansgaard / Oeschger (D/O) oscillations (Dansgaard *et al.* 1993, Johnsen *et al.* 1992), contrasted with the previous conventional view of a slowly cooling, but stable, mid-glacial interval. The Stage 3 Project, which was to continue for seven years, concentrated on compiling and synthesizing *existing* data to answer two broad questions (van Andel 2003a, 1): (1) what was the climate of Europe like during OIS-3 and to what extent did the rapid changes recorded in the Greenland cores affect European fauna and flora? (2) Do the human events of the Middle and early Upper Palaeolithic correlate with, or in anyway reflect, the OIS-3 climate and environmental history during this period? In order to address these propositions a series of datasets were established⁵ – in the case of the climate question the datasets comprised a number of syntheses of the relevant Stage 3 environments integrated into a computer simulation (van Andel 2003b; Barron *et al.* 2003; Huntley and Allen 2003), in the case of the anthropogenic question, a database of compiled chrono-archaeological data (van Andel *et al.* 2003). This paper is not concerned with the overall outcome of the Stage 3 Project, which have already been presented and discussed in another publication (van Andel 2003c). However, one outcome that did emerge from the Stage 3 Project, and which lies at the heart of this new project, is the degree to which *‘Neanderthals and early anatomically modern humans were both best adapted to temperate, or at worst boreal conditions, living on sedentary animal resources and thus both equally handicapped when an arctic mode of living with its seasonal mobility became the better option’* (van Andel 2003c, 260). It was felt that this conclusion drawn from existing research deserved further investigation, and the launch of EFCHED around the time when the Stage 3 Project

⁵ Datasets may be accessed from the following Stage 3 Project web page:
<http://www.esc.cam.ac.uk/oistage3/Details/Homepage.html>

was drawing to a close provided the wherewithal to generate new relevant data, with the aspiration of being able to test these propositions.

The Rationale to the New Research – Outlining the Problem

The climatic tolerances and environmental preferences of Neanderthals are closely tied to questions concerning their disappearance in the face of the arrival of anatomically modern humans (d’Errico and Sánchez-Goñi 2003, Weniger and Orschiedt 2000). The conventional view is that Neanderthals were cold-adapted, in the main due to their perceived arctic or hyper-arctic physiological body form compared to anatomically modern humans (Holliday 1997a, 1997b, Ruff 1991, Trinkaus 1981, Trinkaus *et al.* 1991) but also due to the traditional view that the Pleistocene was a sequence of short warm interglacial events, alternating with long, very cold, glaciations, and that they mostly coincided with colder time intervals. However, neither of these contentions stands up anymore to critical examination. Firstly, analyses of Neanderthal and modern human cranial sinuses (Tillier 1977) and nasal cavity (Franciscus and Trinkaus 1988) would appear to undermine the perceived physiological cold adaptive qualities of the Neanderthals. Furthermore, recent investigations of Neanderthal physiology (Aiello and Wheeler 2003) have reinforced this view for these studies indicate that the minor physiological differences that are observed in Neanderthals would not have been sufficient to cope with the cold conditions prevalent in European winters in this period without recourse to cultural adaptations. Secondly, as already mentioned, understanding of the climatic background has altered with the discovery in the middle part of the Weichselian of large amplitude high-frequency (100-1000 year) climate oscillations (Dansgaard *et al.* 1993, Johnsen *et al.* 1992) - at least 18 may be discerned in the period 50-30 ka BP. Analysis, in the Stage 3 Project, of the existing spatial and chronological patterning in the climate (van Andel 2002) and archaeological (van Andel *et al.* 2003) datasets has cast further doubt on this conventional cold adaptation viewpoint, although it has to be conceded that present terrestrial palaeoenvironmental data are not of sufficiently high temporal resolution to permit adequate modelling of rapid millennial Dansgaard / Oeschger (D/O) oscillations, or to determine the extent to which the terrestrial environment follows the ice core records.

Examination of the geographical distribution of European Mousterian sites in the 60-30 ka BP time period (van Andel *et al.* 2003, 33-39) shows a strikingly similar pattern to that of sites with Aurignacian and Early Upper Palaeolithic (EUP) tools thereby further questioning the traditional Neanderthal cold adaptation model. Indeed, if the common interpretation of these cultural assemblages and their associations with respective hominid remains is accepted, present chronological data could arguably be taken to support the opposite perspective. The corollary of this is a scenario where both populations groups share similar climatic and environmental preferences, leading to a requirement for alternative explanations for the demise of Neanderthal populations.

It should be recognised at the outset that the existing chronometric record is severely limited in many respects. Before about 45-50 ka cal BP the extant dataset is overwhelmingly based of ^{14}C determinations. However, the existing ^{14}C chronologies are particularly problematic beyond 30 ka ^{14}C BP, in part due to measurement difficulties as the upper age limit of radiocarbon is approached, but also due to the uncertainties of the ^{14}C calibration in the period between 30-60 ka, which include a long plateau around 32.5 ka ^{14}C BP corresponding to ages from 40-35 ka cal BP (Jöris and Weninger 2000). Patterns observed in the Stage 3 Project's chrono-archaeological database (van Andel *et al.* 2003) also suggest that a significant proportion of the ^{14}C determinations beyond 30 ka ^{14}C BP are underestimating the true age of many Mousterian sites, for close examination shows a number of puzzling inconsistencies in the present chronometric dataset when compared to proxy climate records (**figure 2**). It is clear from this figure that there is evidence for anti-correlations between the abundance of dated sites and the warm periods, which may at first sight be taken to support a cold adaptation for Neanderthals. However, unless one is also to view anatomically modern humans as *physiologically* cold adaptive (highly improbable given an 'Out of Africa' origin, although Gravettian developments show that such populations could exploit cold climes through *cultural* adaptation), then the similar spatial distribution of later Mousterian and Aurignacian sites argues for the opposite. As **figure 2** shows, the temperate stage of OIS-3 (58-44 ka cal BP) is poorly represented in terms of dated archaeological assemblages compared to the subsequent transitional / cold stages (44-27 ka cal BP). This internally contradicts the picture emerging from the spatial pattern of site distributions and may be accounted for by the

consistent underestimation of the true age of the archaeological sites. It is, at present, unclear whether this pattern is due to the influence of calibration and short-term climatic modulation in influencing the age distribution for those sites where the chronology is dependent on ^{14}C . That there are definite limitations to the existing dataset can be shown by the apparent systematic differences between assembled ^{14}C ages for Mousterian bone and charcoal samples (B. Weninger, personal communication, van Andel *et al.* 2003, 24-25), with bones typically giving younger ages than charcoal. This may be explained by differing degrees of success in chemically removing, during pre-treatment, contamination deriving from the burial environment. However, the possibility that it may also reflect the relationship between the archaeological remains and intrusive carbon sources must be borne in mind, raising the importance of understanding site taphonomy in any integrated analysis of this sort. It should also be noted that there are noticeable differences within this dataset in the geographical coverage of dated sites across Europe, in part reflecting the differing amounts and timing of excavation undertaken in different countries, but also dependent on the level of access to scientific resources for dating. Clearly an improvement to this situation is desirable.

One of the objectives of northeast Black Sea EFCHED Project is to attempt to address some of these limitations by combining the use of newer non- ^{14}C chronometric approaches to specific sites with existing ^{14}C chronologies, whilst extending the same techniques, where practicable, to other, currently undated, sites. The Project intends to apply a series of methodologically independent chronometric techniques to appropriate materials (thermoluminescence [TL] to burnt flint, optically stimulated luminescence [OSL] to windblown sediments, argon-argon [Ar-Ar] to volcanic tephra horizons, magnetic palaeointensity to fine-grained sediments) that are associated with late Mousterian archaeological assemblages. If it can be shown that ^{14}C is regularly underestimating the true age of these assemblages then the question becomes within which environmental/climatic zones are such occupation layers situated and what does this say about late Neanderthal environmental preferences.

Research Objectives and Potential Implications

The specific objectives of the northeast Black Sea EFCHED project are:

- To ascertain whether the perceived cold adaptation characteristics of Neanderthal populations are, at least in part, due to a biased picture of the present chronological data set of late Mousterian sites that currently suggests that Neanderthals may have occupied the later and cooler, more climatically-variable, part of OIS-3 (42-26 cal BP) rather than the warmer earlier (58-42 cal BP) time frame;
- To investigate a geographically discreet subset of the European late Mousterian site dataset - namely southern Russia north and east of the Black Sea - the geographical distribution of which is most likely to have been significantly influenced by environmental factors due to its more continental climate when compared to other parts of the Neanderthal world in western or southern Europe;
- To produce a dataset of cross-validated non- ^{14}C age determinations based on a range of sample materials (burnt stone, windblown sediment and volcanic tephra) from sites with relevant lithic industries in order to gain insight into whether deficiencies in the ^{14}C dataset for the late middle Palaeolithic beyond 30 ka cal BP are biasing the current temporal perception of Neanderthal site densities for this period;
- To make a dataset of cross-validated non- ^{14}C age determinations available from southern Russia, Crimea and the north Caucasus such that the middle Palaeolithic archaeology can be put in a wider European context thereby starting to address some of the current imbalances and thereby furthering integration of this field of study;
- To highlight a possible methodological problem that may be influencing current views of the degree of interaction between Neanderthal and anatomically modern human populations, for by underestimating the antiquity of some late Mousterian sites the present situation artificially increases the density of settlement in the period of Neanderthal and anatomically modern human co-existence, thereby biasing a realistic evaluation of inter-population interactions.

Depending on the outcome of this research there are a number of potential implications. If the findings suggest that many Mousterian sites currently thought to be contemporary with the earliest Aurignacian tool-using anatomically modern

humans are, in practice, older than the ^{14}C chronology is presently implying, then the probability of significant sapiens-Neanderthal interaction decreases. Against this though is the likelihood that the very earliest Aurignacian ^{14}C dates probably suffer the same chronometric difficulties as the Mousterian dataset does and so would also need upward revision. However, this is not the case with the later ^{14}C determinations (less than *c.* 30 ka BP) in that these do not exhibit the same degree of age underestimation due to the fact that the bias caused by small quantities of recent carbonaceous contamination rapidly diminishes as the quantity of surviving ^{14}C increases. The effect of this differential stretching of Mousterian and Aurignacian would be to displace the period of interspecies interaction to an older timeframe, possibly one associated with a warmer climate, thus raising the question of what would be the response if two similarly adapted hominids occupying similar areas and exploiting similar resources had to compete in deteriorating climate such as occurred in the second half of OIS-3. For these reasons this topic deserves investigation.

Methodology and Geographical Focus

It is axiomatic that a project that aims to investigate the climatic and environmental factors influencing Neanderthal adaptation must focus on a region where environmental factors are likely to have had a significant role on such groups. Furthermore, the chronometric methods to be applied should ideally be able to cover the time period in question, although it is also important to be able to relate new results from non- ^{14}C analyses to the existing overwhelmingly ^{14}C based chronological dataset. This can be achieved by exploiting cross-validation opportunities between methodologies through the adoption of multiple approaches to a range of materials where possible. This requires appropriate dating samples to be available that are well associated with archaeological and environmental evidence. Secondly, the inclusion of at least one currently well dated early Upper Palaeolithic site in the study will facilitate comparison between the new, mostly non- ^{14}C analyses on Mousterian sites, and the existing mostly ^{14}C chronologies that predominant on Upper Palaeolithic sites.

The selected study area for this EFCHED project is southern Russia, Crimea and the north Caucasus (**figure 3**). The reasons for choosing this area are that, firstly, during the Weichselian this region experienced the most continental climate of any in Neanderthal inhabited Europe (van Andel 2002, 5) and so should provide the most

appropriate data on the cold, or warm, adaptive preferences of Neanderthals⁶. Analysing the chronological and spatial distribution of Mousterian and transitional Palaeolithic sites in this region should elucidate the climatic preferences and tolerances of the hominids responsible for the material culture. Secondly, the region holds out the possibility of having the appropriate material for assembling a non-¹⁴C based chronology. For example, tephra of the Campanian Ignimbrite Y5 eruption (Fedele *et al.* 2003; Pyle *et al.* forthcoming) dating to *c.* 39.3 ka BP (Ar-Ar) has been reported in the Kostienki-Borshchevo region and from cores in the central southern Black Sea – therefore we hope to find it in other Pleistocene sequences situated between these localities. Multiple volcanic tephra horizons, probably deriving from Caucasian or Turkish eruptions, have been reported at one Middle Palaeolithic site (Myshtulagty Lagat) in northern Ossetia (Hidjrati *et al.* 2003) and may be present in other Pleistocene localities. A palaeomagnetic excursion has been identified at Kostienki 14 (Markina gora) in a lower stratigraphic position compared to the Y5 tephra (Gernik and Guskova 2002) – it is thought to equate to the Laschamp excursion that may be as early as *c.* 44-46 ka BP in age (Sinitsyn 2004). The same, or possibly a different magnetic event, is known from Biriuchya Balka 2 (Konstantinov region, Rostov district) (A. Matioukhine, personal communication) and such magnetic excursions may be present on other sites. Hence tephrochronology, argon-argon dating and magnetic palaeointensity studies, together with OSL of windblown sediments and TL of heated stones and hearths from cultural horizons may provide, in the course of this research, the construction of a complementary chronological framework independent of the ¹⁴C data for this time period.

A further benefit of choosing to undertake a study in this region is the potential to create a new suite of chronometric data for the north eastern Black Sea region thereby facilitating a better integration of the region with others in western Europe where the use of non-¹⁴C chronometric methods have been more commonly applied. Were this new research to show that many of the late Mousterian sites in southern Russia presently tentatively placed in the transitional and cold stages of OIS 3 (44-27 ka cal BP) really belonged in the earlier warm stage (58-44 ka cal BP), then the implications

⁶ We concede that the Black Sea littoral is not especially continental in its climate, although areas to the north of the Sea do experience continental conditions. What is likely is that the more distant sites to the littoral experienced a more continental climate than did areas of Neanderthal habitation in southern and western Europe. The relative scarcity of Mousterian sites in the Russian steppe away from the moderating influences of the Black Sea is perhaps indicative of the likely research outcome.

would be significant. Neanderthals could no longer be portrayed as being more cold-adapted than anatomically modern humans, the debate on the cause of their demise would be moved on, and the contrast with the subsequent Gravettian tool producers with their distinctive cultural package better suited to extreme cold climates is brought into sharper focus.

Proposed Programme of Investigation

There are several important requirements if the proposed research is to be successfully undertaken. Archaeologically the diagnostic characterisation of the lithic assemblages should ideally be such that the identification to a particular technocomplex is well understood. This derives, in part, from the extent of study to which the excavated material has been subjected to, but is also dependent on the size and nature of the assemblage; for example, small workshop assemblages with few diagnostic elements may be significantly more problematic in their assignment than larger, more culturally diagnostic ones. It could be argued that if an assemblage cannot be characterised, then the value of dating such a horizon is, at least in the context of this project, at best marginal. Additionally if the archaeological sites already had a ^{14}C chronology so much the better, since this would permit direct comparison, and perhaps cross-validation, with the non- ^{14}C chronometric methods, however the absence of existing ^{14}C dates is not an insuperable problem, since it may be possible to correct this situation by later dating of archived bone, antler and charcoal. The most vital aspect is access to ongoing excavations, since to apply the non- ^{14}C methods proposed here requires the existence of fresh sections or exposures for the collection of sample material. That said a permissible alternative would be to have access to preserved existing sections provided the existing published accounts can be related to the stratigraphic sequence observed in the field. Sites where hominid remains have been discovered must be a priority since these have the added bonus of the anthropology-archaeology linkage, although given the rarity of skeletal remains generally the expectation of meeting this condition is low. Geographical coverage across the study area, and the inclusion of a mixture of both open-air archaeological sites and rock shelters, are two other factors worthy of consideration since factoring in such variables allows for environmental and temporal patterning in the dataset.

A central element of EFCHED is the interest in past environments and climate, in addition to chronology, archaeology, and palaeoanthropology. The environmental

aspect will come, in part, from new analyses such as granulometry and magnetic palaeointensity, which the Project intends to undertake. But existing studies of the faunas and microfossils, primarily pollen and spores, will also be important. Because such work has often been undertaken on different parts of a site to that where the new studies will be undertaken, it is important to be clear as to the link between the new non- ^{14}C age determinations and the existing proxy climate records. For this reason the Project intends to take a parallel series of pollen samples together with the new dating samples in order to verify that the age-environment linkage has been correctly identified.

The archaeological sites selected for fieldwork and analysis fall within six broad geographical locations within the study area (**figure 3**): (1) the Kostienki-Borshchevo area (Voronezh region of the middle Don basin, Russia); (2) the Seversky Donetsk area (Konstantinov region, Rostov district, Russia); (3) the Gubs gorge area of the Kuban basin (Maikop region, Russia); (4) the Sochi area (Black Sea coast, Russia); (5) the central Caucasus republic of North Ossetia in the Russian Federation; (6) two groups of sites in the west and east of the Crimean peninsula (Ukraine).

Kostienki 14 (Markina gora) (Don river basin, Voronezh region): this Upper Palaeolithic site, one of many in the Kostienki-Borshchevo area, is primarily included in the study because as one of the most extensively dated early Upper Palaeolithic sites in Russia, it can provide control and cross-validation to our study. Possessing an large ^{14}C chronology (Sinitsyn and Praslov 1997, Sinitsyn *et al.* 2002a, 2002b), together with a confirmed Y5 tephra horizon and a magnetic excursion event linked to a lithic industry referred to as ‘Initial Upper Palaeolithic’ (Sinitsyn 2004), Kostienki 14 already shows the ^{14}C / non- ^{14}C age offset alluded to earlier in this paper. For example, charcoal associated with the Y5 tephra has a ^{14}C uncalibrated age of 32 420 +440 /-420 BP (GrA-18053) compared to the argon-argon age of 39,280 \pm 110 yr BP for the tephra (Fedele *et al.* 2003). As would be expected, once calibrated the age difference significantly reduces (c.37 ka cal BP vs. c.39.3 ka BP) but the underestimation by ^{14}C does not disappear (for discussion of the implications, see Pyle *et al.* forthcoming). As could be predicted the age offset increases as the age limit of ^{14}C is approached: for example, charcoal from layer “hs” (‘horizon in soil’) has given an uncalibrated ^{14}C age of 34 550 +610 /-560 BP (GrA-13297), which calibrates to c. 38.8 ka BP, compared to a magnetic excursion that may correlate with the Kargapolovo (=Blake?) (c.40-42 ka BP) or Laschamp (c.44-46 ka BP) event (Gernik and Guskova 2002). Whatever the situation as regards the true correlation, the basic trend is clear.

Biriuchya Balka 1a and 2 (Seversky Donetz basin, near the village of Kremenskoe Konstantinov region, Rostov district): two of at least eight open air workshop lithic production sites with late Mousterian, transitional and early Upper Palaeolithic assemblages that are being investigated by A.E. Matioukhine (1998, 1999, 2003). The most distinctive feature is the triangular bifacial point with concave Streletskia-Sungiriah bases. Biriuchya Balka is important to this study due to the fact that it is one of the few localities in the steppe region where Upper Palaeolithic material stratigraphically overlies Middle Palaeolithic. The presence of a magnetic excursion around 1190 cm in layer 11 (Middle Palaeolithic layer 5v) may possibly be the same as that reported from Kostienki 14 (Markina gora) although this is uncertain. We believe a thin Y5 tephra layer may be present but remains, as of yet, unrecognised and in the course of our research we wish to see if this hypothesised presence can be confirmed.

Kalitvenka 1 and 1v (Seversky Donetz basin, Kamenskoe region, Rostov district): two of a series of open air workshop sites excavated by A.E. Matioukhine (2003) from which have come a large number of cores and flakes relative to finished tools. In terms of industry the material is said to include the use of Levallois technique together with some bifacial and Middle Palaeolithic tool types. The mineralogy and coarse grain quartz sedimentology make these sites more suitable for OSL dating than most of the others in this study although the palaeo-environmental prospects are not favourable.

Myshtulagty Lagat Cave (North Central Caucasus, N Ossetia autonomous republic): on the flank of the north-central Caucasus mountains, this cave has over 22 vertical metres of deposits with at least 36 layers from the Lower Palaeolithic to the Medieval of which 23 strata are Middle Palaeolithic (Hidjrati *et al.* 2003). There are at least 10 volcanic layers intercalated with the cultural horizons in the lower part of the sequence. The middle Palaeolithic is extremely well represented. Given the scale of this site, the richness of the evidence and the time depth, Myshtulagty Lagat could easily absorb the entire resources of the Project for the potential is enormous. It is likely to remain the focus of research for many decades.

The following seven caves in the northern and western Caucasus of the Russian Federation can be investigated within this Project because although ongoing excavations are in progress, sampling is possible from existing sections once these have been re-exposed and cleaned:

Monasheskaya (Gubs river gorge, Kuban basin, North Caucasus): a well-investigated site that has been examined by excavation on many occasions (Liubin and Autlev 1961-64, 1975-76, Beliaeva and Liubin 1987-88, 1990-91). The sequence (~0.7 to 1.70 m) consists

of three Mousterian layers. Lithics are abundant (>40,000 items) and belong to a single industry (local variant of Typical Mousterian with Micoquian influence) (Beliaeva 1999). Faunal and palynology indicates ~3 cycles of warming and cooling. The uppermost Mousterian layer, containing fossil hominid remains, formed in cold and dry conditions, which, according to the pollen, may correspond to the end of OIS-3. Underlying this are burnt bones and burnt flint. Poor bone preservation precluded successful ^{14}C dating (what ages have been made are much too young). This site represents a difficult dating proposition with regards to OSL, but it is worth attempting due to the large well-studied archaeological assemblage and the interesting environmental evidence.

Gubskiy N 1 (Gubs river gorge, Kuban basin, North Caucasus): thickness of deposits is similar to that of Monasheskaya but the stratigraphic sequence is different, despite close proximity to the aforementioned site. Includes three thin Mousterian layers and overlying Upper Palaeolithic material (Liubin *et al.* 1973). Relatively small lithics collection, but the industry is characteristically similar in form to the aforementioned site. A palynological study by G.M. Levkovskaya suggests that use of the Gubs N1 rock shelter was contemporary with the uppermost Middle Palaeolithic level of Monasheskaya.

Barakaevskaya (Gubs river, gorge, Kuban basin, North Caucasus): this cave has a single thin Mousterian layer (0.25-0.3 m), which yielded more than 21,000 lithics and numerous animal bones (Liubin 1998). A mandible of a Neanderthal child comes from the site (Liubin *et al.* 1986). The industry is very similar to that from Monasheskaya and Gubskiy, i.e. Typical micro-Mousterian with Micoquian influence (Liubin 1998) although perhaps slightly older. In spite of the thinness of the sedimentary sequence many climatic changes (from sub-alpine to broad-leaved tree vegetation) were recorded in terms of the palynological record analysed by G.M. Levkovskaya.

Malaya Vorontsovskaya (Black Sea coast, Sochi region, Krasnodar district): this site has undergone excavation on many occasions: by D.A. Krainov in 1940, L.N. Soloviev in 1950-51, V.P. Liubin in 1964-65, V.M. Muratov in 1965, D.A. Tchistyakov in 1983-84 and 1986 (Tchistiakov 1996). The stratigraphic sequence at this cave is c.1 m thick and there are 7 layers containing the same Middle Palaeolithic industry (~3,500 items) although there seems to be some doubt as to whether it is “Typical Mousterian” or “Denticulate Mousterian” (Liubin 1989, Tchistiakov 1996). Biostratigraphic palynological data (M.N. Klapchuk in 1965, G.M. Levkovskaya in 1983-84) indicate repeated environmental change, from broad-leaved forest to sub-alpine vegetation. There is only one ^{14}C determination from a Mousterian horizon, and this was obtained on burnt bone from layer 3 ($35\,680 \pm 480$ uncal ^{14}C years BP, GR-6031), however to what extent this age can be taken as being representative of the Middle Palaeolithic as a whole is unclear.

Navalishenskaya (Black Sea coast, Sochi region, Krasnodar district): the stratigraphic sequence is 1.65-2.5 m in thickness although the Middle Paleolithic is only ~1 m thick and consists of three thin Upper Palaeolithic and three thin Mousterian layers (Liubin 1989, Tchistiakov 1996). The industry is small and impoverished (~75 tools) perhaps indicating a short-term hunting camp and may represent the “Denticulate Mousterian”. According to pollen studies undertaken by M.N. Klapchuk V.P. Grickuk and Z.P. Gubonina, in the Mousterian period the climate changed from cool (predominance of coniferous trees) to warmer and moister, before becoming warm and dry, prior to a major climatic downturn coinciding with the Upper Palaeolithic (Tchistiakov 1996). In terms of fauna cave bear dominate the sequence. Currently no absolute age determinations have been reported.

Kepshinskaya (Black Sea coast, Sochi region, Krasnodar district): a ‘through’ gallery cave with a single Mousterian layer of 1.0-1.2 m in thickness that was excavated by V.P. Liubin in 1966 and 1967 (Liubin 1989). The lithics in layer 3 were very few in number (~30) but said to be characteristic of a “Typical Mousterian” industry. Both palynological and faunal data indicate very cold (alpine-sub-alpine) glacial conditions. No absolute dates are known from the site.

Akhshtyr [Akhshtyrskaya] (Black Sea coast, Sochi region, Krasnodar district): an extensively investigated, and complex, karst cave that has been investigated by different researchers on a number of occasions (M.Z. Panichkin in 1936, S.N. Zamyatnin in 1937-38, Panichkina and E.A. Velilova in 1961, Velikova alone in 1962-63 and 1965, and in 1978) – summarised in Liubin (1989, Tchistiakov 1996). The five Mousterian layers have yielded ~3600 lithic finds, however the presence of typologically Late Acheulian finds from the lowest Middle Palaeolithic horizon points to, potentially, a much longer time range to this site than the other, so far mentioned, north western Caucasian sites. The presence of human skeletal remains in the transitional layers 3 and 3a would normally make dating especially desirable, but the mixed stone tool association, and the combination of archaic and modern traits to the skeletal remains, in the context of this project makes the resulting outcome less meaningful. The eroded and possibly re-deposited nature of some of the deposits suggests OSL dating will prove to be especially difficult and/or problematic.

The following four sites in the Crimea are either currently under investigation by a joint Ukrainian-German team led by V.P. Chabai and J. Richter, or can be sampled as preserved sections remain accessible:

Kabazi II (Crimea): one of five excavated sites located on a steep mid slope beneath a limestone plateau above the Alma river valley (Chabai 1998, 2004). Three separate typologically different industries have been recorded at Kabazi II. Units II and IIA contain

tools attributable to the Western Crimean Mousterian industry (Chabai, 2000, 2004b), which could be said to form part of the Levallois-Mousterian *sensu lato*; Units IIA, III, V and VI contain tools believed to belong to the Ak-Kaya facies of the Crimean Micoquian (Chabai 2004b); whilst tools from Unit IV have been tentatively compared to the Kiik-Koba (lower layer) facies of the Crimean Micoquian (Chabai 1998, 1999). Near the base of the sequence is a well-defined fossil soil belonging to the Mikulino (=Eemian) interglacial (Chabai 1998, Gerasimenko 1999). A ^{14}C chronology exists for cultural layers II/1 to II/5, with ages in the *c.*31-35 uncal ^{14}C years BP time range (Hedges *et al.* 1996). Rink *et al.* (1998) report a number of ESR dates from Kabazi II, whilst McKinney (1998) present U-series ages. The biostratigraphic context, including both faunal and palynological studies, has been well investigated (see, in particular, Gerasimenko 1998) and it is this, linked to the very long (~12 vertical metres) sedimentary sequence covering almost 100 ka years (*c.*130-30 ka BP), that makes the site so appealing in terms of the EFCHED remit. The main issue on this site in terms of this Project will be the degree to which the sediments are susceptible to OSL measurement.

Kabazi V (Crimea): this buried rock shelter site is situated approximately 400 m from Kabazi II under a limestone cliff near the top of the slope on the west-facing slope of the Alma river valley in the western Crimea (Yevtushenko 1998). A series of four Middle Palaeolithic cultural horizons (subsequently subdivided and then grouped into complexes – Yevtushenko 1998, 279-80) were discovered including a number of individual *insitu* living floors with traces of fireplaces and concentrations of flints and bones but also some mixed deposits the result of hill wash disturbance. Typologically the industry has been classified as belonging to an early stage of the Staroselian facies of the Crimean Mousterian (Yevtushenko 1998, 284-5). Within our EFCHED project due to the presence of heated stones this site has considerable potential for dating by TL. The OSL prospects are poor due to the nature of the sediment supply that seems (according to C. R. Ferring, in Yevtushenko 1998, 279-279) to mostly derive from weathering of the limestone bedrock.

Sary-Kaya (Crimea): this is an open-air site situated in a lower slope position below a limestone plateau in the eastern Crimea. First discovered by Yu.G. Kolosov, excavations revealed 5 cultural horizons – 4 associated with a fossil soil, the fifth being situated stratigraphically beneath the soil – and approximately ~300 lithic tools (Kolosov *et al.* 1993). These are said to typologically resemble the Ak-Kaya facies of the Micoquian (Chabai 2004b). No absolute dates are currently available.

Karabai (Crimea): first discovered in 2004 this lower slope open-air colluvial site is situated in the eastern Crimea and is actively under excavation by A.I. Yevtushenko and V.P. Chabai. It is believed at least five Middle Palaeolithic archaeological layers may be

present, although given the recent discovery of the site a considerable amount of investigation is required before these more conclusive observations can be reported. No absolute dates are available.

Summary and Conclusions

As already stated, the aim of the new Project is to investigate whether the present chronological data for late Mousterian sites in Europe are biasing our perception of Neanderthal populations by making them appear as more cold adapted than the incoming anatomically modern humans. Geographically the research focus is on the part of the Neanderthal world that may have experienced the most continental climatic environments, i.e. European Russia and the Ukraine north and east of the Black Sea, since it may be from such a region that the environmental preferences and tolerances of Neanderthal populations will be best discernible. By applying a range of cross-validated non-¹⁴C chronological methodologies (optically stimulated luminescence [OSL], thermoluminescence [TL], magnetic palaeo-intensity, tephrochronology and argon-argon [Ar-Ar]) to a series of late middle Palaeolithic assemblages the new research project aims to identify spatial and temporal patterning which, when correlated with local environmental proxies and wider climate data, should permit a better understanding of Neanderthal environmental preferences. Fieldwork commenced in 2004 and subsequent laboratory investigation of material from the aforementioned sites may allow more conclusive observations to be made – one could say only time will tell.

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List of Illustrations and Captions

Figure 1: Diagram showing the three main elements to the EFCHED initiative (human evolution and dispersal, cultural change and past climate change). It is the aim of the programme to investigate the interplay of these three factors over time in the late Pleistocene period (figure taken from NERC EFCHED programme)

Figure 2: Diagram showing the Greenland GISP2 ice-core climate record for the period between 10-110 cal ka BP and the number of absolute dated (all methods) Mousterian archaeological assemblages in Europe (based on data in the Stage 3 Project chrono-archaeological database [van Andel *et al.* 2003]). The heart of the new project is the hypothesis that the decline in the number of dated Mousterian assemblages around 50 cal ka BP is incorrect, and that it can be explained by an age underestimation by the ^{14}C method in the period beyond c.30 cal ka BP.

Figure 3: Map of the lands bordering the north eastern part of the Black Sea showing the location of the proposed Middle and early Upper Palaeolithic archaeological sites that are included in this research project.

