

The Sites of Kirchhellen and Weeze, Lower Rhine Bay/ Germany, with an Elder Acheulean: starting points for research into the problems of recognizing stone-artefacts in pebble-accumulations of fluvial terraces

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complexity in nature versus simplifying criteria

Abstract: The continuing critic by part of the prehistorians, including the principal rejection of pieces found in and on fluvial terraces without additional archaeological documents, which does include Kirchhellen and Weeze, caused the author to continue research and he began to study situations, where geofacts are produced, which could be mistaken for archaic artefacts. Results up to now seem to indicate a better suited approach to this problem, as explained in the following part. To postulate criteria, in this case enabling to distinguish between arte- and geofacts, an extensive fundamental study of the origin of geofacts and the context should have been undertaken, to form a basis from which to draw conclusions and then to establish criteria. This is missing in our case. The author's report describes observations, which seem to point in a direction enabling a better understanding of the problem. The statements, that the existence of artefacts in fluvial terraces is highly improbable and that it is not possible, if they exist, to separate them from geofacts in pebble accumulations, is contrasted by numerous archaeological sites with a wealth of artefacts, the latter even excavated in thousands from fluvial terraces in the mediterranean area. The production of geofacts as a natural process is much to complex to postulate simple criteria, as they are used now. The pattern of natural damages differs from rock to rock, frequently very strong. Experience gained with flint/silex, in Germany or elsewhere, cannot be generalized and used on other rocks: on one site archaic looking geofacts, made perhaps on limestone, may exist in hundreds together with isolated anthropogene similar artefacts on quartzite. The research into a possible archaeological site in an elder fluvial terrace demands to study the flow of material for a longer distance of the river, as well as the tributaries and to take into account numerous complex aspects, which influence the production of geofacts in the case involved. As many collections as possible of artefacts from the Elder Paleolithic have to be studied, besides extensive field work on terraces in different areas plus experimental knapping; these are basic conditions to gain the necessary knowledge, and this expressly over long periods, preferably many years. The final aim is the possession of a wealth of detailed, personal knowledge of both: the artefacts involved as well as the geofact-forms in general: then as a next step the speci-

al geofact-forms of the area involved in new research. The pieces found in Kirchhellen and Weeze are reconsidered in view of the above mentioned observations and groups are created: a. one group of artefacts; b. one group which comprises pieces from a zone of passage. There are still questions open: for instance is the geology of Kirchhellen object of new studies, but also questions with respect to the general problem artefacts/geofacts might be further clarified and this may help with the classification of certain pieces.

**[Die Fundstellen Kirchhellen und Weeze
mit einem älteren Acheulean: Ausgangspunkte
für weitere Untersuchungen des Problems,
Stein-Artefakte in Geröllansammlungen
von Flussterrassen zu erkennen.]**

Kurzfassung: Die anhaltende Kritik eines Teiles der Prähistoriker einschliesslich der prinzipiellen Ablehnung von Fundstellen in und auf Flussterrassen ohne zusätzliche archäologische Dokumente, was ja auch Kirchhellen und Weeze einschliesst, veranlasste den Autor zu weiteren Untersuchungen; er begann daher, sich mit Stellen zu beschäftigen, an denen Geofakte produziert werden, die für archaische Artefakte gehalten werden können. Die bisher vorliegenden Resultate scheinen eine besser geeignete Annäherung an dieses Problem zu zeigen und werden im folgenden Teil erklärt. Zur Erstellung von Kriterien, in diesem Fall solcher zur Ermöglichung der Trennung zwischen Artefakten und Geofakten, hätte eine umfangreiche grundsätzliche Studie des generellen Ursprunges von Geofakten und ihres Kontextes vorgelegt werden sollen, als Basis für allfällige Schlüsse und der Erstellung von Kriterien. Diese fehlt jedoch. Der hier vorgelegte Bericht beschreibt einige Beobachtungen, die in eine Richtung deuten, die ein besseres Verständnis für das Problem gestattet. Die Behauptung, verrollte Fundstücke seien keine Artefakte mehr, ebenso sei es nicht möglich, in Geröllansammlungen Arte – von Geofakten zu trennen, kontrastiert mit zahlreichen Fundstellen mit verrollten Artefakten, sogar zu tausenden aus Flussterrassen ergraben, im Mittelmeer-Raum. Die Entstehung von Geofakten aus natürlichen Prozessen ist viel zu komplex, um einfache Kriterien, wie sie im Gebrauch sind, dafür aufzustellen. Die Erforschung einer möglichen archäologischen Fundstelle in einer älteren Flussterrasse erfordert die Untersuchung des Material-

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flusses über eine längere Distanz des Flusses sowie seiner Zuläufe und dabei die Beachtung zahlreicher komplexer Aspekte, die den jeweiligen Fall beeinflussen. Dazu sollte die Kenntnis sovieler Sammlungen wie möglich aus dem älteren Paläolithikum erworben werden, daneben sind ausgedehnte Feldarbeit auf anderen Terrassen und experimentelles Schlagen eine grundsätzliche Bedingung, um das notwendige Wissen zu erlangen und dies ausdrücklich über eine längere Periode, vorzugsweise eine Reihe von Jahren. Das Endziel ist der Besitz umfangreichen detaillierten Wissens sowohl über die involvierten Artefakte als auch über die generellen Geofakt-Formen und dann als nächster Schritt die der Region, in der sich die abzuklärende Fundstelle befindet. Die Fundstellen von Kirchhellen und Weeze werden mit Blick auf die hier beschriebenen Beobachten überprüft; sie enthalten eine Serie von Artefakten neben einer Reihe von Stücken, die in eine Übergangszone gehören. Es sind noch Fragen offen: so ist, als Beispiel, die Geologie von Kirchhellen Objekt einer neuen Untersuchung, aber ebenso könnten Fragen des generellen Problems Artefakte/Geofakte weiter geklärt werden und dies könnte bei der Ansprache bestimmter Stücke helfen.

1 Introduction

In 1992 the description of the above mentioned sites and their artefacts was published (SCHMUDE 1992); the recognition and acceptance of these was based on the personal experience of the author with artefacts in France, Germany and Spain, and in addition the confirmation of a number of prehistorians experienced with this complex. In the following years the artefacts of Kirchhellen and Weeze met with critic and non-acceptance as well as acceptance. A certain picture developed during the years following the publication of 1992. The persons accepting these pieces as artefacts based their opinion on long experience and intimate knowledge of artefacts, found on surfaces of terraces as well as from gravelpits and from inclined, eroded terrace-slopes in agricultural zones. Most of these persons, further named group "A", had, in addition, also gathered experience with geofacts as well as with experimental production of stone-tools. This experience was collected in countries with longstanding research into the numerous fluvial terraces and their palaeolithic sites with inventories made mainly on quartzite, quartz and others, but only to a low degree on silex. So the recognition of artefacts is, by this group, based on a wealth of empirical knowledge, including excavations with 2000 to 6000 artefacts on quartzite/quartz, showing a wide spectrum of types of tools as well as a wide range of conservation covering all aspects: eolised, leached, patinated, rolled and mixtures of these. Experimental artefact-production is an additional tool. (TAVOSO 1978; QUEROL & SANTONJA 1979). The oppositional group, "B", bases its critical position on several statements listed in the following.

- a) Pieces, which are rolled, are only acceptable as artefacts, if additional archaeological documentation as rests of fire, worked bones etc. exist. (HAHN 1991: 52);
- b) only, if pieces, made on rocks not originating from this location and which are not in a secondary position, exist, are such pieces acceptable as artefacts from secondary sites (HAHN 1991: 51);
- c. it is not possible to recognize elder, sparsely worked artefacts in great accumulations of pebbles, as there are to many pebbles damaged by nature and alike to artefacts, especially if collected in lengthy periods of time. (ROEBROEKS 1993: 12+13);
- d. if artefact-character is claimed, a number of simple criteria should be fulfilled: unifacial regular and low angled flaking indicates an artefact, bifacial flaking therefore a geofact; an anthropogene flake should have negatives on its dorsal face etc. and others on details (HAHN 1991: 53&54).

These are also the criteria used as arguments against the finds from Kirchhellen and Weeze. So the author found himself faced with two opinions. At present there seems to be a stalemate situation, where one can only join one of these schools: an unsatisfactory situation and the author searched for possibilities to open ways for new movement. The approach is as follows: to be able to distinguish between arte- and geofacts, it is a basic condition to know both in detail. There are numerous sites and artefacts from an Elder Paleolithic, which can be studied. This is, however, different, when it comes to geofacts. Isolated observations and a few publications attempting to establish criteria (PATTERSON 1983, also in HAHN 1991) have been published. As the separation of arte- from geofacts is one of the very fundamental questions in prehistory, the establishment of criteria should be the result of an extensive, detailed study of the origin of geofacts and the context. Then, following an analysis, as a next step conclusions could have been drawn and, finally, criteria established. For the group „B“-arguments no such analysis seems to have been published. The criteria postulated and used seem to be the result of isolated personal observations, generalised regardless of the context. Here an example for illustration: one of the statements published by HAHN (1991:52) and widely used, demands, that a flake found, especially in secondary situation, should have negatives or scars on its dorsal side, indicating human work, as natural forces can also produce flakes, but then these would be without traces of further work, i.e. completely cortex-covered. However, nature produces also flakes with scars on the dorsal side (personal observation of the author: Bay of Biscay-beach, limestone; Pyrenees river: Gave d'Oloron, limestone). More important: the Acheulean in the Mediterranean Area contains a significant percentage of cortex-flakes, separated from

the numerous great cobbles; they comprise 20-50 % of the total of flakes. Many times a small series just contains a few such pieces. This criterium did in one discussion lead to the doubtful situation, that out of a series with hand-axes, choppers and cores the only flake found, a typical great piece for the production of tools, completely cortex-covered, was declared a geofact (TAVOSO 1978: 80, 258, 268, 275, 288, 291, 296, 301, 356). It must, however, be mentioned, that HAHN (1991) explains repeatedly, that the last decision should always be based on the geological situation. The author felt, that one way to progress could be a more detailed study of the creation of geofacts and the context, on the limited scale available to him. He began to observe locations, where geofacts are produced. The results up to now are highly interesting and seem to indicate certain tendencies. These shall therefore be explained here and may perhaps show a different approach to the problem.

2 Working Method

The basic principal is a change of the presently used manner of approach, that is to imagine hypothetically, what could (and partly may!) happen in nature and use this speculations to explain in which manner a disputed piece may have been created; frequently publications with observations of isolated cases are added to this hypothetical approach and are generalized. The author returned instead to the empirical approach: see for himself, what rivers really produce, note the observations, collect typical pieces and only thereafter try to recognize trends and, if possible, draw conclusions. This also means the end of discussions with partners, which cannot denominate locations and contextes, on which they can base their argument or which do not dispose of the necessary general experience. In other sciences it is an accepted method to form a working-hypothesis and then test, if facts fit into the theoretical frame; this testing is, in our case, missing. Following example may illustrate this: in the river Sieg, in a certain pebble-and-cobble-accumulation, flat slabs of quartzitic sandstone do, under the peculiar conditions of this spot, form numerous long, slender pic-like geofacts of rectangular diameter. Theoretically they should not exist: it is a physical and technical experience, that any material will first break at its weakest point and a very long and slender point should, in line with this, break off somewhere in the first third. However, nature here shows, that facts are different from a theoretical approach. As a practical method in the field to study accumulations of pebbles, the same manner of search as for artefacts was used, that is: slow, regular walking, adapting speed to circumstances and using geometrical patterns ensuring observation covering the complete area

chosen, focusing now on natural damages. For each site notices of the observations are taken, typical pieces collected. A worker, amateur or professional, studying the geofacts of a certain location and/or area will in most cases detect a pattern of damages typical for the same and the conditions ruling there. He may encounter repetitively the same form of damage, but also a design composed of many, sometimes difficult to describe, facettes or multitudes of such damages. It is therefore necessary for him to store in his memory the picture of the design of the significantly damaged pieces, to be later able to recognize such a pattern.

3 Observations and Tendencies recognizable

3.1 Locations observed

The following rivers, beaches and moraines where studied:

- a) Gave d'Oloron and Nive/Nivelle, rivers in the piemont of the Pyrenees, mainly with quartzite, quartzitic sandstone, vulkanites (France),
- b) Ain, Rhone-tributary, mainly with limestone/dolomite (France),
- c) Alm, Totes Gebirge, with limestone/dolomite (Austria),
- d) Sieg, Rhine-tributary, mainly quartzitic sandstone, basalt (Germany),
- e) Beaches between Biarritz and St. Jean de Luz, Biscaya: limestone, quartzite, quartz, sandstone, silex, shale, vulkanites etc. (France),
- f) Beaches near Eckernförde, Baltic Sea: nordic moraine with quartzite, shales much granite and others, flint (silex), sandstone, limestone etc. (Germany),
- g) Mindel-moraine near Konstanz/Bodensee: quartz, limestone, shales etc. (Germany),
- h) Moraine north of Lingen/Ems: quartzite, quartz, flint/silex etc. (Germany).

This is certainly a short list, but even these limited observations show surprising tendencies. The details of these locations shall be published in the future.

3.2 Tendencies recognizable and conclusions

The study of the material of these locations did show certain typical, repetitive natural damages in connection with certain geomorphological conditions. This enabled the recognition of tendencies and therewith conclusions.

- a) It is not possible to establish simple criteria to distinguish artefacts from geofacts as: unifacial, regular, flat flaking indicates anthropogene origin, bifacial the contrary, a natural origin. Natural forces produce both and other geofacts, for instance, flakes with dorsal negatives, indistinguishable from arte-

facts, in fact complete series of geofacts looking like "archaic tools". Furthermore, discussions with quaternary geologists confirm, that the processes in nature are much to complex to allow the establishment of simple rules.

b) Rocks differ in their behaviour against forces more or less, in many cases extremely. Silex, the greatest deceiver, produces easily geofacts, which can be mistakenly collected as artefacts; limestone/dolomite also does, but to a lesser degree. Sandstone, if brittle, shows typical breakage, while tough quartzite is much less liable to break at all. It is of utmost importance to differentiate: at the same site one may find hundreds of artefact-like looking geofacts, perhaps from limestone, while tough quartzite produces nearly no geofacts at all and if so, separation follows crevices and generally natural zones of weakness. And so there can be quartzite-artefacts at the same site, for instance choppers, which would, without differentiation, be mistaken for geofacts. A person experienced only with silex cannot utilize the knowledge gained to criticize disputed assemblies made on other rocks. To be able to do so, one has to pass an intensive period of learning to understand the respective rock and its peculiarities, which should by no means be underrated: it should include practical field-work, the study of collections of artefacts made on this rock, experimental knapping and then the same for geofacts, and all this in a prolonged period: we speak about years.

To be able to recognize, in addition, altered (eolised, rolled, patinated, leached etc.) artefacts and to distinguish them from geofacts, which - contrary to the position frequently taken - can be learned, one has to have a certain talent, namely to see the original forms of the surface through the veil of alteration. One sees occasionally in collections of amateurs between numerous well-conserved artefacts a few altered pieces: the collector "has the eye". There are, on the other side, professionals and collectors with great collections of good standard, but which do not recognize altered pieces. A student, who has learned, additionally, that altered pieces are "unpersons" and cannot be artefacts, will have the greatest difficulty in ever learning it, even if he has the talent. It is quite astonishing and a contrast, for a worker from northern or middle Europe to cooperate with prehistorians in the Mediterranean area, which have due to their lifelong contact with these type of artefacts and sites, the necessary experience. From TAVOSO (1978: 255, 256) the following is cited as an example: "... les 29 outils et éclats qui composent cette série ne représentent ... qu'un échantillon - assez pauvre ... à cause de l'intensité de l'usure fluviale qui, effaçant les arêtes, polissant les facettes de taille et émoussant leurs contours les rends si semblables aux galets qui les entourent, que leur découverte est beaucoup

plus une affaire de chance, de patience ou de „flair“ que de l'observation. La reconnaissance de ces quartzites taillés est rendue encore plus difficile par le fait qu'il n'y a aucune différence de coloration entre le cortex des galets et les facettes de taille ..." (... the 29 tools and flakes, which compose this series, represent ... a rather poor sample ... caused by the intensity of the rivers usage, which by erasing the ridges, polishing the scars of flaking and blunting/rounding their contours makes them similar to the pebbles by which they are surrounded, so that their discovery is much more an affair of chance, patience or "flair" than of observation. Recognition of these worked quartzites is made even more difficult by the fact that there is no difference of colouring between the pebbles and surfaces of the scars." (End of citation.) This is an excellent description of the problem. (See also DE LUMLEY, 1971: 184, 196, 197 and MACRAE 1988: 92). Another aggravating circumstance is the dominant silex-tradition of Northern/Middle-Europe; the introduction of quartzite- and quartz-artefacts in Germany has been a continuous, tenacious discussion through decades, against rigid traditions, while in other countries the work with them was already well established routine for long periods. The discussion of A. Rust's eoliths has also left traces, which still today aggravate the problems.

c) The creation of geofacts depends on many factors, which intermingle and influence each mutually, such as the original form of rock, the length of the transport-distance, the geomorphology in general and specifically. (Fig. 1)

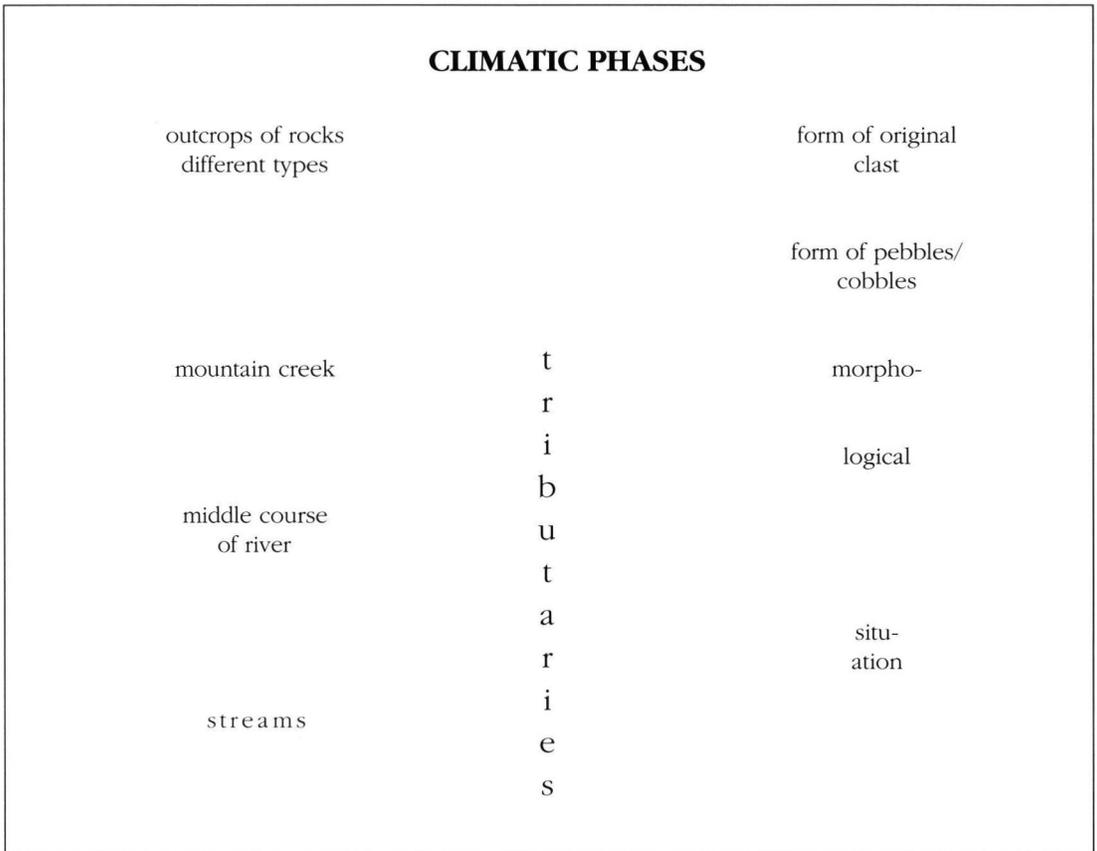
According to the observations geofacts are in rivers very fast rolled to such a degree that the damage cannot be recognized anymore. This differs from rock to rock, but after 20-40 km transport most damage seems to be unrecognizable.

This is partly different in moraines, where damage increases with the length of transport, but scars are thereafter still well conserved. Pebbles transported in a river would, after 500 km, be completely rounded; this is not so in the nordic moraines.

As mentioned before, all rocks react differently to forces and processes. Therefore geofacts of one rock may in several places show similarities, in others they may differ; pieces found may, of one rock, be geofacts, but - in the same place - of another rock be artefacts, while both look similar, e. g. like „choppers“. In a steep valley, still in the mountains, where masses of very differently sized rocks, sometimes very big ones, are transported, geofact - production is high. In a wide valley, further down, where the pebbles/cobbles have already been sorted to a certain degree and are on average smaller and more evenly sized, geofact-production diminishes and differs from the above mentioned case. The same ap-

Fig. 1: Mutually influencing factors in the process of geofact-production.

Abb. 1: Sich gegenseitig beeinflussende Faktoren im Prozess der Geofakt-Entstehung.



plies to the different situations on beaches: a position in front of a cliff or, on the other hand, a flat, sandy beach, produce very different types of geofacts. All this is part of very basic circumstances; they should be studied first. Thereafter one may approach the more complicated situations: the influence of periglacial conditions and the mixture of products of many conditions in a great stream, which transports over a long distance and accepts tributaries entering with a diversity of material, laden with different transport-effects. But to be able to understand these, one has first to learn the simpler, the basic forms. Here a negative example: in a discussion a participant, asked how he knew, that certain pieces from a terrace were geofacts, replied that he had studied the pebbles of this terrace. This is, in the authors opinion, a doubtful approach, because not having studied the basic forms in simple cases, he is not in a position to recognize these under the much more complicated conditions on an elder terrace from a great stream, with a mixture of geofacts and possible artefacts. This can be compared with someone trying to translate a Latin author as Caesar without having learned the grammar. And it brings

us back to an additional problem: not being able to call on the necessary knowledge, succour is sought from hypothetical, speculative construction.

3.3 The Site of Sorde l'Abbaye

As an illustration of the above mentioned points, the approach to a site in SW-France is described.

The Site.

In the valley of the Gave d'Oloron, near the above mentioned village and close to the rivers end, a gravel-pit produces sands and small gravels from the remains of a terrace conserved in the form of an island, with altitudes between 37 and 44 m a.s.l. The riverbed is at 0 m a.s.l., under tide-influence, ca. 35 km from the sea. The gravel contains an enormous amount of pebbles and cobbles, the great majority being of tough palaeozoic quartzite, up to 50 - 60 cm length and nearly equal width and thickness. This terrace is dated as „Mindel“, the age is therefore between 0,4 and 1,0 mio y., as defined in this area.

The Industry.

Since September 1991 on 23 visits 64 artefacts were

found. They contain an Acheulean with pics, bifaces and cleavers, together with choppers/chopping tools, 1 scraper, flakes and numerous cores, all of quartzite. Remarkable are the extraordinary size and weight of many of the tools and cores, e.g. pics with up to 2,7 kg, cores up to 18,9 kg. The larger tools and cores are formed with very few, but well-placed, bold, very strong blows. All pieces are more or less rolled, some to the limit, many are eolised, some patinated. A few of these pieces could, on the first look, be geofacts; it is therefore necessary to study this aspect.

The General Geology.

In the valley and the area surrounding this site a number of terraces can be distinguished, but their remains are only seldom clearly recognizable; over wide stretches they have been destroyed, and we find only their remains in the form of pebble-fields, the highest on hill-tops of ca. 140 and 170 m a.s.l. There are good-conserved terrace-rests at ca. 70-80 m a.s.l. near Sorde. The composition of the gravels is similar to the one on the site: in the majority the tough palaeozoic green and bluish quartzite, then quartzitic sandstone, sandstone, decomposed granite and shale, ophyte etc. The surface of the quartzite-pebbles and cobbles is altered, on bigger pieces abt. 2-5 mm deep, but smaller pieces may be completely altered and show inside an olive-brown tinge of colour.

Industry on Terraces and Hills.

Collectors, the author included, have found isolated pieces as well as concentrations on the 70/80 m-terrace and higher up on the slopes. Further south, concentrations are found on top of the hills, covered not by terrace-remains, but a sand-clay mixture. The industry on the terrace is a broad Middle Palaeolithic, with pieces from a Middle Acheulean down to Mousterian, plus Neolithic. On top of the hills one finds a rather young, evolved Acheulean, with flat bifaces, cleavers, rare polyedres, cores and many flakes.

The private collections comprise from 500 to 800 quartzite-artefacts plus a few thousands of pieces of worked, untypical silex, which cannot be classified. From the terrace-surface at 70/80 m originate a few bigger cores with 5-6 kg and scars up to 18 cm length. Corresponding flakes have been found there.

These artefacts are all more or less altered: coloured, encrusted, patinated. Everybody handling these artefacts has a very clear picture of what an quartzite-artefact from this area looks like.

Flow of Material.

In the Pyrenees, between 1300 to 1800 m altitude, a Cretaceous conglomerate crops out, forming mountain-ranges; it contains already well-rounded pebbles

of quartzite and quartzitic sandstone, which erosion transports via creeks into the valleys. These creeks form small rivers, locally named "Gaves", which flow in a northerly direction for ca. 50-60 km, where they join larger rivers, here the Adour, which enters the Atlantic at Bayonne.

The author has, in a number of cases, studied pebble-accumulations in such rivers, as well as a gravel-pit producing sands from the lowest/youngest terrace. The picture he has gained shows that today's rivers transport mainly limestone, ophyte, sandstone, some silex and others: higher up in the river the pebbles/cobbles are frequently and to a considerable degree damaged, but further down-river the damage diminishes and in addition, natural damage becomes less and less recognizable as the result of rolling and polishing. Newer damage in these lower reaches is rare and easy to understand. The terraces higher than 30 m contain, in contrast, a great majority of the tough quartzite/quartzitic sandstone, whose pebbles are well rounded and do not offer points/areas for attack. Damage is therefore rare; if at all, pieces separate along zones of weakness and here, on the sharp edges, splintering causes occasionally a series of small scars. There is, especially if one is familiar with the quartzite-industry from the terrace-surfaces, a very clear distinction possible between arte- and these geofacts. With the 64 artefacts only two or three questionable pieces were found, clear geofacts, broken along crevices and with consequent splintering along the newly formed sharp crests. The greater problem is the degree of rolling: one finds relatively frequent pieces, which have most probably been artefacts destroyed by the river; to draw the line, what to collect is frequently difficult. The criterium used is the condition, that there must still be marks of the blows recognizable, either the point of impact, radiating striae, bulbous or scar, or an unmistakable configuration of polished scar - forms of a typical piece, a biface or a discoid core, for instance.

The nearest recent, steeper, cut-in valley-stretch, which might favour geofact-production is ca. 30 km distant, too far, to deliver fresh-looking geofacts to Sorde l'Abbaye, but this stretch did, anyhow, not exist in the period of formation of the 37-44 m terrace as it is now situated at a lower altitude.

It must be emphasized, that this is a simple case. But even here, a considerable amount of knowledge and practical experience has to be combined with research on the local peculiarities to enable one to arrive at a well-founded, realistic position.

3.4 Additional Observations.

The very specialized experience which the person working on a site on or in a terrace, gains, cannot be highly enough rated: he has seen thousands of pebbles

bles, geofacts and artefacts, learned their peculiarities and has become familiar with them to a degree which an occasional visitor cannot acquire in a short time. To this visitor, a certain number of pieces may look acceptable, but others doubtful or even suspicious: his reaction will be to refuse these latter. If he has enough practical experience and has gone through the same process, he will rather state that he has difficulties to follow the opinion of the worker, but will realize his own disadvantage and leave these pieces open, until he can spend more time on an intensive study.

An imperfect method frequently used is the refusal of pieces which the critic does not accept, with the statement "this is nothing". In 90% of all cases this is, even combined with an explanation, unconvincing. It is a basic necessity to show the professional, student or amateur a way to learn and gain his own, personal experience. Examples are: showing the respective pieces of ones personal collection of artefacts/geofacts or indicating places where one can see them, or collections of museums/individuals with this type of discussed artefacts. The authoritative statement "this is not an artefact" without exact explanation and not combined with an example in stone or the indication, where to study it in nature, is unconvincing.

Another point of discussion is the length of time involved to find isolated artefacts: a long period is supposed to underline the natural origin of the putative pieces. Roebroeks states "It took Würges about two years (!) to assemble this set, which is very clearly a selection of pieces, whose number is infinitesimally small compared to the whole" (1993: 16). For anyone having worked on terrace-surfaces or in gravel-pits producing from thebeds, this is the usual daily routine. Numerous collections in the Garonne-area, the Nahe, the Mosel, the Wetterau or also Sorde l'Abbaye near Bayonne would not exist, if this would be used as a criterium. Many a concentration was found lateron as a consequence of earlier isolated doubtful finds. On todays terrace-surface as well as on palaeo-surfaces artefacts were loosely spread, normally isolated; the concentration is the exception. If isolated pieces or small-concentrations are mingled with the pebbles of accumulations, they become nearly „infinitesimal“, but with the necessary patience (and luck!) they can be found. Even in English or German gravel-pits producing silex-artefacts patience is required: MACRAE states 8 hours on average per artefact found (1988: 129) in England, a country with an extraordinary wealth of artefacts.

Another good example is the collector Plasse, who found in the Leine-river-gravels near Hannover the first silex-flakes relatively fast, but the first handaxe after 13 years! (JACOB-FRIESEN 1949: 15).

The above mentioned criticism (and other similar points) shows a lack of communication between

some of the professional prehistorians and amateurs, to the detriment of prehistory.

One of the rigid rules of prehistory when considering the possible artefact-nature of a piece found, is: „from a collection or series every piece has, also when considered isolated, to be clearly an artefact.“ At least with respect to collections of altered pieces made on quartzite, quartz etc. this rule is not sensible. In an inventory consisting of a number of pieces, which are altered in varying degrees, from nearly fresh to nearly unrecognizable, one has, based on the part of better conserved and clear artefacts, to consider accepting as well those pieces, which one might not accept as an isolated find. There is no logic in rejecting a piece which is well known from excavated or otherwise secured inventories or which constitutes a regular part of many series together with bifaces, choppers, flakes, cores etc. in the gravels of the terrace, only because it is little worked and difficult to recognize for the inexperienced person. One should never tear a piece out of its system, its context, into which it belongs. One might ask for a description of the pattern of geofact-creation for comparisons, but it must be underlined, that artificial separation of pieces from their context will lead to misjudgement.

Frequently one encounters statements, that differing alterations of scars and/or parts of a piece are an indication of differing periods of creation and that therefore these are geofacts. This argumentation is not applicable on quartzite and quartz, as on each site with artefacts from gravel-pits these contain numerous pieces with differing states of alteration, sometimes more or less limited to certain scars, sometimes to parts of the surface. The configuration of such pieces, bifaces, cleavers or chopping tools, shows however that they have been produced in one act. The differences in alteration are the results of variations of the position on or in the ground and the respectively varying conservation of parts of such a piece.

4 Kirchhellen and Weeze

If we apply the above explained observations and conclusions to the sites of Kirchhellen and Weeze and their inventories, a number of points call for attention:

- a) frequent experimental knapping showed, that the main rocks, of which the pebbles/cobbles consist, had certain limitations in their usefulness as tools.
- b) silex/flint: the numerous globular pieces (in Kirchhellen one of 11 kg), are full of fractures; if hit, they burst into many small pieces, which could after retouch be used for scraping and cutting. Such tools were not found, but have probably been destroyed by the river and the climate. Only in Kirchhel-

len one piece with a scraper-like retouch was found, but it is impossible to assure its anthropogene origin. c) quartz: is frequently full of crevices and fractures and very coarsely structured. If hit with strong blows, it sometimes bursts into pieces, which can be used for scraping and perhaps cutting; again it is not possible to identify such specimens. According to JUSTUS (1988: 49) occasionally compact blocs from the Alps have survived transport and provide better material. Apart from a few artefacts on mediocre quartz, one great flake of 3,25 kgs, made of a better variety, was found.

d) Palaeozoic quartzites, comprising such varieties as the Taunus-quartzite, the Revin-quartzite from the Ardennes/Eifel-region and others, many of Devonian origin (with *Spirifer* sp.) offer frequently magnificent-looking oval, flat pebbles or slabs, inviting experimental knapping. If hit, they mostly separate along surfaces of schistous inner structures and other zones of weakness, offering irregular, smaller pieces of rock, useful only for small tools. They have sharp cutting edges, which blunt relatively fast, as experiments on hard wood and bone show.

e) Tertiary-quartzite is also difficult to work, but has important advantages over the other materials. There exist great pebbles or blocks, well rounded, occasionally ca. 60 x 40 x 30 cm, normally in the range closer to 30 x 20 x 25 cm. Frequently one finds remains of the greater blocks/pebbles, in form of prismatic, jagged or irregular blocks as well as flat pieces. If hit with strong blows, flakes will separate from the pebbles or blocks, but they often follow zones of weakness in an irregular manner and only a limited amount of real flakes with bulbous and conchoidal forms are produced. However, in experimental knapping flakes in the range of 10-12 cm length were produced, which might be converted into tools. The result of this work is a very resistant tool, which stands up well against use and in fact, as trials show, much better than the other rocks. This seems the ideal material for heavy work, but can also cut very efficiently.

Considering the great refuse-heaps in the pits, one should bear in mind that they offer a false impression: in relation to the volume of gravel and sand produced they are very small, as observation shows. So in the past these pebbles/cobbles were sparsely and widely distributed, there was no surplus as for instance in Sorde or the Garonne-area. Men had to search and make use of what was within reach. In addition to being rare, larger cobbles/-boulders in Tertiary and other quartzites have frequently strongly rounded forms and the angle of the planes is unfavorable for knapping. Having nevertheless found a cobble with favorable surface-forms and having produced at best one or two medium-sized flakes (4 - 8 cm), the rocks burst into irregular pieces along

crevices. Such pieces may show the form of a flake or triebre and have certainly been used, but to recognize them as artefacts is quite difficult. The above picture is based on experimental knapping.

This means, that the rocks from the Rhine-gravels do offer material for tool-production, but of irregular and mediocre quality; the resulting tools or artefacts will have their peculiar traits and a picture much more difficult to recognize than inventories of better material as for instance in Middle Spain, where excellent and SiO₂-rich quartzite is available. The quartzite from Sorde l'Abbaye is in-between the two mentioned materials. Sites with rocks offering even more difficult pictures are the coarse quartz of the Roussillon-terraces, very irregular limestones from North Africa (Terra Amata-Museum, Nizza) or the quartzites from Olduvai Beds III and IV, on which scar-boundaries are hardly visible and not countable; this is the material used for bifaces/cleavers! (LEAKEY 1994: 265).

Here an example is used to explain the problems created by rash criticism on a difficult material. In Weeze one convex chopper on quartz has been found, on which 5 to 6 long parallel scars on one side can be recognized, at a rather steep angle of 70-80°. Visiting prehistorians all accepted this piece as a convincing chopper; however, one found on the lower, flat surface of this plano-convex piece, partly in parallel with the working-edge, fine crevices and felt, that the postulated scars were in fact planes of some of the crevices, where the quartz broke off under pressure by other cobbles or boulders. As this does of course happen, the argument seemed at first sight valid; a detailed study showed, however, how dangerous these rash judgements are. On closer and more detailed look it became clear, that the next parallel crevice (7 mm distant) entered the cobble at an angle of ca. 45°, as do other visible rests of such: these crevices cannot have caused the scar-like surfaces with an angle of 70-80°. It is still thinkable, that the beginning of the crevice in the lower surface could have served as a starting point. The author collected quartz-cobbles in the pit and partly worked them, producing chopper-like pieces. Studying these collection at home he found, that only rather marked, deep crevices serve as a starting zone or „point“ for a break-off, while the thinner fissures have apparently no influence on the internal compactness of the quartz. If quartz breaks off at a crevice, it follows as a rule the flat, smooth surface which forms the crevice. All this shows, that the recognition of such a piece demands very detailed, intensive study and an intimate knowledge of the material, gained over a longer period. With difficult material such as this, it is not possible for a visitor to form a definite opinion just by letting the pieces run a few hours through the hand.

To be able to recognize artefacts in the a.m. sites, it

is necessary to study at least the basic formation of geofacts in the more important tributaries with representative character, close to the sites. As a start, accumulations in the river Sieg have been studied and the numerous geofacts found show a very clear pattern of geofact-production. In quartzite, these are easy to distinguish from artefacts; the basalt-geofacts form more frequently surprising pseudo-artefacts ("choppers"), but the general context and their proportion in the pebble-content of the river confirm the geofact-origin. In the near future other rivers in the proximity will be studied as well, but as their pebbles originate mainly from the Devonian, their contents should be the same or very similar to the Sieg. It will be interesting to study other rivers such as the Maas or Mosel, which have a longer/greater area of material inflow.

The conclusions based on the above general and also the specific part, concerning Kirchhellen and Weeze (leaving aside local differences), are:

- a) A certain part of the pieces are artefacts. They differ strongly from the geofacts and conform with artefacts well-known to the author.
- b) The other part contains artefacts, but of which a geofact-character of some cannot be excluded.
- c) Flakes are, due to their inherent problems, treated as a separate group.

The flakes from Weeze do contain in the authors opinion a few, which are definitely artefacts. Having seen large amounts of flakes, including the typical large Acheulean specimens, one can discern typical traits, which mark the intentionality. As these traits are composed of a multitude of facettes, they are difficult to describe, but a result of experience. There is, e. g. a large flake of quartz with 3,25 kg, showing well-conserved and strongly expressed marks of blow, which differs completely from everything seen and/or found in quartz in Weeze, but compares well with large Acheulean flakes, e. g. those from the authors collections from SW-France.

Observations of indirect character can also be important and underline the arguments connected with the lithology. One such argument is the regularity of finds on certain sites only: if we would deal with geofacts, we should find them everywhere. Out of 15 pits visited by the author, only four contain industry. This includes four pits in the area of the Weezeterrace (ca. 4 x 1 km), in only two of which artefacts are constantly encountered, in the other two not; this is a mirror of the situation on the surfaces of many terraces with industry. Again: if here geofacts, presented as artefacts, are collected, we should find them in all places.

4.1 A recently found typical artefact: a cleaver

Here follows the description of this cleaver, mentioned in connection with the Tertiary-quartzite-flakes, on one of which it is made. The dimensions are:

L = 172, B = 122, Th = 68 (mm); W = 1,51 kg. The tool is made on a flake of the a. m. Tertiary-quartzite, from which the bulbous has been removed; the striae of radiation are, however, strongly expressed and easy to recognize. The form of the piece is parallel-sided with a pointed butt. The edge is slightly oblique. The ventral face shows lateral retouch, partly invasive. The dorsal face is worked around the butt. The working edge is battered (use; river; refreshing?). This cleaver fits well in the line of cleavers known from the Spanish Meseta, as in Pinedo and El Sartalejo (QUEROL 1979; SANTONJA 1985). It does not show the elegance known from many north-african cleavers; here the difficult lithic material intervenes unfavourably, but for an artefact of over 783 000 years it is well worked.

4.2 Kirchhellen and Weeze: conclusions

The research of the period after 1992 does produce a certain shift in accent, but the first statement is still fully valid, even strengthened: Kirchhellen and Weeze are paleolithic sites with industry, in Weeze older than 783 000 y., in Kirchhellen either somewhat younger than the Matuyama/Brunhes-limit at 783 000 y., or perhaps elder, with further clarification hopefully in the future. One has to accept, that in this type of site - fluvial terraces with rolled/eolized/patinated artefacts - the recognition and acceptance of the anthropogenic origin of the specimens in question, which are part of a complex of pieces difficult to interpret, demand differentiation as well as an unusual degree of specialised experience.

5 Summary

The essential points in the afore mentioned text are:

1. It is possible to find altered, sparsely retouched artefacts in fluvial terraces and other pebble-accumulations: it can be learned, but needs intensive training and a certain talent.
2. It is not possible to establish rigid general "criteria" to distinguish between arte- and geofacts.
3. Each worker, engaged with such sites, has:
 - to gather a wide knowledge of such artefacts,
 - to gather a broad knowledge of the general geofact-creation,
 - to start at each site anew to study conditions and context, which can successfully only be done by someone intensively experienced in these matters.
4. These problems can only be approached in an empirical way and therefore the years of experience as well as the amount of material seen count.

6 Possibilities for future research

Concluding this paper, possible directions for further research are suggested.

To obtain a closer approximation to the solution of this vital question for prehistory, in our case: how to distinguish artefacts from geofacts, several ways appear open. There are numerous questions of the processes and their possible influences on geofact-production still open, which could be explored; the ideal aim would be to find objective, measurable criteria, which seems at least at present very unlikely. A first possibility would be the extension and enlargement of the studies described in this paper. To observe more pebble-accumulations should increase knowledge and assist in closer limiting the area of the gray zone between artefacts and geofacts, apart from increasing and spreading personal experience. In addition, one may, even if to the author this does at least at present not seem a good prospect, attempt the study and description of the complete surface of selected limited areas on pebble-accumulations, in sq.-metres or complete bancs, and see, if this produces new impressions.

Another approach would be to form a conception of the forces necessary to move coarser pebbles in the rivers and to damage each other, producing geofacts, which may occasionally mimic artefacts. This would mean to enter the complex of sedimentology concerned with the dynamics and forces in rivers, their calculation and the analysis of the morphometry of pebbles. (See REINECK & SINGH 1980, numerous references).

To the author it seems a basic necessity to study as many aspects as possible of the processes in rivers and to recognize the framework of conditions and factors in the role of geofact-production, which plays only a secondary part in the total process and of this limited part pseudo-artefact-production in its turn plays again only a less important role. But detailed knowledge of the context may assist in achieving better understanding of the facts, important to prehistory, still accepting that a „gray“ zone of indeterminable pieces will always exist under the highly complex conditions.

A different line of approach would be to systematize technical characteristics on postulated artefacts. The above described cleaver (4.1.) could serve as an example. Traces of damages, which are postulated to be anthropogene, are visible; listing all the scars plus the modifications of the pebble-body reaches a point where, in comparison with cleavers from collections from similar circumstances as well as the geofacts typical for the site concerned, a decision should be facilitated. In our case, the cleaver, it becomes apparent, that the possibility of a conformity by hazard with a geofact can be overwhelmingly excluded, especially if such piece is found on a site where other artefacts have already been found.

The following could be another possibility: in a conversation this remark was made: the experience,

the numerous artefacts of the type with which we are concerned and as well the geofacts, which you have both seen and memorized, can never be stored and programmed in a computer. At least to the authors knowledge this has not been tried.

On a very different level inquiries might be started: how far are possibilities explored, that in other disciplines of science, for instance cristallography, petrography, mineralogy, engineering, physics or others, in this period of fast developments new knowledge, technics and experiences exist, which could lead to advances in the solution of our problem, perhaps even a first step to objective criteria. The great majority of recent new scientific and technical developments came from interdisciplinary cooperation: this problem is a typical case for such.

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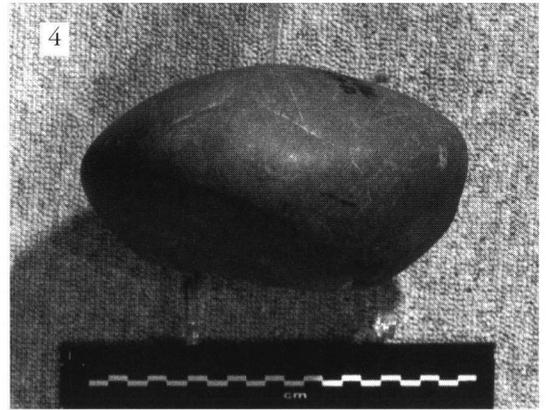
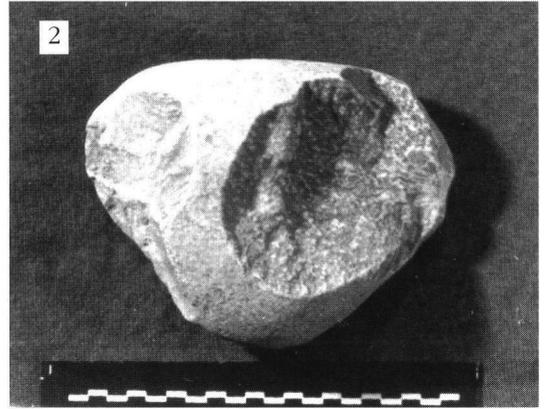


Plate 1/Tafel 1:

1. Geofact on limestone, simulating "chopping tool".

1. Kalkstein-Geofakt, „Chopping-tool“-ähnlich.

2. Geofact on limestone, simulating "nucleus".

2. Kalkstein-Geofakt, „Kern“-ähnlich.

1. and 2. show typical pieces created by wave action on flat pebbles on a beach. Origin: beach near Biarritz, Bay of Biscay.

1. und 2. zeigen typische Stücke, die durch Wellen-Schlag an flachen Geröllen auf einem Strand entstanden.
Herkunft: Küste bei Biarritz, Golf von Biskaya.

3. Geofact-flake: same origin as 1. and 2.

3. Geofakt-Abschlag: selbe Herkunft wie 1. und 2.

4. Undamaged quartzite-pebble from the same beach as (1), (2) and (3). In contrast to the limestone-geofacts, the quartzite-pebbles are only in extremely few cases flaked and then with very small scars of only ca. 0,5 - 1,0 cm. If damaged, this is along crevices.

4. Unbeschädigtes Quarzitzeröller vom selben Strand wie (1), (2) und (3). Im Gegensatz zu den Kalkstein-Geofakten sind die Quarzitzeröller nur in äußerst seltenen Fällen bestossen und dann mit sehr kleinen Negativen von nur ca. 0,5 - 1,0 cm. Sind sie beschädigt, so ist dies längs Klüften.

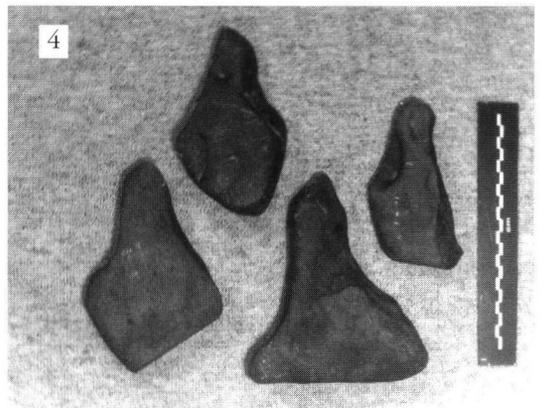
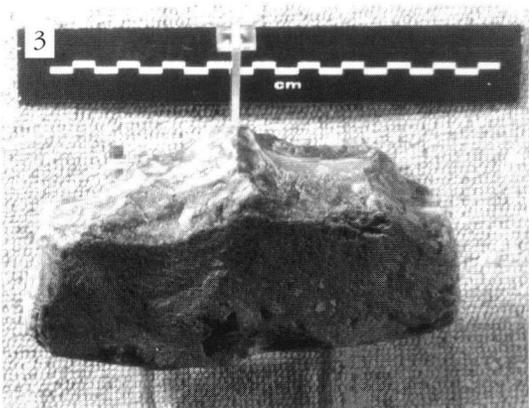
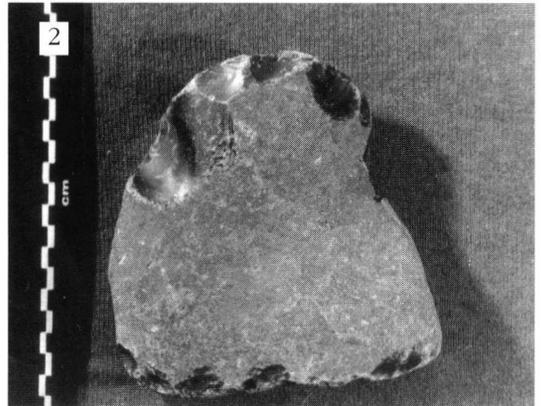
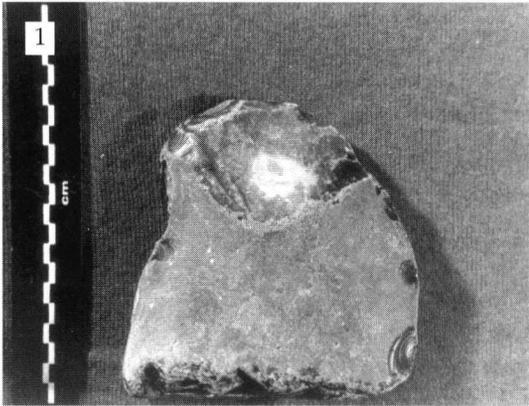


Plate 2/Tafel 2

1. and 2. The damage of this geofact on flint (silex) follows the same pattern as seen on Plates 1 and 2. Found isolated, such a piece could by a less experienced person be taken for an artefact. Origin: Danish Isle of Møn. Beach below the famous cliffs.
 1. und 2. Die Beschädigung dieses Flint-Artefacts folgt demselben Muster wie auf Taf. 1 und 2. Als isolierter Fund könnte solch ein Stück von einer wenig erfahrenen Person für ein Artefakt gehalten werden. Herkunft: Dänische Insel Møn. Strand unterhalb der berühmten Kliffs.
3. Flint-geofact from the beach of the Baltic Sea near Eckernförde, simulating a "chopper". This damage is caused by the transport of the moraine and/or wave-action. If one follows the criteria from group B, this piece might be anthropogene.
 3. Flint-Geofakt vom Ostsee-Strand bei Eckernförde, ähnlich einem „chopper“. Diese Bestossung wurde durch den Transport in der Moräne und/oder den Wellenschlag verursacht. Folgt man den Kriterien der Gruppe B, könnte dieses Stück anthropogen sein.
4. Pic- or point-like geofacts on plates of devonian quartzitic sandstone in the bed of the river Sieg, near Eitorf. Theoretically these long, slender points should be broken off, but they are typical for this stretch of the river.
 4. Pick- oder Spitzen-artige Geofakte an plattigem Geröll des devonischen quarzitisches Sandsteines im Bett des Flusses Sieg, bei Eitorf. Theoretisch müssten diese langen, schlanken Spitzen abgebrochen sein, sie sind aber typisch für diesen Teil des Flusses.