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**Oldowan: Rather more
than smashing stones**

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Oldowan, rather more than smashing stones: An introduction to "The Technology of First Humans" workshop.

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"Even the simplest tool made out of a broken bough or a chipped stone is the fruit of long experience- of trials and errors, impressions noticed, remembered, and compared. The skill to make it has been acquired by observation, by recolection, and by experiment. It may seem an exaggeration, but it is yet true to say that any tool is an embodiment of science"

Vere Gordon Childe

New questions for old stones

The appearance of the earliest artefacts is a prominent area of study within the overall field of the exploration of Human Origins. For a variety of reasons, the systematic use of stone tools has been considered a key piece of evidence in understanding the evolutionary process of the human species.

In recent years this affirmation has undergone revision. The application of actualistic studies in the reconstruction of these scenarios has attempted to integrate the appearance of the earliest industries as one more element to be considered within this process of adaptation, yet with a less transcendental character than that traditionally conceded it (see for instance Oliver et al. (ed.) 1994). The lesson behind this proposal almost certainly rest with seeing a need for the appearance of the first stone tools to be embraced within a wider general context.

Yet in parallel with this, we believe that the analysis of these lithic assemblages is an analytical objective that is important in its own specific right. Perhaps this is the reason why we have selected this quotation from Vere Gordon Childe, taking as our own an observation made over half a century ago.

Artefacts have played a transcendent role in the human evolutionary process, not only due to the implications entailed in the study of mechanisms related to the making and managing of these stone tools. It is equally important to remember that in this activity we can recognise other associated questions such as the transmission of information, learning and others behaviours not directly observable in the fossil record, but which are strongly involved in the definition of "human nature".

This is why we believe that this quotation is still completely valid, since many current discussions are directly or indirectly related to the existence of these artefacts. Just by way of an example, the following considerations occur to us as giving cohesion to central questions in current research, such as:

a) to determine the possible causes associated with the appearance of the first artefacts: when and why these hominids began to "depend" on formatted artefacts to carry out their daily activities,

b) the variability and change in early lithic technology: whether they should be considered as being unique and unchanging entity, or whether to the contrary we should introduce various factors as ecological, cultural or temporal in order to explain their composition,

c) the notion of "stasis": which elements explain how these artefacts survive for periods of time measured in millions of years, and why they come to be replaced. In the same way, the causes that promote this substitution process do not appear to be well determined either.

These questions represent the "Oldowan" idea, a concept which in recent years has been the object of important contributions, as we shall outline in the following pages. Traditionally, and from an essentially taxonomic perspective, it has been considered that technocomplexes as a whole prior to the appearances of industries with bifacial tools (Acheulean) should be grouped together under the generic description of Oldowan, thus becoming a type of "hotchpotch".

We are currently seeing an important replacement of these designations by other, apparently looser concepts like Mode I and Mode II, ideas that owe their origins to the proposal made by G. Clark (1977), and updated by various authors (e.g. Foley and Lahr 1997). We believe that this nominative replacement fails to solve the problems of definition entailed both by the cultural nomenclature and the recent proposal.

The term Oldowan (or its synonym Mode I) unites those groups of stone tools appearing in a space-time context corresponding firstly to that which would be termed "African Oldowan", i.e. those technocomplexes described in the deposits inserted in the Rift Valley area (from Tanzania to Ethiopia) and the caves of South Africa, and with chronologies that can be assigned to the Late Pliocene - Early Lower Pleistocene.

At present it is assumed that their distribution includes those stone tools presumably sharing some techno-typological and morphological attributes with those observed in this classic area and which have been described in the North of Africa (Sahnouini 1988), the Middle East (Bar-Yosef and Goren Inbar 1993), the Caucasus (Gabunia et al. 2001) and the Iberian Peninsula (Bermudez de Castro et al 1995; Martinez-Navarro et al. 1997).

In fact, the presence of these technocomplexes outside of the African continent necessarily denotes the dispersion of these hominids over the Euro-Asian continent.

The causes related to the expansion of these hominids over a wide and diverse spectrum of ecological niches has only recently begun to be discussed thoroughly (Roebroeks 2001).

If the geographical dispersion of these assemblages is imprecise, the chronological framework it embraces seems just as confused. Recent discoveries suggest that the oldest known artefacts are to be found at Gona -Kada Gona and Ouna Gona- in Middle Awash (Ethiopia)-, having a chronology which is estimated to be not less than 2.6 million years (Semaw et al. 2003). In the same area, in Bouri, and with a similar chronology, cut-marks are mentioned which, according to the authors, were made by stone instruments, although no lithic tools are documented associated with human bone modified (Heizenlin et al. 1999).

In the not too distant future it is more than likely that artefacts with an earlier chronology will be discovered. Despite this predictable constant revision of the date of appearance of artefacts, what the causes are which brought about the need to obtain stones, knapp and use them in a systematic way, and how this need affected and altered the behaviour of these hominids, are questions whose answers remain elusive.

If the origins of this activity are unknown, its disappearance, substitution or possible affiliation with the Acheulean is equally obscure. Faced with an unilinear view linking the recent Oldowan and Acheulean assemblages, there are lines of argument suggesting that the appearance of what are termed the Mode II imply important transformations, possibly related to the appearance of a new species of hominid, with more complex cognitive capacities, and which could be more closely related to the idea traditionally used to define the genus *Homo* (Cachel and Harris 1998).

Between the beginning and the end of what we term Oldowan it can be affirmed that this technological tradition survived for almost two million years.

These arbitrary limits can be defined by adopting the chronologies proposed for the earliest dated tools in the east of Africa, or to cite an example from the Iberian Peninsula, the case of the artefacts from level Td-6 of the Gran Dolina at Atapuerca, also assigned to Mode I (Bermudez de Castro et al 1995; Carbonell et al. 1999).

The enduring over time of these technocomplexes is possibly associated with another of the challenges, classic in its interpretation and regularly conceptualised like "Oldowan stasis" (Semaw 2000).

A question which may explain this longevity or stasis rests on the fact that Oldowan is considered to be a static entity and with limited internal variability. In fact, the idea of "Oldowan" embraces those technocomplexes characterised essentially by the presence of pebble tools and flakes.

This classic diagnosis was formulated from assemblages recovered in Beds I and II at Olduvai, in which choppers and chopping tools are considered as "artefacts type" in its definition (Leakey 1971).

Any attempt at defining is always problematical since it tries to delimit entities that are heterogeneous or present a degree of variability. In the case of the Oldowan artefacts, they are considered as the result of a simple process; this notion of products created in an expeditive way, without fulfilling any organisational criteria, considering the knapping as the mere application of force on the cobbles or supports to obtain cutting edges.

This identification resting on the definition of these technocomplexes and the activities associated with these artefacts, usually implies an immediate nature and a low level of planning which would have as its correlate a behavioral development similar to that of modern chimpanzees (Wynn 1993).

Faced with this perspective, recent discoveries made at various sites in Eastern Africa question this view. The incipient descriptions from Lokalelei 2c (Roche et al. 1999) or in several findings at Gona (Semaw 2000; Semaw et al. 2003), make up a panorama which is at least critical of this interpretation.

At present only preliminary descriptions are available, but the insistence is that, in these assemblages, dated as more than 2.3 million years old, the artefacts are the result of knapping strategies which cannot be characterised as simple.

For these authors, these artefacts demonstrate that hominids had acquired a certain technical competence which implied a complete understanding of the physical principles associated with conchoid fracture. This knowledge, combined with an effective neuro-motor capacity, allowed them to have a precise control of the organisation of the knapping, managing volumes with the aim of obtaining supports in which an incipient morphometric standardisation can be detected.

These preliminary observations suggest that in very early chronological contexts (certainly far more than in contexts on which the classic Oldowan diagnosis is based) there exists a technical competence which is higher than is usually supposed.

This would indicate that these hominids possessed abilities which were far more developed than hitherto proposed. In other words, this diagnosis does not fit well with the notion of artefacts being made in an immediate and rudimentary manner, as has been defended traditionally.

In the same way, they prompt a new question: if in very early assemblages, such as those at Lokalelei or Gona, systematic knapping methods are defined which can be described as "complex", what were the preceding strategies like that encouraged the appearance of these sophisticated systems?

In other words, what are those primitive technological traces associated with the appearance of these knapping systems like? Or to the contrary, should it be assumed that the complexity of the knapping is knowledge that is quickly acquired and that does not suffer subsequent modifications.

There exists another important variable in this discussion which does not escape us: who is the agent that generates these artefacts? Are these assemblages produced solely by that which we have described as the genus *Homo*, or to the contrary, is it feasible to suppose that several species of hominid were creating artefacts simultaneously? This is another aspect of the debate which will sooner or later have to be dealt with, from the different perspectives involved in the study of Human Origins.

These questions suggest the need to establish comparative frameworks that allow possible changes inside this record commonly described as Oldowan to be detected. The possibility cannot be ruled out that these differences observed between the classic descriptions and recent ones obey questions referring to the archaeological description of the artefacts.

The emphasis on the interpretation of the material from Lokalelei from a perspective related to the "chaîne opératoire" concept, and in which refitting is a basic analytical tool allows a more dynamic approach to be taken regarding technical behaviours and the difficulties involved in the knapping of stone instruments (Roche et al. 1999).

This focus, scarcely developed in the study of collections of a very early chronology, allows for a more integrative understanding than that derived from the comparison of the number of items or percentages of artefacts. These studies have often brought little of interest to the internal description of the variability which these artefacts present; and in the case we are examining, this question may not be a secondary one.

The study of the first technological manifestations is a subject which is attaining a certain degree of complexity and which has to face up to new challenges.

It is possible that these differences that are beginning to be commented on have the underlying implication that different technological traditions are being mixed under the Oldowan label which may correspond to profound and diverse forms in the conception of the making and using of these artefacts. Neither can it be discounted that these differences may be due to distinct species of hominids.

Or perhaps they only denote the deep methodological divergences with which the authors attempt to describe an archaeological entity. Whatever the case, we believe that the idea of "smashing stones" can not longer be sustained.

Putting together some pieces of the puzzle

This diversity of question marks motivated us to hold a scientific meeting which focused on discussing aspects referring to the idea of Oldowan and restricted the scope of the discussion to the material recovered specifically in the African continent. The causes of this decision are various and are bound up with the genesis of this book.

The idea of this meeting was linked to the research project being carried out since the mid-nineties by Manuel Dominguez-Rodrigo in the Peninj-Lake Natron archaeological area (Tanzania). Following a series of surveys aimed at surveying the archaeo-paleontological potential of the area, systematic excavations were begun to verify the important archaeological potential detected in the area.

This project was carried out during 2000, 2001 and 2002, and the work was directed by Rafael Mora and financed by the Spanish Ministerio de Ciencia y Tecnologia and Ministerio de Asuntos Exteriores, and the Vice-Rectorat de Investigació at the Universitat Autònoma of Barcelona.

After studying the stone collections recovered during these seasons, the conclusion we came to did not correspond to the characterisation usually adhered to in the literature on describing Oldowan technocomplexes (e.g. Kimura 2002).

The impression given was that the apparent morphological simplicity of these artefacts might conceal a greater degree of complexity, just as other authors had previously proposed (Gowlett 1986; Texier 1995). Within these assemblages a significant internal variability was noted, i.e. distinct technical systems of artefact making were detected.

The example of Peninj allowed discussing the general characteristics implicit in the definition of the classic Oldowan, the interpretation of the technological variability within these collections; and at the same time to analyze the possible relationships between Oldowan and Acheulean artifacts.

In the same way, this meeting hoped to reduce a substantial deficiency in research in the Iberian Peninsula. The discussion of the significance of the first technologies documented in the African continent was, despite being a relevant subject at an international level, an aspect that had only been dealt with tangentially in the framework of isolated conferences.

Our idea however consisted of organising a scientific meeting in which people could participate and set out in detail the results obtained by various projects under way, focusing on the definition of the Oldowan concept.

This meeting was held over the 18th, 19th and 20th of December 2001 in the Universitat Autònoma of Barcelona (Bellaterra, Spain), within the framework of the 12th Seminar on Prehistoric Technology, and with the participation of Erella Hovers of the Hebrew University of Jerusalem (Israel), David Braun and Jack Harris of the Rutgers University of New Jersey (USA), Pierre-Jean Texier of the CNRS Sophia-Antipolis (France), Rosalia Gallotti, Marcello Piperno and Maria Grazia Bulgarelli of the University of Naples (Italy) and Manuel Domínguez-Rodrigo of the Universidad Complutense of Madrid (Spain). Ignacio de la Torre of the History Instituto de Historia of the CSIC, Jorge Martínez-Moreno and Rafael Mora of the CEPAP-UAB co-ordinated the meeting.

The central objective rested on discussing various questions mentioned throughout these pages, and which were in some way related to the question marks that had arisen as a consequence of the results obtained from the stone assemblages from Peninj. We were able to discuss whether the African Oldowan should be considered as a single entity in which no changes could be observed over more than a million years, or whether, to the contrary, phases of internal change could be established.

In accepting this second possibility, these technical and technological changes were associated with the appearance of some new species of hominid. This proposition was inter-related with another, equally important question: is this variability a consequence of a process of adaptation to the environment, or is it a response to "cultural traditions" differentiated in an analogous way to that recently described in the genus *Pan*? (Whiten et al. 1999).

In addition, the results obtained from these projects were set out in an attempt to contextualise these reflections and how they affect the research into the origins of human behaviour. It therefore struck us as interesting how the different researchers who had come up against materials that were allegedly similar attempted to define what it was that they understood by Oldowan.

In this attempt at definition elements were combined relating both to the recovery of these materials (sampling and excavation methods) and to the methods involved in the description and interpretation of these artefacts.

These contributions provided the opportunity to visit some of the research projects currently being developed in Eastern Africa. Below we would like to set out the basic points presented by the various participants. These notes can serve as general introductions to the contributions made by those authors in this book.

Marcello Pirpeno and Rosalia Galleoti present the results of the Italian Archaeological Mission in Melka Kunture (Ethiopia). In the Melka Kunture Formation the classic sites of Garba, Gombore or Balchit are documented. This important area has been excavated since the 60's and the results obtained by the team originally led by J. Chavaillon and currently by M. Piperno have been published in preliminary form (Chavaillon et al. 1979, and references therein). Just as they explained, following a long period of studying the materials, the authors are currently preparing to bring out a monographic publication of the results obtained in this archaeological area crucial for understanding the significance of the Oldowan and Acheulean assemblages.

Marcello Piperno and Rosalia Galloti's contribution focuses on two different though interconnected aspects. In the first part, they synthesise the general information available about these classic sites. This review serves as an introduction to a detailed examination of the fossil record recovered in Garba IV, stressing the spatial distribution patterns observed at this site.

The application of a GIS enables an analysis of the distribution of archaeological materials, discussing the impact of the site formation processes. The examination of these excavated surfaces allows general intra-site ideas to be dealt with, to which usually it has attributed a secondary importance.

At the same time, they discuss the need to link inferences about the material distribution with a precise monitoring of the vertical dispersion of the materials. These reflections give us an accurate understanding of the significance of this site and are a good example of the archaeological potential to be found at Melka Kunture.

Since the middle of the 90's, Manuel Dominguez-Rodrigo has co-ordinated a research project in the Peninj area (Lake Natron, Tanzania). Interest was shown in this area in the sixties by Glynn Isaac (Isaac, 1965). At the beginning of the 80's, Glynn Isaac began a research project which was cut short by his sudden death. The work currently being carried out validates the notion that Peninj is an area with an immense archaeo-paleontological potential, just as Isaac had alerted.

This study stresses the general characteristics of that known as the Type Section, classifying it within the regional geological framework of the Lake Natron area, discussing its chronology and the sedimentary environments that favour the formation of these deposits. This presentation introduces us to the general characteristics of the archaeological assemblages recovered in the area, which come from the excavation of several sites, whose results were set out in other studies (Dominguez-Rodrigo et al. 2002).

This presentation stressed the need to carry out suitable reconstructions of the ecological contexts with the aim of evaluating the framework in which these early hominids interacted, in a line similar to that proposed by the Landscape Archaeology model developed by G. Isaac in Koobi Fora (Isaac 1984, Isaac (ed.) 1997), and which is being carried out at Olduvai Gorge (Blumenshine and Masao 1991; Blumenshine and Peters 1998).

Finally, it also deals with the question of the important variability documented in the technical systems of knapping detected in the stone artefacts coming from the Type Section at Peninj, a

question which has been presented and discussed at length in another recently published article (de la Torre et al. 2003).

The Koobi Fora Archaeological Project, led by Jack Harris, continues to be one of the basic references for analysing the significance of the Oldowan assemblages. Since the end of the 60's this has been a basic enclave within the studies referring to Human Origins, due to a great extent to the work carried out by G. Isaac, and whose culmination has been the publication of the monographic study on the archaeology of these sites (Isaac (ed.) 1997).

This study marks the end of the series represented by the research carried out during the 70's. Jack Harris has continued working in this area and has co-ordinated a line of research centred on the important archaeological record preserved in this region.

The contribution set out in this book is a result of this project. The study carried out by David Braun and Jack Harris into the technology of the Koobi Fora Oldowan artefacts proposes the development of an instrumental methodology with which to quantify an essential parameter: the size of the cutting edge of the tools. Using an image treatment system and the application of statistical tests, the aim is to evaluate technological and behavioural aspects of the earliest hominids.

The determination of the origin of the raw materials allows analysis of the interactions between technology and raw material sources. Armed with these results, they discuss how the change in the provisioning of the source areas affects the composition of the stone collections from the KBS and Okote Formations.

Discussion of this and other factors allow us to visualise changes in the behaviour of the hominids, fundamental requirement for understanding both the organisation of internal technological guidelines and the transformations observed within those two chronological horizons contained between 1.8-1.6 million years.

The significance of the archaeological sites at Hadar (Ethiopia) was presented by Erella Hovers. The Hadar sites are of great importance in the field of Paleoanthropology due to the discovery in the nineteen seventies of *Australopithecus afarensis*. In recent years, work has begun in several Pliocene deposits in which lithic tools appear.

In this contribution she focuses her study on the stone collection recovered in site A. L. 894, since, with a chronology of over 2.3 million years, it can be considered as one of the oldest sites in which the presence of lithic artefacts has been detected. The emphasis placed in her study on linking stone analysis and formation processes induces us to think of the need to homogenise this type of observation when making comparisons between sites. As she argues, these processes may have profoundly affected the analysis of the assemblages and in consequence may limit the validity of the intra-site comparisons as it is usually carried out.

Her analysis of the stone artefacts from this site leads her to consider that the knapping systems are a consequence of strategies aimed at obtaining flakes with cutting edges, with nuclear forms like choppers not being detected. Another element of discussion raised in this study is the need to integrate the site formation processes when analysing the significance of the pieces that have been retouched.

At least in the case that Hovers describes, the supposed retouch may be the consequence of natural processes, and not the result of an intentional activity directed to modify the edge of the pieces. This observation would make it necessary to review the archaeological contexts in which the presence of retouched pieces has been described.

The contributions presented in this colloquium focus on the four key archaeological areas within the studies into Human Origins: Melka Kunture and Hadar (Ethiopia), Koobi Fora (Kenya) and Peninj or Olduvai (Tanzania).

In parallel with these presentations, various presentations were given during the congress by P. J. Texier and J. Harris.

Pierre-Jean Texier gave two presentations that were of undeniable interest with regard to analysing different questions that arose during the seminar.

On the one hand, he set out his results regarding the NY 18 site at Nyabusosi (Uganda), a generally little-known but nevertheless very interesting site. The technological and conceptual implications highlighted about these Oldowan artefacts are important to bear in mind when it comes to evaluating the concept of technical complexity in the configuration of archaic artefacts (Texier 1995).

The second presentation dealt with research being carried out at the West Turkana French Archaeological Project co-ordinated by H el ene Roche of the CNRS. He presented the discoveries at sites which are set to become relevant for demonstrating the technical competence demonstrated by hominids in ancient contexts. On the one hand there was an account of the work at Lokalelei 2c, which has been published in preliminary form (Roche et al. 1999).

Also presented was Kokiselei 5, a site which will certainly need to be taken into account when analysing the origin of Acheulean industries as well as the relationships between the Oldowan and Acheulean technical systems.

Jack Harris carried out an important synthesis in which he reviewed his lengthy experience in studies into Human origins. Starting with the classic work on the Karari industries, he reviewed the significance of a number of classic sites, such as the Hippo Artefact Site, the Kay Behrensmeyer Site or FxJj 50, all of these in Koobi Fora. Especially revealing were his observations about the new taphonomic and zooarchaeological studies being carried out at these sites and about others that are currently being excavated.

These studies assume that some of the ideas defended in classic work should be reformulated in the light of aspects which were not taken into account in the classic studies (Isaac (ed.) 1997).

Although he focused on the results provided by Koobi Fora, his reflection incorporated results from other sites such as Fejej, Senga 5 and Gona, in which he has participated actively in a direct or indirect manner. He also defended the use of fire as a common element in the activities of the hominids 1.8 million years ago, described in FxJj 20 main. He argued that the discrepancies in the archaeological record in relation to the use of fire, which does not begin to become evident and indisputable until approximately 300,000 years ago, could be due to difficulties in the identification of this activity.

Rather more than smashing stones...

Despite the breadth of subjects dealt with during the presentations that made up this seminar, those attending were left with the feeling that the idea of "Oldowan" is far from being dealt with as a well defined entity and cannot be considered as a closed question. In addition, new discoveries like those made in recent years, such as Gona (Semaw et al. 2003), Kanjera (Plummer et al. 1999), or the aforementioned West Turkana, Koobi Fora or Peninj, provide new clues with which to re-evaluate this idea.

It has already been mentioned above that Oldowan has traditionally been understood as a uniform entity, with little internal variability in the composition of those stone collections both in terms of their temporal and their spatial distribution. This notion was discussed throughout this seminar, since, in contrast to this monolithic view anchored in the unilinear evolutionary paradigm, several contributions do not share this perspective.

We consider that these differences of interpretation are related to important methodological differences and that they have a clear correspondence to equally different theoretical proposals. This diversity becomes patently clear when discussing ideas related to the technical capacities involved in the knapping of instruments and their possible implications with regard to the cognitive capacities of the hominids.

These important differences in the interpretation of this aspect are seen when comparing the proposals developed from the perspective advocated essentially by North American research groups influenced directly or indirectly by the proposals put forward by G. Isaac.

This perspective insists on the need to include paleoecological and paleoenvironmental aspects in order to study the complex interaction of the hominids within their natural environment. Using this perspective, the study of these industries is vital in order to draw conclusions about the behaviour of the hominids referred to in terms of activities and processes associated with the management and use of these instruments. From this perspective, the stone tools would be considered as an interface within that adaptive setting, which allows a series of behavioural inferences to be made which must be contrasted to those provided by other aspects of the fossil record.

In contrast to this position, the alternative line of research insists on the need to analyse the artefacts as a consequence of a process which is essentially aimed at identifying the motivations entailed in the knapping. This conception is linked to the notion of "chaîne opératoire" essentially developed by French authors, and stresses the importance of studying the elements involved in the making of artefacts, i.e. the "methods" and "techniques" involved in those "systems" (Inizan et al. 1995).

Reffiting is one of the possible reconstruction techniques with which to identify how the different technical gestures involved in the shaping of artefacts were formulated.

Under this premise, the act of knapping is the starting point from which to analyse the strategies of reduction and the technical "know-how" involved. This implies that the cutting movement is made up of an overall conception of this process, and as a consequence allows us to ponder the idea of technical competence and analyse the cognitive capacities of these hominids.

We believe that these perspectives need not be conflicting. In fact it is perfectly acceptable to suppose that stone instruments are basic tools of subsistence, and that as a consequence they should be considered as describers of the behaviour of these hominids. In the same way, the study of the sequencing of the decisions made, and actions carried out during the knapping describes the competence that these hominids had in obtaining essential artefacts.

In these decisions a set of choices are manifested and passed on through the generations, which in the end constitutes an environment of learning and knowledge shared by these collectives. The study of this process could be a route enabling us to answer questions about the cognitive environment of these hominids.

We should repeat that these aims are not mutually exclusive. Nevertheless, in this seminar these two proposals emerged sharply defined, and appeared as discourses which, if not incompatible, were at least two theoretical-methodological proposals with suppositions and aims that were well differentiated. Our interest does not lie in indicating the advantages or drawbacks of either of them, but we do wish to insist that these important differences in orientation when it comes to analysing a process like the making of artefacts, may be the origin of the significant disagreement that exists when it comes to describing this process.

It was previously mentioned that at the moment the classic characterisation of what is considered as Oldowan is being questioned. The idea of simple technocomplexes, characterised by the presence of choppers and flakes obtained without a precise organisation, appears not to be very appropriate.

Thus, in other assemblages it is argued that there exists a certain complexity, referring to aspects such as the selection of supports which are reduced; following systems that allow products to be obtained that are morphometrically standardised. I.e. the idea of predetermination could be introduced.

Faced with this type of observation, a question that might seem obvious is that referring to the interest that this type of conclusion can awaken. If these reflections are considered in a de-contextualised way, there is indeed a risk of considering them as essays or interesting examples, yet with a limited interest, since they do not allow generalisations about the activities carried out by these hominids.

Contrary to this, we consider that this type of study allows us to revise the idea of variability in the knapping systems on comparing the strategies involved in the obtaining of artefacts. This possibility should be examined with the aim of determining whether different systems really favour the appearance of assemblages that are apparently similar and characterised as homogeneous and unvarying.

The different contributions to this seminar appear to coincide in the opinion that there are important differences in the knapping systems, and that these differences are already documented in very ancient chronological contexts. Establishing this variability could prove to be a new line of research from which it could be possible in the first place to demonstrate whether Oldowan should really be characterised as a long-lasting entity, or to the contrary, if different internal stages or phases can be differentiated.

In the same way, it could be a way of allowing comparison of the spatial distribution and dispersion of these systems, enabling us to verify whether these stone collections discovered in Africa, Asia and Europe are really homonymous.

The apparent simplicity of these Oldowan collections may be concealing a much more complex panorama than that usually supposed. Documenting these differences could imply important changes with regard to analysing specific aspects such as: What is the scenario implied in the use of stone instruments? Do artefacts allow us to analyse the cognitive capacities of the beings that have created them? Or is the genus *Homo* alone in being the only agent capable of making lithic artefacts?

As can be seen, the study of early technology is not a closed field. Numerous questions persist, and almost certainly the introduction of new questions will allow us to unravel these matters. Possibly, one of the consequences of this discussion may be to consider that these technocomplexes are rather more than smashing stones, since in these simple actions we can rediscover something that unites us with our forebears and links us to them.

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