16. Summary and Conclusion

The analysis presented here tries to elucidate major processes of the transition from Middle- to Upper Palaeolithic. Although a major point of discussion in today's literature, anthropological data known so far from the time between 40,000 and 30,000 is considered to be incomplete. At the moment, a secure correlation between industries that play a major role in the transition from Middle- to Upper Palaeolithic, like the early Aurignacian or the Szeletian, and Neanderthals or modern humans is not possible. It follows, that - at the momentary state of knowledge - it is impossible to test models that try to explain the appearance of Upper Palaeolithic assemblages in Europe with an immigration of homo sapiens sapiens populations from the Near East. On the other hand, no secure data is available to support the idea that all early Upper Palaeolithic assemblages in Europe were produced by late Neanderthals. As a consequence, the data used here is restricted to material culture only.

To avoid a biased sample, the data set considered includes not only assemblages of industries indisputably involved in the transition from Middle- to Upper Palaeolithic, e.g. Szeletian or Aurignacian assemblages, but also assemblages of the late Middle Palaeolithic dating to OIS 3, and the Gravettian. All in all, 61 assemblages coming from 35 sites were analyzed, covering the time of the interpleniglacial of the last (Würmian) glaciation (OIS 3). The sources of information included literature, but also first hand investigation of original material.

According to conventional classifications, 11 assemblages belong to the Mousterian, 20 assemblages were described as Micoquian, 12 assemblages were classified as Altmühlian or Szeletian, 15 assemblages were thought to be Aurignacian, and 3 were labelled as Gravettian. For a more secure data base, the original data was filtered by the following criteria: presence of stratigraphical information, presence of a sorting of stone artefacts into raw material units, presence of a reconstruction of the chaîne opératoire. The remaining 9 sites listed below were analyzed in greater detail:

1. The Weinberghöhlen near Mauern, with two stratified Middle Palaeolithic assemblages classified by G. BOSINSKI (1967) as Mousterian (Zone 5) and Altmühlian (Zone 4), and one Gravettian assemblage (Zone 1);

2. the Hohle Stein near Schambach as the defining assemblage of an inventory type in G. BOSINSKI's (1967) concept of the Central European Micoquian ("Inventartyp Schambach");

3. the Sesselfelsgrotte, with 12 interstratified Micoquian and Mousterian of the G-layers, embedded in a long stratigraphical succession dating from OIS 5 to OIS 3;

4. the Obernederhöhle, with two stratified assemblages classified as Micoquian (lower and middle layers), and a poor layer with few Aurignacian artefacts;

5. the open air site of Zeitlarn 1, where an assemblage with preponderant leaf points has been classified in the literature as Szeletian;

6. the open air site of Keilberg-Kirche with a hitherto unknown assemblage of the early Aurignacian;

7. the open air site of Florian Seidl-Straße with an assemblage that includes backed pieces and Châtelperronian points;

8. the open air site of Salching with an assemblage belonging to the Gravettian, and

9. the open air site of Albersdorf with an assemblage that has been classified as Szeletian.

Despite the fact that these sites where selected for their better preservation and/or detailed description in the literature, many of them are still lacking data about the faunal remains, the spatial distribution of artefacts and/or the correlation between settlement structures and artefacts. In part, this is caused by the fact that archaeological materials were collected from the surface (Albersdorf), or because the sites were excavated during the first half of the 20th century (Weinberghöhlen, Hohle Stein). In other cases, however, bones or settlement structures were not preserved (Zeitlarn 1, Keilberg-Kirche, Salching), or the analysis has not been finished (Sesselfelsgrotte, Florian Seidl-Straße). Therefore, the analyses presented here are mainly based upon stone artefacts.

At Florian Seidl-Straße, two ^{14}C-dates (that may only give a minimal age) between (Hv-1560) 28.780 ± 1735 BP and (Hv-1561) 29.450 ± 1900 BP fall into the range of Gravettian dates. These dates fit well with the appearance of small backed implements typical for Gravettian assemblages. Other features, like Châtelperronian points and a chaîne opératoire similar to those described by J. PELEGRIN for Roc-du-Combe and Arcy-sur-Cure (1995), speak for a classification as Châtelperronian. Because finds were excavated from redeposited sediments, the chronological as well as the cultural position of Florian Seidl-Straße remained

unclear. As a consequence, it was excluded from further studies in the course of this work.

Data for comparative studies comes from the remaining 8 sites. For all in all 22 assemblages („Auswertungseinheiten"), the chaîne opératoire for stone tool production was reconstructed on basis of a qualitative analysis of blanks and cores. Retouched pieces were described by a list of 80 types, combining conventional Middle- and Upper Palaeolithic type lists (e.g. BOSINSKI 1967; HAHN 1977; OTTE 1981). For statistical analysis, the number of 80 different types was reduced to 24 tool classes.

After a description of the topographical and geological setting, the history of investigation, the statigraphy and chronological position within OIS 3 as well as the analysis of the formal tool classes and chaîne opératoire, each site was looked for its possible function. In general, it is assumed that an annual settlement cycle of Pleistocene hunter gatherers consists of camps of different activities. It follows, that seasonal camps might differ in respect of the time they were maintained, and the number of different activities conducted. Some might have been visited for hours, others for days or weeks. A functional classification of the function of sites and assemblages into the categories „base camp", "special task camp" or „ephemeral camp" is based on a list of attributes that includes the number and the diversity of formal tool classes, the frequency of blanks, and the distances to raw material sources. Given the weakness of archaeological data, visits of different function may accumulate within the same archaeological layer. Because this hampers the analysis, it was tried to counterchecked the final classification by the presence and frequency of different steps of the chaîne opératoire, the possible reduction of formal tools (e.g. surface shaped bifacial tool types), and, if present, settlement structures like fireplaces and artefact concentrations.

After describing and discussing single assemblages, cluster analysis and seriation of 22 assemblages from 8 sites resulted in a revised classification. It turned out that assemblages conventionally classified as „Altmühlian" and „Szeletian" are not significantly different from assemblages classified as „Micoquian" in the literature. In all assemblages, backed bifacial knives („Keilmesser") and leaf points appear in changing frequencies. Important technological features like the presence of the Levallois concept for blank production and a plano-konvex/plano-konvex way of shaping the surface of bifacial tools („wechselseitig-gleichgerichtete Kantenbearbeitung" according to BOSINSKI [1967]) support the hypothesis that Bavarian assemblages with preponderant leaf points („Altmühlian", „Szeletian") and Micoquian assemblages are part of the same cultural system. Earlier studies of J. RICHTER (1997) already were able to show that Mousterian and Micoquian assemblages should be treated as one cultural unit, because blanks (coming from various Levallois methods) and unifacial tools are identical („Mousterian with Micoquian Option" or „M.M.O".). Now, it is assumed that assemblages with high frequencies of leaf points also belong to the same late Central European Middle Palaeolithic artefact system. In this work, this system is simply referred to as interpleniglacial "Micoquian".

A cluster analysis of formal tool classes confirmed the functional classification of Middle Palaeolithic sites. Assemblages with preponderant leaf points - Weinberghöhlen, Zone 5 and 4, and Albersdorf - and the eponym site for BOSINSKI's (1967) Micoquian inventory type „Schambach", the Hohle Stein, were sorted into the same cluster. These assemblages were considered as (repeatedly visited?) „special task camps". A second cluster with assemblages from Sesselfelsgrotte, G-layers, and Obernederhöhle, lower and middle layers, is characterized by low frequencies of surface shaped tools and can be explained as (repeatedly visited?) „ephemeral camps" or „special task camps" of less pronounced character. According to high frequencies of surface shaped tools, a third cluster with assemblages coming from G-layers of Sesselfelsgrotte was interpreted as „base camps". These interpretations were confirmed by the results of a correspondence analysis. At the same time, Aurignacian and Gravettian assemblages were placed in great distance towards all other sites, showing that significantly different sets of formal tool were used and discarded.

In a second step of analysis, a catalogue of 15 attributes was used to classified assemblages as „Middle Palaeolithic" or „Upper Palaeolithic". All assemblages of the Bavarian Micoquian belong to the „Middle Palaeolithic". At the momentary state of knowledge, there are no assemblages that combine Middle and Upper Palaeolithic features. Speaking in conventional terms, there are no "transitional industries". None of them, neither the so called „Altmühlian" nor the Bavarian „Szeletian" assemblages show any tendency towards the Upper Palaeolithic. Despite the fact that some show remarkable frequencies of blades or Upper Palaeolithic tool types, there are no cores of distinct Upper Palaeolithic concept, and no bone artefacts. Aurignacian and Gravettian assemblages were classified as Upper Palaeolithic.

Stratigraphical, faunistic and radiometric data are the basis for a chronological model that tries to incorporate gradual changes in climate and vegetation from North to South and East to West. Assemblages from the G-layers of Sesselfelsgrotte, from the Hohle Stein, layer C1, and from the Weinberghöhlen, Zone 5 date to the first interpleniglacial interstadial („Oerel interstadial"). The second interstadial of OIS 3 that might cover the pollen-zones of „Glinde" and „Moershoofd" interstadial saw Middle Palaeolithic settlements at Weinberghöhlen, Zone 4, Sesselfelsgrotte, layer E3, and Hohler Stein, layer S-IV,2. Because the macro fauna is not supposed

to change basically during the first part of OIS 3, and because young ^{14}C-dates are reported from the G-layers and layer E3 of Sesselfelsgrotte, it is possible, yet not very probable, that some of these assemblages date to the Hengelo interstadial. Because finds are coming from the surface, or because stratigraphical information is weak, the dating of Micoquian assemblages from Albersdorf, Zeitlarn 1 and Obernederhöhle, lower layers and middle layers is insecure. These assemblages were produced at an unknown point of time between Oerel and Hengelo interstadial. If simple evolutionary criteria were considered, Zeitlarn 1 with many blades might mark a late phase of the Bavarian Micoquian. But at the moment there are no reliable arguments for such a late chronological position. As a consequence, the author is working with the hypothesis that assemblages with preponderant leaf points might be contemporaneous with, for example, G-layers of Sesselfelsgrotte.

The Aurignacian assemblage of Keilberg-Kirche with an average date (out of three dated samples of charcoal) of 38 ka marks the beginning of the Upper Palaeolithic in Bavaria during the Hengelo interstadial. Although ^{14}C-dates from Keilberg-Kirche and Sesselfelsgrotte, G-layers and layer E3 speak for an overlap of Middle and Upper Palaeolithic settlement in Bavaria, there are no interstratifications that could support the hypothesis that Middle and Upper Palaeolithic assemblages might have been contemporaneous. It is concluded that in Bavaria, the early Aurignacian is later than the late Micoquian. Other Aurignacian assemblages from the Kleine Ofnet and Große Ofnet as well as from Fischleitenhöhle, Räuberhöhle and some open-air find spots along the Danube valley bear no reliable stratigraphical information. Therefore, it is not possible to specify their chronological position. According to single artefacts, including fragments of bone points, from Zone 2 of Weinberghöhlen, a survival of Aurignacian assemblages until the end of Denekamp interstadial can not be excluded. Stratigraphical observations in Weinberghöhlen and at the open-air site of Salching speak for a presence of Gravettian assemblages in Bavaria not earlier than the end of the Denekamp interstadial.

Between Middle and Upper Palaeolithic, there are marked, yet expected differences in the frequency of formal tool classes. Whereas in the Middle Palaeolithic Upper Palaeolithic tool types are comparably rare, they dominate in Upper Palaeolithic assemblages. In the Upper Palaeolithic, to the contrary, Middle Palaeolithic scrapers or surface shaped tools occur only as single pieces. In part, there differences go back to different chaînes opératoires for the production of blanks. In Micoquian assemblages, the production of blanks is mainly based upon the Levallois concept. The production of a wide range of blanks is a direct consequence of the fact that flaking surfaces of Levallois cores have to be prepared after the detachment of one or more target flakes. As a result, an assortment of simple flakes, éclats débordants and target flakes is produced. In cases were the reduction of Levallois cores is long, the assortment may be produced several times. Although uni- and bipolar Levallois recurrent methods are known, Middle Palaeolithic core reduction in Bavaria is dominated by the production of flakes. A comparison of blank frequencies in 20 assemblages proved that only from the Aurignacian onwards assemblages with considerable numbers of blades appear. In Upper Palaeolithic blade concepts with volumetric cores, most of the blades are controlled by scars that are formed by negatives of older blades. At the same time, the long negatives of blades produce scars that control the detachment of future blades. In contrast to the Levallois concept, there is no systematic interruption of the production sequence. Usually, the preparation of the entire cores is found only at the beginning of the core reduction. Afterwards, the once prepared volume is only corrected. Thus, the blanks of Upper Palaeolithic blade concepts are usually weighted, with a dominance of blades. However, the reconstruction of the chaînes opératoires have shown that these phases of correction might appear often, as in the simple, strictly unipolar Aurignacian method of the Upper Palaeolithic blade concept, or sporadically, as in the Gravettian bipolar method. This leads to changing ratios between flakes and blades. A quantitative „extraction analysis" for one assemblage from Micoquian, Aurignacian and Gravettian came to the result that the relation between blanks that exclusively prepare the core, and those that are target flakes or blades controlled by negatives or scars, is gradually becoming biased towards controlled blanks. The latter dominate in the Gravettian assemblage, while in the Aurignacian assemblage preparational flakes are still more numerous than blades.

If the industries of OIS 3 in Bavaria are compared by their chaînes opératoires, it turns out that the Micoquian, with the Levallois concept, sometimes combined with the Quina concept or a concept to detach blades and elongated flakes from prepared surfaces, is dominated by flakes. During the Gravettian, to the contrary, the bipolar "Corbiac" method is used to produce series of thin and narrow blades. The Aurignacian method shows features of both Middle and Upper Palaeolithic concepts and methods. Although a volumetric concept for the production of blades, an only rough initial preparation of the cores leads to considerable amount of flakes struck in the course of the correction of the core. In addition, many cores are abandoned early, and the often repeated initial preparation of new cores again leads to high frequencies of flakes. The differences in the chaînes opératoires described above are, in part, responsible for differences in the frequencies of modification types. In general, blades and thick flakes were recognized as important blanks for major Upper

Palaeolithic tool types. Blades, on the one hand, offer the opportunity for modifications of the terminal ends (e.g. end scrapers, borers) and/or intentional breakage (e.g. Burins, éléments tronquées). Thick flakes, on the other hand, may be used for carinated technologies (e.g. carinated end scrapers, carinated burins).

Since blades or massive cortical flakes are rare in Middle Palaeolithic concepts for blank production, formal tool classes are dominated by types that are characterized by lateral retouch (e.g. Side scrapers and all classes of surface shaped tools). If end scrapers, borers or burins appear, then they are mainly made on small flakes and therefore look „untypical". From the Aurignacian onwards, modifications other that lateral ones are more numerous. Often, lateral retouch and modifications of the terminal end are combined. Bladelets with fine retouch point to carinated technologies and new techniques for hafting. End scrapers and splintered pieces, that are present in low numbers in the Middle Palaeolithic Micoquian, now appear in great numbers, as well. But still, many formal tools are made on flakes, because the output of the chaîne opératoire is dominated by flakes, not by blades. In the Gravettian, the production of backed bladelets and points is the result of intentional breakage into several pieces defined and controlled by previous retouch. Pre-condition for this technique that allows to multiple the output of cutting edges from a given volume of raw material are long and thin, regular blades. These are produced in the course of the Gravettian bipolar „Corbiac" method.

It has been shown that the concepts for blank production have an important influence on the frequency of Upper Palaeolithic tool types: if blades and bladelets are produced in greater number, than the frequency of Upper Palaeolithic tool types is higher than in assemblages that are based on a concept that is focused on the production of flakes. A strong correlation between both variables - the frequencies of blades and Upper Palaeolithic tool types - is confirmed by a correlation coefficient of Pearson's r = 0,82 for assemblages from Central and Eastern European Micoquian, Szeletian, Bohunician and Aurignacian.

The frequencies of different blank types also have an influence on the reduction of formal tools. In Middle Palaeolithic assemblages with simple blanks only, tool histories tend to be short. Resharpening processes are mainly done by lateral retouch that is becoming steeper after each working step. As an alternative, surface shaped tools are produced that offer the possibility of resharpening processes that do not change the angle of the lateral angle. A striking example for the correlation between restricted possibilities for long reduction sequences of simple unifacial blanks and high frequencies of surface shaped bifacial tools comes from the lower part of the G-layers of the Sesselfelsgrotte. In these assemblages, the Quina concept leads to many thick flakes with a natural back that must be abandoned early because only one edge is capable for retouch and resharpening. In these assemblages the number of surface shaped bifacial tools is proportional to the number of unifacial tools. Later, in the Levallois dominated upper part of the G-layers, no such proportional relation between unifacial and bifacial tools was observed.

The use of strategies that try to produce as much working edges from a given formal tool as possible is best illustrated at sites with a short duration of settlement. It is assumed that the time for production and curation of equipment is especially restricted at ephemeral sites and special task sites. During the Middle Palaeolithic, many "special task camps" (recognized by their small numbers of notches and denticulates as equivalent to the "time of activity") are characterized by high frequencies of leaf points. At the same time, the high number of leaf points at Zeitlarn 1 and Weinberghöhle, Zone 4 is probably caused by a repeated visit of these sites, each dedicated to the same activity. Because surface shaped tools must be regarded as highly mobile, there are also "ephemeral camps" with only few surface shaped tools. In these cases, like Obernederhöhle, lower and middle layers, leaf points are found among other surface shaped tools. It is assumed that only a small number of leaf points and other surface shaped tools were retooled and rehafted (because stays were short), and that several visits were not dedicated to the same activity. As a consequence, single leaf points are also found in "base camps", like Sesselfelsgrotte, G-layers. It is assumed that they were imported from "ephemeral camps", as is the case for a part of other surface shaped tool classes, like backed bifacial knives, for example. In contrast to "ephemeral camps" with some surface shaped tool only, and "special task camps" with preponderant leaf points, surface shaped tools in base camps are diverse, they appear in great numbers, and they are often produced on-site. At Upper Palaeolithic sites classified as "ephemeral camps" or "special task camps", flaking and/or breakage of flakes and blanks for the production of bladelets is observed. In the Aurignacian assemblages of Keilberg-Kirche, thick flakes, often covered by cortex, are used for carinated technologies. It is concluded that carinated end scrapers served as cores for retouched bladelets and as tools for cutting and scraping. This multi-purpose function of carinated end scrapers in the Aurignacian is confirmed by use wear analysis from Geißenklösterle (SYMENS 1988) and Breitenbach (SCHULTE im WALDE 1987).

Another major aspect in an attempt to explain the biography of stone tool assemblages is the function of a site within an annual settlement pattern. Hypothesis about settlement patterns and annual territories are based on distances humans moved within site and/or logistical territories. In the archaeological record, the distances of

moves are visible through raw material transport. The distances of raw material transport are measured by three classes: "local" sources in a distance under 5 km as an equivalent of the "site territory", "regional" sources in a distance under 20 km that might correlate either with micro moves within a logistical territory, or with macro moves from one camp to another ("residential mobility"), and sources at distances of 20 km or more that show long distance residential moves. For the Middle Palaeolithic, hypothesis about the function of sites were made according to the diversity and number of formal tools classes, the reduction of tools, and structures like fire places and artefact concentrations. The results were counterchecked by the number of notches and denticulates. Both tool classes were identified as „time of activity" both in Southwestern European Mousterian assemblages (DIBBLE & ROLLAND 1988) and in Middle and Central European late Middle Palaeolithic (Micoquian and Mousterian) assemblages (RICHTER 1997). For the Upper Palaeolithic, with only four Bavarian assemblages under detailed analysis, the „time of activity" was measured by the diversity of formal tool classes, calculated by the Simpson-Index (RICHTER 1990). To estimate the duration of settlement, the results were compared to assemblages from Middle and Central Europe. Data for these comparisons were - with additional sites published recently - taken from HAHN (1977) for the Aurignacian, and from OTTE (1981) for the Gravettian.

During the Middle Palaeolithic, ephemeral camps, special task camps and base camps were all found within the analyzed region. With the help of models for settlement patterns from other regions, like Latium in Italy or the Negev in the Near East, an annual territory was reconstructed that can be placed within the borders of Bavaria, along the Danube and Altmühl. Until today, "base camps" are missing for the Bavarian Aurignacian. The sites known so far are heavily dominated by "ephemeral camps". On grounds of typological comparisons the author takes into consideration that Bavarian Aurignacian sites are only part of a larger annual territory that includes Southwestern sites in the Lone and Ach Valley. This hypothesis is possible, yet difficult to prove, and the size of the annual territory would be greater than estimations made by HAHN (1987b). Compared to the Middle Palaeolithic, the annual territory seems to be stretched, but there are also similarities, however: raw material procurement is mainly based on the exploitation of local sources, and - if at all - restricted to regional distances. Although only three major sites are known for the Bavarian Gravettian, there are marked differences in comparison to the Micoquian and Aurignacian. For the first time since the beginning of OIS 3, a site is found in the Donau-Isar-Hügelland, south of the Danube. In addition, distances of raw material transport have generally grown. At Salching, volcanic keratophyr from an outcrop near Saldenburg, approximately 58 km to the Northeast, proves long distance moves. The fact that bipolar core blanks made from keratophyr were fully prepared, but not reduced when they reached the site, speaks for direct transportation, with no stops in between ("residential move"). Even the micro moves around the site included longer trips of nearly 40 km. Although the author is aware of the fact that the sites of each industry can not be seen as contemporaneous (which is a major, yet inherent problem when comparing Palaeolithic sites), he still believes that the data can be interpreted as indicating a gradual growth of annual territories from Micoquian to Gravettian. At the same time, distances between campsites seem to increase, and "base camps" seem to last longer. The latter can be best seen when the settlement structures of Sesselfelsgrotte, G-layers, uppermost assemblage Se-12, and Weinberghöhlen, Zone 1 are compared.

The changes in the size of annual territories and (as a consequence of a longer use of "base camps") the decrease of residential mobility corresponds to the chronological sequence of major chaîne opératoires. Shortly after the beginning of OIS 3 the Quina concept appears in the G-layers of Sesselfelsgrotte. It is followed by Levallois methods with different recurrent methods, the Aurignacian blade method with volumetric unipolar cores, and, finally, the Corbiac method during the Gravettian. These innovations, which are focused on a more efficient reduction of raw material, are most probable accepted because distances between the ("residential") camps increased, and because base camps were maintained for a longer time. It is assumed that different variables, like an increasing number of activities to maintain base camps, changes in the intensity of mobility within local and/or regional territories around camp sites, and (a more developed) division of labour within radiating settlement systems leads to more blades, volumetric cores, more Upper Palaeolithic tools.

This development gains speed during the Upper Palaeolithic, but begins much earlier, during the Micoquian. If 12 assemblages from the G-layers of Sesselfelsgrotte are compared, "base camps" are characterized by high numbers of notches and denticulates, and many surface shaped tools. While the diversity of different raw material sources is, compared to "special task camps", low, the amount of raw material coming from local outcrops is much higher. This is interpreted as an optimized extraction of resources. Given that the raw material procurement followed embedded strategies, the number and the distance of places were resources were hunted and gathered decreases on the course of longer stays. At the same time, longer stays lead to the appearance of elongated blanks from Levallois recurrent uni- and bipolar methods, and Upper Palaeolithic tool types. In fact, in 12 assemblages from G-layers of Sesselfelsgrotte, Upper

Palaeolithic tool classes show the same relation with notches and denticulates than side scrapers in the model of DIBBLE & ROLLAND (1992). It follows, that Upper Palaeolithic tools are part of a tool kit that was only needed and used more often if the time of activity was longer. According to use wear analysis, Upper Palaeolithic tools (in the sense of Bordes´ iIII) are mainly used for working hard materials, which is seen as an indicator for "gearing up activities". Thus, the first tendencies towards the Upper Palaeolithic are observed at Micoquian base camps. A reason for this development is seen in the assumption (after KUHN 1994) that activities other than stone tool production, like the procurement of water, wood for fire etc., gain more importance the longer humans stay at the same camp. Therefore, concepts are applied that produce more cutting edges from a given volume, e.g. cores from Levallois recurrent uni- and/or bipolar method. In addition, "base camps" are supposed to be places were "gearing-up" activities took place. It is assumed that Upper Palaeolithic tools might indicate processes of "retooling and rehafting", for example. In Sesselfelsgrotte, the increase of frequencies of elongated blanks and Upper Palaeolithic tool classes correlates with cooler conditions towards the end of the G-layers, indicated by a change in small mammal fauna. Whereas small assemblages with Quina concept at the base of the G-layers allow the reconstruction of a circulating settlement system, it is assumed that afterwards, during cooler climates, a radiating settlement pattern was established, with base camps of long duration, and special task camps (e.g. Zeitlarn 1). Although only gently, temperatures are generally decreasing in the course of OIS 3. This corresponds to the fact that annual territories reconstructed for the Upper Palaeolithic Aurignacian and Gravettian sites are increasing, and that blade concepts with volumetric cores are widely accepted.

Because sites in Bavaria are few, hypothesis about the Aurignacian and Gravettian settlement patterns are based on data from Central and Eastern Europe. In a first step, each industry was separately analyzed for the diversity of formal tool classes. Here, results of the following comparison of both industries are presented. In the Aurignacian, less diverse and therefore specialized assemblages (according to Simpson´s index D) were dominated by carinated end scrapers and bladelets with fine retouch. In the Gravettian, specialized assemblages were dominated by burins and backed pieces (often: on bladelets). According to use wear analysis, it is not plausible to explain these differences by assuming a change of function of tool classes. To the contrary, it is suggested that burins were mainly used for working hard organic materials, like bone, ivory and antler, both in the Aurignacian and the Gravettian. Therefore, in the Gravettian the working of bone, ivory and antler is not only found at residential camps, but at special task sites as well. This is in accordance to the observation that in the Gravettian the average relative frequency of burins is, compared to the calculation for the Aurignacian, much higher. In the Aurignacien, end scrapers are generally more numerous. The differences are seen as an indicator of a change in organic raw materials: if the results of use wear analysis are correlated with tool types (which is not entirely proved), than Middle Palaeolithic tools are often used for working wood, and Aurignacian tools (after SYMENS 1988) are mainly used for working wood and leather. Bone, ivory and antler are used as well, but, compared to the Gravettian, to less extend. One reason might be a more effective treatment of organic materials that allowed Gravettian groups a production of bone points and other objects at places were humans stayed only for a limited period of time (e.g. several days).

The beginning of the Upper Palaeolithic in Bavaria was no revolution. Already during the late Middle Palaeolithic, elongated blanks were produced, and the frequencies of Upper Palaeolithic tool types increased at "base camps" (indicating „Upper Palaeolithic activities"?). But in most cases, blank production is mainly focused on the production of flakes. If concepts for the production of elongated blanks appear, they always use prepared surfaces, and they are always found together with cores indicating the presence of concepts of distinct Middle Palaeolithic character, like the Quina or Levallois concept. Cutting edges are maintained by secondary retouch, or by retouching several edges of a blank. Compared to surface shaped bifacial tools, the histories of unifacial simple tools tend to be short. As an alternative, surface shaped tools with long lasting working edges were produced. Because resharpening is an anticipated process within the concept of surface shaping, bifacial tools must be classified as „curated tools". During the Aurignacian, a simple method to produce blades from volumetric cores was established. Truncations, end scrapers and burins are concepts of blank modification that were also known from Middle Palaeolithic assemblages, but their frequency increased, in part due to increased frequencies of blades. Nevertheless, the simple Aurignacian method produced an assortment of blanks, including thick flakes, blades and bladelets. Among others, the role of carinated end scrapers and carinated burins as type fossils reflect the maintained importance of flakes in the Aurignacian. Carinated technology is frequently used at "special task camps" and seen as a strategy to extract an extra portion of cutting edges. At some Bavarian sites, artefacts from bone, ivory and antler appear, like bone points in Obernederhöhle, upper layers, or Fischleitenhöhle. It is not earlier than the Gravettian that assemblages and sites reach a fully Upper Palaeolithic level. In many respects, like the production of long series of thin narrow blades from carefully prepared bipolar cores, the massive production of backed implements, and the frequent

occurrence of non utilitarian artefacts, Gravettian assemblages are comparable to the Magdalenian. In Central and Eastern Europe, Gravettian settlement structures and numerically big assemblages of formal tools point to enlarged group sizes. Whereas in the Aurignacian residential sites were most probable visited by family sized groups, at least in the Eastern Gravettian ("Pavlovian", "Kostenki I,1-Avdeevo- Culture") residential sites seem to be have been visited by several interacting families at the same time.

On a cognitive level of interpretation, Middle Palaeolithic behaviour related to the production of material culture is best described as a series of working steps, stringed together in a process that has a defined beginning, inner structure and end. The hierarchy of Levallois cores and the curation of mainly lateral edges left little space for interruption and alternatives. Not only final products were anticipated, but also the way from the raw nodule to the final product. In the Upper Palaeolithic, the volumetric concept of blade cores offers the opportunity for a change of striking and/or flaking platforms. The reduction of formal tools may result in the curation if lateral edges, but may also use truncation, for example. Different kinds of modifications, e.g. lateral retouch, retouch of terminal ends and/or the detachment of burin blow, are often found in combination on the same blank.

All in all, the transition from Middle to Upper Palaeolithic in Bavaria can be described as a step by step development, starting in during the late Middle Palaeolithic, and ending with the Gravettian. If looking for a clear break (e.g. accumulation of innovations), then this break is seen between the Aurignacian and the Gravettian, rather than between the late Middle Palaeolithic (Micoquian) and the early Aurignacian. This does not mean that the early Aurignacian developed independently in Bavaria. Radiocarbon dates, chaînes opératoires for blank production, and fossil types from different regions ranging from Central Europe to the Near East were analyzed to provide information about the offspring of the Bavarian Aurignacian. As far as the Aurignacian of the Near East is concerned, the author was able to show that ^{14}C-dates are younger than oldest reliable dates from Europe, and that there are no simple analogies in technology and typology. In general, Aurignacian ^{14}C-dates predating 42 ka are supposed to be insecure. More reliable data is coming from sites dated older than 35 ka that are situated along the Danube in Southwest Germany, Bavaria itself, and Lower Austria. Isolated from this geographical region are sites in Northern Spain and Northern Italy. The geographical position of Bavaria, right in the middle of the distribution of oldest Aurignacian dates along the Danube, offers the opportunity to test hypothesis about the spread of the European Aurignacian. Because ^{14}C-dates show a considerable decline from Southwestern and Central Europe towards the Near East, immigration, either of humans and/or concepts for the production and use of stone tools, from this region is not plausible. At the same time, the Bavarian Aurignacian with „burin de Vachons" and „burin busque" is - from typological point of view - more closely connected to the Upper Danube Valley or Southwestern Europe. If there was a diffusion of ideas from one locus into Bavaria, than this locus has to be searched for in regions towards the West of the analyzed area. This all means, that one central cultural argument of those who advocate an „Out-of-Africa II" dispersal of anatomically moderns - the spread of Aurigacian tool kits from the Near East into Europe - must be rejected.

But, in general, the author doubts that there was one region were the complete Aurignacian tool kit was invented. Looking at the absolute data known so far, no way of diffusion, from centre to periphery, can be recognized. Instead, there might have been several regions, including Bavaria, with a highly innovative late Middle Palaeolithic. In some regions „transitional", yet Middle Palaeolithic, industries like the Bohunician, Châtelperronian or Uluzzian might be found as well. If it is not the incomplete data that suggests patches of different regions with early Aurignacian and/or "transitional industries" in Europe, then a „snowball model" might be a better explanation. Single elements of Upper Palaeolithic Aurignacian tool kits were invented in several regions, some exclusively in one region (e.g. figurines), and others - like volumetric cores or bone points - probably independently in several regions. Through social interaction, these innovations might have been combined to one concept of production and use of stone and bone tools, classified by us as „Aurignacian".

(translated by the author)