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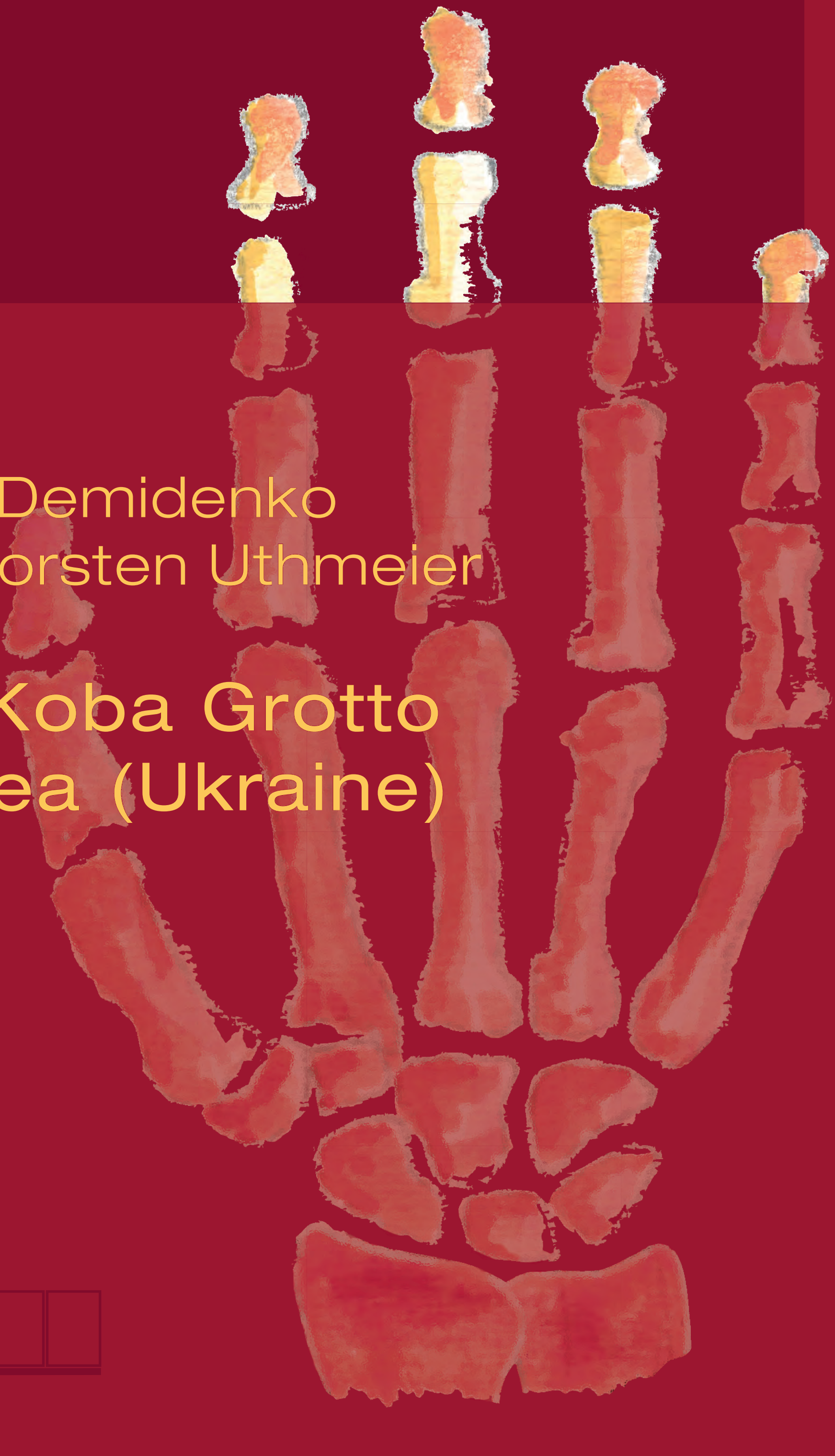

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Kiik-Koba Grotto
Crimea (Ukraine)

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KIIK-KOBA GROTTO, CRIMEA (UKRAINE)

RE-ANALYSIS OF A KEY SITE OF THE CRIMEAN MICOQUIAN

with contributions by

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CONTENTS

PREFACE

This book is an offshoot of the international Ukrainian-German research programme on „Functional Variability in the Late Middle Palaeolithic of Crimea Peninsula, Ukraine“ which was undertaken by the Crimean Branch of the Ukrainian Academy of Science and by the University of Cologne. The German Research Foundation (DFG) has financed this programme for many years (RI 936/3). Further, as the results of the work on Kiik-Koba relate directly to the topic of the new CRC 806 "Our Way to Europe", the editorial work of the present book has been completed under the auspicies of this Collaborative Research Centre (again granted by the DFG).

The main effort of the "Functional Variability" programme was devoted to new excavations at Kabazi II and Kabazi V in the Alma Valley, at Karabi Tamchin in the Crimean Mountains, at Chokourcha Shelter near Simferopol, and at Kara-Bey close to the famous Ak-Kaya Mountain. All these excavations were then published without delay in our Simferopol-Cologne series of Monographs, as well as in a number of contributions and articles (see www.uni-koeln.de/fast).

At the same time, members of our team conducted parallel analyses of important assemblages from earlier excavations, such as Starosele in the West, and Buran-Kaya and Kiik-Koba in Eastern Crimea. Kiik-Koba Grotto became famous for its Neanderthal burials, brilliantly published as part of G.A. Bonch-Osmolowski's excavation report. Especially the hands of the Neanderthals were well preserved, and Bonch-Osmolowski presented the data on the hands with a detailed comparison of all available information on Neanderthal hands available at the time.

For us, the close relationship visible between the lithic assemblages from the principal Middle Palaeolithic layer of Kiik-Koba and layer B of Buran-Kaya, only 8 km distant, was most important and gave reason for a detailed re-analysis of the Kiik-Koba material in the store rooms of the St.-Petersburg Kunstkamera, which now culminates in the publication of the present volume.

I would like to thank all participating authors, all colleagues who contributed data and information, and particularly our editorial team, Dr. Ursula Tegtmeier (coordination and proofreading), Lutz Hermsdorf-Knauth (artwork), Hartwig H. Schluse (cover layout) and Rebecca Miller (language editing).

Cologne, April 2013

Jürgen Richter
series editor

VIII KIIK-KOBA GROTTO, MICOQUIAN LAYER IV RE-ANALYSES: AN OVERVIEW

Yuri E. Demidenko and Thorsten Uthmeier

In this chapter, the various approaches presented in the previous chapters for detailed analyses of the flint and bone artefacts and faunal assemblage from Kiik-Koba Grotto, Micoquian Layer IV, are combined to give an overall picture of the data. At the same time, there are some definite differences in lithic analyses carried out in Chapters IV and V. Here, we present a discussion of all shared and divergent points of view. As previously done for Buran-Kaya III Cave, layer B, the "principle of complementarity" will be applied, in which one analysis adds to another. This is followed by a discussion of the general and unique aspects of the sites with Crimean Micoquian Kiik-Koba industries.

THE GEOCHRONOLOGICAL POSITION OF LAYER IV

In the past, the geochronological position of Kiik-Koba Grotto, Micoquian Layer IV, was suggested to be related either to a Stadial in between Moershoofd and Hengelo Interstadials or to a Stadial preceding the Arcy Interstadial (Demidenko 2004a, 20). Our own attempts to receive reliable radiometric dates for this layer by AMS dating of bone samples were not successful. One sample failed, while the other, dated to 25,790 ± 220 BP (OxA-16841), had a content of collagen that was below the usual threshold. Therefore, this date was regarded to underestimate the real age of Layer IV. A recently published radiocarbon date of 32,300 ± 300 BP (Ki-8163) on a bone sample from "sq. 96, 34" from Kiik-Koba Grotto, lithological layer IV (Stepanchuk 2006, 250) is problematic as well. The label on the bone itself does not allow for a distinction from which of the two squares the sample originates. However, this is of crucial importance, because square 34 is situated in the centre of the find scatter, while square 96 is situated in a lateral area of the slope terrace where finds of Layer IV are rare and presumably redeposited. Therefore, the absolute dates at hand have to be treated with caution.

TECHNO-TYPOLOGICAL ANALYSIS

The analyses of Yu. E. Demidenko clearly show the relation of the Kiik-Koba Grotto Layer IV lithic assemblage to this industry. If V. P. Chabai's tripartite tool structure pattern for explaining the typological variability observed in Crimean Micoquian industries – simple unifacial tools, convergent unifacial tools and internal subdivision of identifiable bifacial tools – is taken as a basic feature for comparison, the following structure for Kiik-Koba Layer IV can be seen: simple unifacial – 30.4 %, convergent unifacial – 54.1 %, bifacial – 15.5 %. Before this pattern was established for Kiik-Koba industry type assemblages, the following parameters had been identified: simple unifacial – 21.5–37 %, convergent unifacial – 51.9–56.2 %, bifacial – 11.1–14.3 % (Chabai et al. 2000, Tab. 10). Moreover, after the recent analysis of the Kiik-Koba industry type assemblage from Buran-Kaya III, layer B (e.g., Demidenko 2004b; 2004c), it is especially interesting to compare it with the new Kiik-Koba Grotto data. The Buran-Kaya III tripartite tool structure is similar to Kiik-Koba, but with a higher percentage of simple unifacial tools (38 %) and somewhat fewer convergent unifacial and bifacial tools (51.2 % and 10.8 %, respectively) (Demidenko 2004b, 64). According to our interpretations (Chabai 2004; Demidenko 2004c; 2004d), this pattern may reflect a slightly higher degree of intensive tool reduction carried out by Neanderthals at Kiik-Koba than at Buran-Kaya III, taking into account the differences between simple and convergent unifacial tools for the two assemblages.

Other typological data recorded and tool reduction models established for the two assemblages (Demidenko 2004b; in Chapter IV, this volume) add more details for understanding of their differences and similarities.

The internal structure of Buran-Kaya III unifacial scrapers, with frequencies calculated for unifacial scrapers (n = 164) and for complete scrapers only (n = 108), is as follows: simple lateral – 30.5 % and 26.8 %, transverse – 20.1 % and 24.1 %, double – 9.8 % and 3.7 %, convergent – 39.6 % and 45.4 %. These can be compared to the Kiik-Koba unifacial scrapers (n = 136 with 107 complete): simple lateral – 35.3 % and 34.6 %, transverse – 16.9 % and 15.9 %, double – 8.1 % and 6.5 %, convergent – 39.7 % and 43.0 %. Differences in percentages are statistically significant only for simple and transverse scrapers. The higher value of simple lateral scrapers at Kiik-Koba may be explained by the manufacture of many on large-sized chips (54.1 %) and thin flakes, and thus unsuitable for further reduction. Their higher presence led to a lower proportion of transverse scrapers at Kiik-Koba. The supposedly most heavily reduced convergent items have nearly identical percentages at the two sites. Thus, the increased presence of simple lateral scrapers at Kiik-Koba can be understood not as a lesser degree in tool reduction intensity, but rather as the selection of many small and/or thin pieces for tool production due to the lack of flint. Considered in this way, a relationship between flint availability or abundance and intensity of use at Kiik-Koba can be discerned. It is important to note that Th. Uthmeier also explains the small size of simple unifacial tools as due to the fact that they are made on flakes from facial retouch that do not allow long reduction sequences (Chapter V). He concludes: "The limited dimension of blanks for unifacial tools resolves the ostensible contradiction between intense use of raw material on the one hand and a high percentage of simple side scrapers on the other hand"(ibid.).

The internal typological structures of unifacial scrapers at Buran-Kaya III and Kiik-Koba show a very similar dominance of all "simple" scraper types (simple lateral, transverse and double) over convergent scrapers (calculated for all scrapers and for complete only): 1.5 : 1 for all scrapers and 1.2 : 1 for complete scrapers at Buran-Kaya III; 1.52 : 1 and 1.33 : 1 for Kiik-Koba.

Comparative analyses of the Buran-Kaya III and Kiik-Koba convergent unifacial tools (convergent scrapers and points) show the general prevalence of points over convergent scrapers for both samples, but with some differences. The internal structure of convergent unifacial tools at Buran-Kaya III (all 149 specimens, including tiny tips) is as follows: 56.4 % points and 43.6 % convergent scrapers, whereas the Kiik-Koba convergent unifacial tools (all 152 specimens, including tiny tips) show a higher occurrence of points (64.5 %) and thus a lesser occurrence of convergent scrapers (35.5 %). The higher occurrence of points among convergent unifacial tools may also serve as another indicator of multiple phases of treatment of tools. The same is also related to straight percentage comparisons between all convergent unifacial tools and all "simple" unifacial scrapers at Buran-Kaya III and Kiik-Koba. Buran-Kaya III shows a 1.5 : 1 ratio of convergent unifacial tools (149 pieces) over "simple" unifacial scrapers (99 pieces). However, at Kiik-Koba, the ratio is much higher: 1.85 : 1, with 152 convergent unifacial tools and 82 "simple" unifacial scrapers.

There are striking similarities between convergent scrapers and definite differences for points according to shape of convergent unifacial tools at Buran-Kaya III and Kiik-Koba. On one hand, convergent scrapers from both sites have the same basic shape types: trapezoidal – 59.2 % and 54.3 %, triangular – 18.4 % and 17.4 %, crescent – 14.3 % and 10.9 %, for Buran-Kaya III and Kiik-Koba respectively, except for leaf shaped tools that are well-represented at Kiik-Koba (13.1 %), but rare at Buran-Kaya III (4.1 %). On the other hand, the point shapes are almost entirely different between the two sites. While the Kiik-Koba point shapes are very similar to those for convergent scrapers (trapezoidal – 56.3 %, triangular – 18.8 %, leaf shaped – 13.7 %, crescent – 8.7 %), with the addition of a few hook-like items (2.5 %), the shapes of Buran-Kaya III points are very different from convergent scrapers. It is worth noting that no point shape type reaches 50 % of all points. Trapezoidal (34.5 %) and leaf shaped (27.6 %) types dominate, with a moderate number for triangular (13.8 %), crescent (12.1 %) and hook-like (10.3 %) points. Such a "restructure" of shape type for Buran-Kaya points in comparison to convergent scrapers occurred due to the considerable increase in leaf shaped items and the appearance of hook-like points, unknown for convergent scrapers. Thus, there are some clear differences between Buran-Kaya III and Kiik-Koba point shape types that may reflect variability in their final secondary treatment.

Additional studies of the unifacial tools from Buran-Kaya III and Kiik-Koba were conducted to describe possible reduction sequences for their different classes and types. The Buran-Kaya III sample was composed of 195 unifacial tools: 29 complete simple lateral scrapers, 33 transverse scrapers (all), 16 double scrapers (all), 49 complete convergent scrapers, 58 complete points, 7 complete denticulates and 3 complete perforators. The Kiik-Koba sample was composed of 212 unifacial tools: 48 complete simple lateral scrapers, 23 transverse scrapers (all), 11 double scrapers (all), 46 complete convergent scrapers, 80 complete points, 3 complete denticulates and 1 complete perforator. The results obtained are strikingly similar. Retouch and angle types, size (length, width, thickness), subdivision of tool blanks into two categories (pieces with shortened, transversal proportions – L < W, and pieces with "regular" elongated proportions – L > W) and accommodation elements present (thinning and natural backing) were used to examine the two samples. Both show clear evidence of the same reduction sequences. The basic trend is as follows: "simple" types (simple lateral and transverse scrapers) – "convergent" types (convergent scrapers and points) – denticulates and perforators. Double scrapers are not present in the trend as they appear to be *ad hoc* occasional tools, a sort of "double simple lateral scraper". A possible reduction stage to produce double scrapers is actually missing between "simple" and "convergent" tool types. Instead, the following main secondary treatment pattern can be observed: retouching of lateral (a simple lateral scraper) and distal (a transverse scraper) edges of a blank creating a "semi-convergent" scraper, usually with semi-trapezoidal or elongated semi-trapezoidal shape. This sort of "initial semi-convergent unifacial tool type" served as a basis for further modification into various trapezoidal, leaf shaped, triangular, crescent and hook-like types and sub-types of scrapers, points, denticulates and perforators.

The main trend for secondary reduction processes of unifacial tools is, of course, not strictly one-way, such that many "simple" types dropped out. Studying the size of tools and unretouched debitage products, a pattern for the production of the most heavily reduced tools ("convergent" types, including convergent denticulates and perforators) on the largest debitage pieces, has also been observed. The key metric parameter was blank thickness, enabling multiple retouching and rejuvenation phases. Also, the presence of many flakes and large-sized chips with shortened, transversal proportions led to the construction of two models for the reduction sequence of unifacial tools.

The first model is based on the use of "regular" debitage pieces (L > W) and has two variants: 1) simple straight and convex scrapers – sub-triangular/semi-crescent scrapers and points – triangular/sub-crescent and crescent/leaf shaped/hook-like scrapers and points; and 2) simple/transverse scrapers – elongated semi-trapezoidal scrapers and points – semi-crescent scrapers and points – sub-crescent and crescent scrapers and points/hook-like points.

The second model uses debitage pieces with shortened, transversal proportions (L < W) and has one basic secondary treatment sequence: simple/transverse scrapers – semi-trapezoidal scrapers, points and denticulates – sub-trapezoidal and trapezoidal/leaf shaped scrapers, points, denticulates and perforators and/or sub-crescent and crescent/triangular scrapers and points – hook-like points.

Some observed differences between Buran-Kaya III and Kiik-Koba unifacial tools are related to blank form, with emphasis on chip occurrence.

The 29 complete simple lateral scrapers from Buran-Kaya III include only 6 chip blanks (20.7 %), while the 37 complete simple lateral scrapers from Kiik-Koba include 20 chip blanks (54.1 %), around 2.5 times higher.

The 26 complete transverse scrapers from Buran-Kaya III include only 3 chip blanks (11.5 %), while 8 (47.1 %) of the 17 complete transverse scrapers from Kiik-Koba were made on chip blanks, around four times higher.

Double scrapers reflect an even higher difference in selection of chip blanks: 1 chip blank (25 %) of 4 complete scrapers from Buran-Kaya III and 4 (57.1 %) of 7 complete scrapers from Kiik-Koba. Only 5 chip blanks (10.2 %) are present for the 49 complete convergent scrapers from Buran-Kaya III and 23 chip blanks (50 %) of 46 complete convergent scrapers for Kiik-Koba, again four times higher.

The 58 complete points from Buran-Kaya III include 6 chip blanks (10.3 %) and the 80 complete points from Kiik-Koba include 30 (37.5 %) chip blanks, a difference of more than 3.5 times higher.

The 7 complete denticulates from Buran-Kaya III include only a single chip blank (14.3 %), and only 1 of 3 complete Kiik-Koba denticulates is also a chip, but proportionally with a higher representation (33.3 %).

The presence of only 3 perforators at Buran-Kaya III and a single perforator from Kiik-Koba prevents blank observations.

Thus, when we directly compared the Buran-Kaya III and Kiik-Koba unifacial tool blank data for the occurrence of chips, a striking difference is observed. At Buran-Kaya III, chip blanks account for 10 to 20–25 % of the tools. In contrast, at Kiik-Koba, the percentage of chip blanks is much higher with, however, a twofold subdivision. The higher chip ranks (47–57 %) are related to different scraper types (simple, transverse, double and convergent). The lower chip ranks (37.5 and 33.3 %) are for points and denticulates. This observation may be explained by advance planning by knappers, initially selecting larger and thicker blanks for tools that are expected to be more heavily retouched.

Two more important observations can be made from the unifacial tool reduction models and chip blank data for the unifacial tools. First, many convergent scrapers and especially points in assemblages of Kiik-Koba industry type are associated with more intensive flint treatment and rejuvenation processes, also caused by the long distance between sites and high quality flint outcrops. Accordingly, we cannot state that the prevalence of convergent tools over "simple" tool types is a culturally determined feature for Crimean Middle Palaeolithic assemblages. In addition, the higher percentage of "convergent" over "simple" tools in the Kiik-Koba unifacial tools (1.85 : 1) in comparison to that at Buran-Kaya III (1.5 : 1) once again underlines longer distances from Kiik-Koba to high quality flint sources and/or longer times of activity (as supposed by Uthmeier in Chapter V), resulting in an even slightly more intensive flint exploitation at Kiik-Koba than observed at Buran-Kaya III. Second, the fact that nearly half of all unifacial tool blanks are chips indicates two notions. We cannot state that all unifacial tools on chip blanks were initially produced on proper chips, as obviously some of the tools have undergone serious retouching leading to overall decrease in size. But the appearance of 47–57 % of chip blanks among "simple" scraper types once again strengthens the hypothesis of Uthmeier in Chapter

V that "simple" unifacial tools are present in greater numbers in the Kiik-Koba tool-kit because Neanderthals had to use imported flint objects much more intensively, thus selecting more chips as blanks for unifacial tool manufacture. This also explains why the highest percentage of chip blanks is found for "simple" types – further retouch of such tools was not planned, the tools instead used for *ad hoc*/daily needs.

Continuing with the comparison of Buran-Kaya III and Kiik-Koba, we now address variability in bifacial tools. At Buran-Kaya III, 23 complete and/or re-utilized bifacial tools form six groups: a preform (4.3 %), 3 single-edged scrapers (13.1 %), a double scraper (4.3 %), 5 convergent scrapers (21.7 %), 11 points (47.9 %) and 2 denticulates (8.7 %). At Kiik-Koba, 38 complete and/or re-utilized bifacial tools show much less variability, with the notable absence of preforms and double scrapers: 2 single-edged scrapers (5.3 %), 14 convergent scrapers (36.8 %), 21 points (55.3 %) and a denticulate (2.6 %). At the same time, the Kiik-Koba bifacial tools show the dominance of points, but also a fairly high percentage of convergent pieces, together totalling 92.1 % of the tool-kit. The Crimean "tool reduction rule" – the higher the convergent tool index, the higher the intensity of tool retreatment for the tool-kit – seems to apply here as well, showing a higher level of intensity for the Kiik-Koba bifacial tools in comparison to Buran-Kaya III. Moreover, it does not appear to be accidental that all Kiik-Koba bifacial tool groups are smaller in size than the Buran-Kaya III bifacial tool groups. Metric data for bifacial tools are as follows: Kiik-Koba single-edged scrapers are 3.90 cm long, 2.00 cm wide, 1.05 cm thick and Buran-Kaya III single-edged scrapers are 4.17 cm long, 3.13 cm wide, 1.33 cm thick; Kiik-Koba convergent scrapers are 3.60 cm long, 2.81 cm wide, 1.08 cm thick and Buran-Kaya III convergent scrapers are 3.84 cm long, 2.86 cm wide, 1.10 cm thick; Kiik-Koba points are 3.50 cm long, 2.75 cm wide, 0.98 cm thick and Buran-Kaya III points are 4.13 cm long, 3.05 cm wide, 1.03 cm thick; the single Kiik-Koba denticulate is 1.4 cm long, 2.3 cm wide, 0.7 cm thick and the single Buran-Kaya III denticulate is 2.5 cm long, 3.0 cm wide, 0.95 cm thick. Thus, apart from more intensive treatment of unifacial tools at Kiik-Koba, the same is also true for the Kiik-Koba bifacial tools with all comparisons to the Buran-Kaya III unifacial and bifacial tools. At the same time, it is worth recalling that bifacial tool reduction is acknowledged as more intensive than that of unifacial tool reduction for both sites.

Finally, regarding the unifacial and bifacial tool reduction and rejuvenation processes at the two sites, it is worth examining the by-products of these processes, which serve to some extent as indicators of intensity of multiple phases of secondary treatment processes of tools. Below are represented the results for large-sized chips (>1.5–2.9 cm) for Buran-Kaya III (n = 4817) and Kiik-Koba (n = 1478). Five types with 9 sub-types were identified for these chips:

1 Bifacial tool treatment chips: Buran-Kaya III – 104 items/3.4 %; Kiik-Koba – 50 items/4.7 %.
1A Bifacial initial treatment chips: Buran-Kaya III – 39 items/1.3 %; Kiik-Koba – 14 items/1.3 %.
1B Bifacial shaping/thinning chips from rejuvenation processes of upper "convex" surface of bifacial "plano-convex" tools: Buran-Kaya III – 65 items/2.1 %; Kiik-Koba – 36 items/3.4 %.

2 Retouch chips of both bifacial and unifacial tools: Buran-Kaya III – 1 395 items/45.5 %; Kiik-Koba – 532 items/50.3 %.
2A Common retouch chips: Buran-Kaya III – 1294 items/42.2 %; Kiik-Koba – 495 items/46.7 %.
2B Retouch chips from fine re-sharpening of lateral edges: Buran-Kaya III – 65 items/2.1 %; Kiik-Koba – 21 items/2.0 %.
2C Retouch chips from radical re-sharpening of lateral edges: Buran-Kaya III – 20 items/0.7 %; Kiik-Koba – 8 items/0.8 %.
2D "Janus/Kombewa" chips from basal and terminal ventral thinning of unifacial tools: Buran-Kaya III – 16 items/0.5 %; Kiik-Koba – 5 items/0.5 %.
2E Pseudo-Prondnik spalls: Buran-Kaya III – 0; Kiik-Koba – 3 items/0.3 %.

3 Rejuvenation chips of unifacial and bifacial convergent tools' tips: Buran-Kaya III – 134 items/4.4 %; Kiik-Koba – 47 items/4.5 %.
3A Rejuvenation chips from unifacial convergent tool tips: Buran-Kaya III – 88 items/2.9 %; Kiik-Koba – 22 items/2.1 %.
3B Rejuvenation chips from bifacial convergent tool tips: Buran-Kaya III – 46 items/1.5 %; Kiik-Koba – 25 items/2.4 %.

4 "Regular" chips (from any possible reduction, including core reduction): Buran-Kaya – 1433 items/46.7 %; Kiik-Koba – 429 items/40.5 %.

5 Undiagnostic chips: Buran-Kaya III – 1885 items/–; Kiik-Koba – 420 items/–.

The large-sized chip data clearly point out near equal tool reduction intensity "signs" for the two sites, or slightly higher for Kiik-Koba. However, the different proportions of chip occurrence are not sufficient to understand the different secondary treatment and retreatment processes of tools. A more accurate method is to compare the number of specific chip sub-types with the tool types from which the chips were highly likely detached. Sub-types “3A” and “3B” are the most pertinent for such analysis as they are associated with rejuvenation of unifacial and bifacial convergent tools, which are themselves considered as one of the most reduced tools. In this regard, the Buran-Kaya data show much more evidence of rejuvenation: 142 unifacial convergent tools *versus* 88 rejuvenation chips (sub-type “3A”) – a ratio of 1.6 : 1; 23 bifacial convergent tools *versus* 46 rejuvenation chips (sub-type “3B”) – a ratio of 0.5 : 1. For Kiik-Koba: 149 unifacial convergent tools *versus* 22 rejuvenation chips (sub-type “3A”) – a ratio of 6.8 : 1; 40 bifacial convergent tools *versus* 25 rejuvenation chips (sub-type “3B”) – a ratio of 1.6 : 1. The first important inference from these tool-to-chip correlations is that both sites show higher reduction intensity for bifacial tools than for unifacial ones. But why are the Kiik-Koba correlations less, when, by all other indications, tool intensity is higher for Kiik-Koba than Buran-Kaya III?

There are two possible explanations here. First, keeping in mind that Bonch-Osmolowski did not use different sized screens for dry sieving during the 1920s excavations at Kiik-Koba, he partially screened sediments of lithological layers IV and VI, which was an unusual practice for that time in Palaeolithic archaeology. This would have led to the loss of some of these specific chips during excavation. Second, the use of a special reshaping technique, well-defined by Uthmeier (Chapter V: “technique 2”), may also play a role: lateral reshaping of some Kiik-Koba surface shaped tools, which was also recorded by Demidenko for chip sub-types “2B” and “2C” at both Buran-Kaya III and Kiik-Koba. The more important aspect is that Uthmeier observed this reshaping technique for more Kiik-Koba surface shaped tools than for such tools at Buran-Kaya III. Combining the two explanations, we may further suppose some differences between bifacial processes and some heavily retouched unifacial tools rejuvenation processes in the Buran-Kaya III and Kiik-Koba assemblages.

But there may be an additional explanation related to bone retouchers. Strangely enough, not a single bone retoucher was discovered in the Buran-Kaya III, layer B fauna after the 1996 and 2001 excavations. This is quite unusual, given that Crimean Micoquian assemblages contain at least a few bone retouchers. In contrast, the Kiik-Koba Upper layer is famous not only for the numerous bone retouchers found, but also for the fact that these pieces were recognized and identified as retouchers for the first time in Palaeolithic archaeology by Bonch-Osmolowski. He identified 50 bone retouchers at Kiik-Koba: 44 in lithological layer IV, 5 in lithological layer III and a single item in lithological layer II (BONCH-OSMOLOWSKI 1940, 116–123). Specific analysis of the bone retouchers by G. A. Khlopachev (Chapter VI) has increased the collection to 71 items. Most originate from lithological layer IV/*in situ* position of the Kiik-Koba Upper layer (n = 58). The other 13 retouchers were found throughout the sequence: layer II – 3 pieces, layer III – 6 pieces, layer V – 1 piece, layer VI – 3 pieces. Khlopachev also suggested that these “non-layer IV” bone retouchers originally stem from layer IV and are present in other layers due to human burial and other pits dug by the Neanderthal inhabitants responsible for the Kiik-Koba Upper layer. Some of these retouchers were found in squares in which the pits are known in layer IV. We can also add, however, that most of these non-*in situ* retouchers (n = 9) were found in layers II and III, above layer IV, again evidencing significant post-depositional disturbance for the Kiik-Koba sequence. At any rate, there are a minimum of 58 bone retouchers in the Kiik-Koba layer IV assemblage and none from Buran-Kaya III, layer B. The very recent study and discussion by A. P. Veselsky of a sample of more than 200 bone retouchers from a series of Micoquian archaeological levels from the early 2000s excavations at Kabazi V are highly relevant here. His final considerations are as follows: “It is most likely that bone retouchers were the most important tools in bifacial tool production, their light weight and soft consistency making them particularly practical in the final stages of bifacial tool manufacture, e.g. for the retouching of working edges. It is also possible that bone retouchers were employed at crucial moments, for example when retouching the tip of points on bifacial tools, when excessive weight and hardness may have led inadvertently to the fragmentation of important tool parts” (VESELSKY 2008, 452). Accordingly, the use of many bone retouchers for rejuvenation of unifacial and bifacial convergent tool tips at Kiik-Koba may have led to a decrease in accidental breakage, while the use of harder retouchers (probably sandstone pebbles with poorly preserved surfaces found during the 1996 Buran-Kaya III, layer B excavations) may have led to much more frequent accidental breakage of convergent tools. If this third explanation is correct, we can speculate that the Kiik-Koba Layer IV Neanderthals treated relatively few flint artefacts overall (no more than 4000 pieces for all layers and a minimal mixture with the Lower layer), but with great care, given the high quantity of bone retouchers present. Here again we are dealing with a combination of two obvious factors: a deficit of flint objects at the site, caused by the considerable distance to high quality flint outcrops, and intensive flint treatment and retreatment processes taking place at the site.

In brief, then, the detailed typological comparisons between the Micoquian assemblages from Buran-Kaya III layer B and Kiik-Koba Layer IV can be summarized as follows. First, all typological data clearly indicate that the two assemblages belong to the same Kiik-Koba industry type of Crimean Micoquian Tradition. Second, indications of higher intensity flint and tool exploitation at Kiik-Koba in comparison to Buran-Kaya III can be explained by the somehow longer distance to high quality flint outcrops from Kiik-Koba and, perhaps even more important, its location in the first ridge of the Crimean Mountains, making uphill trips to the grotto much more difficult. As a result, flint nodules and finished unifacial and bifacial tools brought to Kiik-Koba were treated there more intensively; convergent tool indices are higher for both unifacial and bifacial tools. This was complemented by on-site unifacial tool production of small flakes and large-sized chips (1.5–2.9 cm). As a result, the morphological characteristics of Kiik-Koba Micoquian flint artefacts reflect a more exhausted state and are smaller in size, when compared with the Buran-Kaya III Micoquian flints.

COMPARISON BETWEEN TECHNO-TYPOLOGICAL STUDIES AND TRANSFORMATION ANALYSIS

Despite the fact that different methods were applied, e.g. attribute analysis and qualitative analysis of reduction sequences, both lithic studies presented in this volume (Chapters IV and VI) come to the similar conclusions. In both cases, the assemblage of Level IV is described as an integral part of the Kiik Koba facies of the Crimean Micoquian. In short, its main characteristics is a far going reduction and re-use of bifacial tools and, parallel to this, an intense modification of blanks from (bifacial) surface shaping into formal unifacial tools (e.g. scrapers), while concepts for the flaking of cores are less well presented.

Alongside the overall accordance, there are also differences. Most of them account for the frequencies of formal tools. According to Demidenko (Chapters III and IV, this volume), the indices calculated for the assemblage of Layer IV fit well into the known data for the Kiik-Koba industry of the Crimean Micoquian, while Uthmeier (Chapter V) argues for a closer relation to the Ak-Kaya industry of the Crimean Micoquian. It is important to note that part of these differences is caused by different methodological approaches to identify admixture between Layers IV and VI. Based on a sortation of artefacts larger than 3 cm into raw material units (correlating to workpieces), Uthmeier restricted his analyses to units that were void of discoidal flaking (thought to be restricted to Layer VI) and, at the same time, included pieces indicative for the production of bifacial pieces. Apart from isolated bifacial tools made from greyish flint, his analysis included mainly raw material units made from brownish flint. Because units that lacked pieces indicative for any kind of flaking concept were equally excluded, the analysed assemblage was considered to be a "core assemblage", even more so as chips were excluded. Demidenko's studies used individual artefacts as smallest analytical units and included chips. With the help of characteristic techno-typological attributes he identified additional pieces of the Crimean Micoquian from Layer IV consisting of greyish flint. While there is a *consensus* that part of the bifacial tools (9 items or 23.7 %) was produced from this raw material, differences occur in scrapers and chips. Among the latter are chips from the rejuvenation of unifacial and bifacial working edges: of 22 rejuvenation chips of unifacial convergent tools' tips ("3A" sub-type chips), 10 are on gey flints, and 3 out of 25 rejuvenation chips of bifacial convergent tools' tips ("3B" sub-type chips) are made from this class of raw material. Using the morphological characteristics of blanks, other items from grey flints were also identified as originating from Layer IV. This account for all basic classes and types of complete unifacial tools (21.6 % of simple scrapers, 29.4 % of transverse scrapers, 42.9 % of double scrapers, 17.4 % of convergent scrapers and 10.1 % of points: Chapter IV, this volume). In the frame of transformation analysis, these artefacts were most probably sorted into units with attributes of discoidal flaking or into units without any characteristic feature – and therefore not part of the "core assemblage". The detailed analyses of chips and morphological characteristics of blanks indicate that grey flint was a genuine part of the Micoquian Layer IV that may have been to a certain extend underestimated by the transformation analysis.

Apart from this, there are two additional explanations for differences in between the studies presented here. First, there could be differences in the classification of marginal and/or irregular retouched pieces as formal tools, leading to rather low numbers of "simple" tool types in the study of Demidenko (Chapter IV, this volume). Second, in the study of Uthmeier, the category conventionally named "bifacial tools" also includes items that were either unifacially surface shaped tools. Although this cannot be cross checked piece by piece, it has to be assumed that some of these were classified as heavily retouched unifacial convergent tools (either scrapers or points) by Demidenko. In addition, the latter analysis only used complete and re-utilized bifacial pieces for the calculation of indices, whereas the former also included heavily reduced items.

In sum, differences in the frequencies of tool classes have two reasons: the approaches to identify admixture (raw material units *versus* attribute analysis of individual artefacts), and the definition for tool classes (surface shaping *versus* bifacial pieces and reduced pieces *versus* typologically identifiable pieces). The latter is obviously decisive for the higher number of (mainly bifacial) surface shaped tools within the transformation analysis in Chapter V. Although both approaches have their authority and are difficult to compare directly, it becomes clear that the differences, and especially those concerning the tripartite tool structure essential for a quantitative attribution to the industries of the Crimean Micoquian, should not be over-estimated.

FAUNAL REMAINS

The re-analysis of the faunal assemblage of the Kiik-Koba Layer IV fauna in Chapter VII by M. V. Sablin confirmed the previously known fauna. Regarding hunting strategy, he emphasized that Neanderthal occupants preferred "to hunt adult giant deer, saiga, horse and mammoth". Although direct seasonality data are lacking, adult hunted animals suggest autumn hunting events for Kiik-Koba. Regarding the other five animal species on the Kiik-Koba fauna list (wooly rhinoceros, *Equus hydruntinus*, red deer, bison and *Ovis*), according to Sablin's data, it is worth noting the very probable occasional presence of three rhinoceros bones in layer IV. First, two of the rhinoceros bones were found in squares 71 and 79, well outside the find distribution of the Upper layer. Only one rhinoceros bone was thus identified in the Upper layer concentration (square 14) that can be regarded as occasional. Second, it is important to turn to some of Bonch-Osmolowski's observations on layer III (above layer IV). He (1940, 30–33) especially pointed out "a rather large number of cave hyena, fox and rhinoceros remains" in the inner part of the cave, particularly in squares 77, 76, 35 and 31. Noted in Chapter II of the present volume, the existence of a hyena den during the deposition of layer III would correlate with the rhinoceros bones there. It is thus possible to consider that the three rhinoceros bones in layer IV are in fact related to the hyena den of layer III. Also, the single *Ovis* sp. bone (an astragalus) in square 43 in layer IV is also beyond the Upper layer's find concentration, at the southern edge of the cave, suggesting accidental occurrence.

CONCLUSION

All in all, the results and considerations presented in this volume fit well into the "non-cultural paradigm" for an explanation of the Crimean Micoquian industrial variability (see Chapter II). Like in other studies, it turns out that this variability is best explained by shifts in the intensity of on-site raw material reduction. The latter is most notably reflected in the archaeological record by the degree of resharpening of formal tools, as it has fundamental consequences for the overall outline, the length and the number of working edges of both unifacial and bifacial tools. Many arguments point to a combination of (1) the distance to outcrops of lithic raw material sources, and (2) the time spent at a site that to different degree influences the intensity of tool use in the Crimean Micoquian. It is beyond question that the high frequencies of pointed and convergent tools in assemblages of the Kiik-Koba industry mark the very end of a *continuum* of increased resharpening, and that this is mainly caused by long distances towards raw material sources. At Kiik-Koba Layer IV, the deficit of raw material is additionally attested by several re-used fragments of bifacial tools which also contribute to the dominance of pointed forms. Differences in detail between Kiik-Koba type assemblages, e.g. between Buran-Kaya III Layer B and Kiik-Koba Layer IV, can be best explained by higher investments for raw material procurement (due to a more pronounced relief) and – more hypothetic – longer stays (due to a larger diversity of hunted species) at Kiik-Koba Layer IV. Another characteristic feature of Crimean Micoquian assemblages is a production of flakes that is, by and large, closely ramified with that of bifacial tools. Especially at sites of the Kiik-Koba industry, with a logistically expensive and time consuming raw material acquisition, most blanks come from the production and reduction of bifacial tools. At these sites, it was more economical to work down the initial stock of imported preforms and bifacial surface shaped tools to very small sizes, instead of procuring fresh raw material and start an additional production sequence of surface shaping on a new raw piece. The first strategy leads to a larger ratio between unifacial and bifacial tools if compared to assemblages produced near to outcrops. This basic hypothesis, which has already been stated by various authors elsewhere, is further specified here with the help of transformation analysis. It is assumed that long distance moves to Crimean Micoquian camps were equipped with comparable amounts of raw material transported as raw pieces and preforms to be consumed at the site and related stations/locations after arrival. In cases where no fresh raw material supply was available and the times of activity were medium to long, reduced assemblages of Starosele type and, respectively, Kiik-Koba type were left behind. If stays were short, Ak-Kaya type assemblages without intensive resharpening occur. If standing further testing, such a strategy would relativise the amount of logistical planning of residential moves in the Crimean Micoquian. It still holds true that large parts of the subsistence tactic is focused on large bulk procurement of single species, e.g. equids and saiga antelopes, but this may be more related to times of abundance and established seasonal territories. When confronted with periods of resource instability, moves may have been less well organised.

Apart from the good agreement of the results of the studies presented here with other authors that postulate a functional interpretation of the Crimean Micoquian industries, there are some disagreements between V. P. Chabai and Yu. E. Demidenko with respect to the identification of "short-term camps" for Kiik-Koba industry type sites (Chabai et al. 2000, 88). Chabai explains the more exhausted characteristics of Kiik-Koba industry type flint assemblages by two factors (Chabai 1999; 2004; Chabai et al. 2000; Chabai & Uthmeier 2006). The first is the lowest sedimentation rate for Kiik-Koba, Buran-Kaya III and Prolom I Grottos among all Crimean sites with Middle Palaeolithic deposits; the thick archaeological layers with Kiik-Koba industry type artefacts are the result of multiple visits, and are in fact palimpsests of a series of occupations. The second factor follows from the first. The presence of many tools having undergone several rejuvenation phases should be explained as follows: "artefacts left by the sites' previous visitors were used repeatedly then because of flint deficit there" and "living floors of previous visitors did serve to some extent as a source of raw materials for new visitors, who certainly were also bringing with them some number of new flint artefacts" (Chabai 1999, 73; translation by the authors). Demidenko (2004d) does not agree with the second explanation, citing a lack of actual data to support it. Indeed, there are no flint artefacts with double patina in such assemblages (e.g., Siuren I, Lower layer Micoquian component) or just a few (no more than 5) for each assemblage at Kiik-Koba, Buran-Kaya III and Prolom I Grottos. On the other hand, flint items with double patina occur much more frequently in the Micoquian (Ak-Kaya and Starosele industry types) levels at Chokurcha I, Lower deposits of Unit IV, excavated in 2000, which, in turn, have much higher rates of sediment accumulation. Another example of interest is the Micoquian levels at Karabi Tamchin. Located on the first ridge of the Crimean Mountains in Eastern Crimea, the site is the most distant Middle Palaeolithic Crimean site from high quality flint outcrops (no less than 22 km in straight direction) and also has very low sedimentation rates. Yet the Micoquian assemblages are not of Kiik-Koba industry type, as would be expected from Chabai's approach. The assemblages belong to the Ak-Kaya - Starosele industry type and contain a single flint specimen with double patina. Finally, the Lower layer at Siuren I, c. 1 m thick and deposited over a period of 1000–2000 years, does not contain double patinated flints, and Micoquian artefacts are rare (less than 100 items), although including a number of rejuvenation chips from unifacial and bifacial convergent tool tips. Moreover, the Siuren I Micoquian artefacts abandoned at the site cannot be accepted as a flint source for subsequent Neanderthal visits to the rock-shelter, which is also supported by the fact that Early/Archaic Aurignacian flints in the same sediments were also not used for such purposes. But the situation is even more indicative since the Siuren I Micoquian tools have the highest Kiik-Koba industry type "reduction level" indications: 24.1 % "simple" unifacial tools and 63.8 % "convergent" unifacial tools. Thus the more exhausted nature of Kiik-Koba industry type assemblages in general and Kiik-Koba Layer IV in particular, as well as other aspects of Crimean Micoquian variability would be better explained by the unique activities that took place at such sites, requiring a very high level of flint exploitation at Kiik-Koba industry type sites. Therefore, while Chabai analysed Kiik-Koba industry type sites in the context of the Crimean Micoquian Tradition settlement pattern, considering them to be "short-term camps of C type" (Chabai et al. 2000) or "short-term camps of D type" together with Starosele industry type sites (Chabai 2004; Chabai & Uthmeier 2006), Demidenko (Chabai et al. 2000, 88; Demidenko 2004d, 258–259) is inclined to separate that type of short-term camp into two sub-types with sites of Kiik-Koba and Starosele industry types taken separately.

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