

Session C77 – 15th UISPP (Lisbon, September 2006)

Non-flint Raw Material Use in Prehistory

Old Prejudices and New Direction

L'utilisation préhistorique de matières premières lithiques alternatives

Anciens préjugés, nouvelles perspectives

organized by Dr. Farina Sternke^(*), Lotte Eigeland^(**) and Dr. Laurent-Jacques Costa^(***)

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SESSION'S ABSTRACT

Non-flint Raw Material Use in Prehistory

Old Prejudices and New Direction

The study of raw material is now a central concern in the analysis of prehistoric and archaic lithic production in the Old and New World. In Europe, attention has focused almost exclusively on flint although non-flint raw materials were used as a major component on many prehistoric sites. The main research questions related to the current study of non-flint raw materials are the reasons for non-flint raw material use on one hand, and questions related to methodological problems associated commonly with the technological characteristics of the different raw materials on the other hand. This colloquium aims to give an overview of current non-flint raw material studies in different prehistoric periods and geographical areas, thereby stimulating a further debate about the central issues and increasing the dialogue among researchers in this neglected area of lithic studies.

RÉSUMÉ DE LA SESSION

L'utilisation préhistorique de matières premières lithiques alternatives

Anciens préjugés, nouvelles perspectives

L'étude des matières premières lithiques est aujourd'hui une composante fondamentale de l'analyse des productions préhistoriques. En Europe, les recherches se sont, en premier lieu, focalisées sur le silex, présents en grandes quantités dans de nombreuses régions, négligeant de ce fait l'utilisation intensive de matières alternatives dans de nombreux sites préhistoriques. Les problèmes principaux soulevés par la recherche actuelle en matières premières alternatives (autres que le silex) sont : 1) les facteurs socio-économiques, techniques ou idéologiques, motivant l'utilisation de ces matières lithiques, et 2) les questions méthodologiques relevant des caractères technologiques de ces différentes matières premières. Ce colloque a pour but de proposer une vue d'ensemble des recherches actuelles sur l'utilisation préhistorique de matières premières lithiques alternatives, dans des périodes et des zones géographiques variées.

C77 SESSION PROGRAM

Session 1 – Terminology and Methodology in Non-Flint Raw Material Studies

Chair : Lotte Eigeland

14:30-14:40 *Opening*

14:40-15:00 Per FALKENSTRÖM (Uddevalla, Sweden)

C77-01 **Reflections on prismatic blades - The terminology of blades made of different materials in central Sweden.**

15:00-15:20 Morgane DACHARY (Rouffignac Saint Cernin – France)
Loïc DAULNY

C77-02 **Approche comportementaliste du Magdalénien d'après l'étude techno-fonctionnelle d'un outillage lithique hors silex et sa relation avec les autres types de vestiges. La Grotte de Bourrouilla (Pyrénées-Atlantiques, France).**

15:20-15:40 Roberto RISCH (Barcelona, Spain)

C77-03 **Recording Macrolithic Artefacts: a morpho-technical approach.**

15:40-16:00 Arturo DE LOMBERA HERMIDA (Tarragona, Spain)

C77-04 **Quartz Lithic Industries: Scar identification.**

16:00-16:30 *Coffee Break*

16:30-16:50 Gérard POUPEAU (Bordeaux, France)
F.-X. LE BOURDONNEC (Bordeaux, France)
Sarah DELERUE (Bordeaux, France)
M. DUTTINE (Bordeaux, France)
S. DUBERNET (Bordeaux, France)
G. VILLENEUVE (Bordeaux, France)
L. BELLOT-GURLET (Thiais, France)
T. CALLIGARO (Paris, France)
P. MORETTO (Bordeaux, France)
F. FROHLICH (Paris, France)
M. BOHN (Brest, France)
N. J. G. PEARCE (Aberystwyth, UK)
R. B. SCORZELLI (Rio de Janeiro, Brazil)

C77-05 **Obsidian characterization for raw material provenance studies: some alternatives.**

16:50-17:10 Inge DIETHELM (Riehen, Switzerland)

C77-06 **Petrographical composition and provenance of Neolithic "Black stone" artefacts in the collection of the "Museum der Kulturen" in Basel and in archaeological excavations near the shoreline of Lake Neuchâtel, Switzerland.**

17:10-17:30 Tristan CARTER (Stanford, USA)
Sarah DELERUE (Bordeaux, France)
Marina MILIĆ (Belgrade, Serbia)
Nicholas J.G. PEARCE (Aberystwyth, UK)
Gérard POUPEAU (Bordeaux, France)
M. Steven SHACKLEY (Los Angeles, USA)

C77-07 **Characterizing obsidian from Neolithic Çatalhöyük (Konya Plain, Turkey): a chaîne opératoire approach.**

17:30-17:50 Elin HANSEN (Oslo, Norway)
Lotte EIGELAND (Oslo, Norway)

C77-08 **The Rock that Rocks the Rock.**

Session 2 – Non-Flint Raw Materials in Experimental Archaeology and Use Wear Studies

Chair : Dr. Farina Sternke

09:00-09:10 *Opening*

09:10-09:30 Ana CRUZ (Tomar, Portugal)
Luiz OOSTERBEEK (Tomar, Portugal)
Pierluigi ROSINA (Tomar, Portugal)
Sara CURA (Tomar, Portugal)
Stefano GRIMALDI (Trento, Italy)

C77-09 **Non-flint raw material use throughout time and space in the Middle Tagus Valley (Central Portugal).**

09:30-09:50 Briagell HUET (Rennes – France)

C77-10 **Raw materials and techno-economic behaviours in the Middle Palaeolithic: the mixed lithologic industries example from the Armorican massif (northwest of France).**

09:50-10:10 Anna LUNARDI (Siena, Italy)

C77-11 **Quinzano and Rivoli, two Middle Neolithic sites in the Adige Valley (Verona, North Eastern Italy): lithic choices and functional aspects of the non-flint stone implements.**

10:10-10:30 André Pierre PROUS (Belo Horizonte, Brasil)

Andrei ISNARDIS (Belo Horizonte, Brasil)
Marcio ALONSO (Belo Horizonte, Brasil)
Maria-Jacqueline RODET (Belo Horizonte, Brasil)
Henrique PILO (Belo Horizonte, Brasil)

C77-12 **Quartz, quartzite and hematite in prehistoric assemblages from Brasil.**

10:30-10:50 Harry LERNER (Montreal, Canada)

C77-13 **Use-related Wear Accrual on Silicified Wood Tools from Northern New Mexico: Implications for Interpreting Wear Patterns on Archaeological Material.**

10:50-11:20 *Coffee Break*

11:20-11.40 André Pierre PROUS (Belo Horizonte, Brasil)
Filipe AMORELI (Belo Horizonte)
Jorge Manoel COSTA (BOA VISTA, Roraima, Brazil)
Marcio ALONSO (Belo Horizonte)

C77-14 **Grindle for cassava: last lithic tool of South American Lowlands.**

11:40-12:00 Andrea ŠAJNEROVÁ-DUŠKOVÁ (Praha, Czech Republic)
Jan FRIDRICH (Praha, Czech Republic)
Linda HRONÍKOVÁ (Praha, Czech Republic)
Ivana SÝKOROVÁ (Praha, Czech Republic)

C77-15 **Pitted and grinding stones from Lower and Middle Palaeolithic settlements in Bohemia: a functional study.**

12:00-12:20 Jenny ADAMS Jenny ADAMS (Arizona, USA)
Selina DELGADO (Barcelona, Spain)
Laure DUBREUIL (Montréal, Canada)
Caroline HAMON (Paris, France)
Hugues PLISSON (Aix-en-Provence, France)
Hara PROCOPIOU (Lyon, France)
Roberto RISCH (Barcelona, Spain)

C77-16 **Functional analysis of macro-lithic artefacts.**

12:20-12:40 Ignacio Clemente CONTE (Barcelona, Spain)
Juan Francisco GIBAJA BAO (Faro, Portugal)

C77-17 **La formation de traces d'usure dans des roches distinctes au silex: le cas de les quartzites et rhyolites, différences et similitudes.**

12:40-13:00 Laure DUBREUIL (Montréal, Canada)

C77-18 **Non-flint stone tool technology in the Epipalaeolithic: The example of the Natufian**

13:00-14:10 *Lunch Break*

Session 3 – The Socio-Economic Implications of Non-Flint Raw Material Use

Chair : Dr. Laurent-Jacques Costa

14:10-14:20 *Opening*

14:20-14:40 Astolfo GOMES DE MELLO ARAUJO (São Paulo, Brasil)

C77-19

Non-flint raw materials in South America: a Brazilian perspective.

14:40-15:00 Enza SPINAPOLICE (Rome, Italy and Talence, France)

C77-20

Lithic industries and raw material in Southern Italy Mousterian: example from Grotta dei Giganti (Salento, Apulia)

15:00-15:20 Małgorzata WINIARSKA-KABACIŃSKA (Poznan, Poland)

C77-21

Obsidian and the Sviderian culture at the Polish Lowland.

15:20-15:40 Yves PERDAEN (Gent, Belgium)
Philippe CROMBÉ (Gent, Belgium)
Joris SERGANT (Gent, Belgium)

C77-22

The use of quartzite as a Mesolithic chrono-cultural marker in the Low Countries.

15:40-16:00 Peter Charles WOODMAN (Cork, Ireland)

C77-23

Alternatives to Flint - Even in the Heartlands.

16:00-16:30 *Coffee Break*

16:30-16:50 Grégor MARCHAND (Nantes, France)
Rodrigue TSOBGOU-AHOUE (Rennes, France)

C77-24

Que doit-on sacrifier? De l'analyse mécanique des roches à la variabilité stylistique dans le Mésolithique de Bretagne.

16:50-17:10 Hari C. MAHANTA (Assam, India)
A. Sarmah MAHANTA (Assam, India)

C77-25

Investigating the Neolithic Cultures of Meghalaya, Northeast India: A New Study of the Garo Hills Sites.

17:10-17:30 Ulla RAJALA (Cambridge, UK)
Marco MADELLA (Barcelona, Spain)
Ravi KORISSETAR (Dharwad, India)

C77-26

Quartz and other knapped raw materials of Deccan Neolithic: a comparison of surface assemblages from three Indian ashmound sites.

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17:30-17:50 Mikkel SØRENSEN (Copenhagen, Denmark)

C77-27

The Lithic Raw Material Choice in the Eastern Arctic, 2500 BC – 0 AD.

17:50-18:10 Chloé ANDRIEU (Nanterre, France)

C77-28

Usage, valeur et symbole de la chaille dans l'aire maya classique

18:10-18:30 *Discussion*

PAPERS' ABSTRACTS

C77-01

Per FALKENSTRÖM (Uddevalla, Sweden)

Reflections on prismatic blades - The terminology of blades made of different materials in central Sweden.

Abstract: The main scope of this paper deals with comparable attributes regarding different raw materials. Prismatic blades from sites in central Sweden have been chosen to shed light upon some problems regarding lithic terminology, particularly blade attributes. Studies of blades still rely heavily on artefacts made of flint or equivalent materials. Blades are usually classified according to defined attributes in order to fit into a terminology based on fine grained materials. This entails problems such as how to understand lithic artefacts, the technological repertoire and consequently human behaviour in the past. It is suggested that blade technology in central Sweden remained standardised irrespective of raw material was. With a lithic terminology based on attributes related to intentional blade production, some characteristic attributes are interpreted as variations on a theme but with one purpose, namely prismatic blades.

C77-02

Morgane DACHARY (Rouffignac Saint Cernin – France)
Loïc DAULNY

Approche comportementaliste du Magdalénien d'après l'étude techno-fonctionnelle d'un outillage lithique hors silex et sa relation avec les autres types de vestiges. La Grotte de Bourrouilla (Pyrénées-Atlantiques, France).

Résumé: Cette analyse s'inscrit dans le cadre de la préparation d'un doctorat sur l'exploitation paléolithique de matières minérales hors silex. La séquence magdalénienne de Bourrouilla (Arancou, Pyrénées-Atlantiques, France) a, jusqu'ici, surtout livré un matériel attribué au Magdalénien supérieur et final.

Notre premier objectif est d'obtenir, à partir de l'analyse techno-fonctionnelle des témoins minéraux sélectionnés, des schémas comportementaux tant économiques, techniques que fonctionnels et ainsi de proposer, entre autres, des descriptions d'activité par quelques étapes détaillées de leur chaîne opératoire (par exemple pour la taille des roches et le traitement des matières dures d'origine animale). Notre approche est donc résolument comportementaliste. Le second objectif consiste en la comparaison de la série de Bourrouilla avec des séries badegouliennes étudiées par ailleurs, de manière à cerner d'éventuelles modifications de comportement au cours du Paléolithique supérieur.

Pour cela, nous tentons d'attribuer chaque témoin minéral sélectionné, d'après la confrontation de l'ensemble de ses caractéristiques intrinsèques et extrinsèques, à l'une des catégories d'objets anthropiques et de préciser sa fonction : matière travaillée, outil, complément d'outil, installation, élément d'une structure d'habitat, etc. L'intérêt est d'identifier puis d'analyser les outils pour tenter de déterminer les composants de la dynamique opératoire de toutes les activités où l'outil s'est trouvé impliqué, mais aussi dont il est la résultante

C77-03

Roberto RISCH (Barcelona, Spain)

Recording Macrolithic Artefacts: a morpho-technical approach.

Abstract: In contrast to most other artefact categories in archaeology, no unified recording system has been developed to allow for the analytical description of the large variety of stone tools comprised under the term *macrolithic artefacts*. Most typological efforts have focused on specific tool types and archaeological contexts, and they tend to emphasise morphological features rather than technological aspects. This limits the possibilities

for approaching the production processes in which these instruments were worn, shaped and transformed in different times and spaces. One consequence of this lack of a unified recording system is a very patchy understanding of the technological variability and development of many types of prehistoric stone artefacts and, accordingly, of the activities associated with them.

In situations where hundreds of macrolithic artefacts are recovered as part of systematic excavations, in many later prehistoric sites in the western Mediterranean for example, it has become necessary to develop a recording system which is sufficiently flexible to embrace very diverse sorts of implements, but which at the same time allows comparisons between observations. This requires, in the first place, a standard norm for placing the objects in front of the observer and dividing them into defined areas. Thereafter, a system of categories is established which allows the characterization of the artefacts and their distinct areas in terms of petrographic, morpho-metric and functional variables. The heuristic potential of this recording method will be tested using a series of examples of macrolithic analysis in different archaeological contexts.

C77-04

Arturo DE LOMBERA HERMIDA (Tarragona, Spain)

Quartz Lithic Industries: Scar identification.

Abstract: Quartz is one of the main raw materials used by the prehistoric communities from the Lower Paleolithic to the Holocene. There are difficulties with a development of an appropriate technical analysis on these materials because the low morphological standardization of the products do not allow for an intensive study of these industries. Quartz is traditionally considered as a secondary lithic source as evidenced by opportunistic and low complex strategies because of the application of the flint's analytical criteria (ringcracks, ripple marks, bulbs, etc.) and the typological studies. Through experimental approaches and archaeological comparison several knapping scars on quartz blanks can be identified. These can identify the hammer shock points and removal direction, facilitating a technical analysis. Scars (radial fissures, fractures, etc.) are closely related with the quartz petrological characteristics, formation processes, morpho-structural varieties and the mechanics of flaking. A technical analysis of quartz using these criteria has allowed for the identification of different reduction strategies, showing greater variability and complexity on the management of these kinds of raw materials.

C77-05

G rard POUPEAU (Bordeaux, France)
F.-X. LE BOURDONNEC (Bordeaux, France)
Sarah DELERUE (Bordeaux, France)
M. DUTTINE (Bordeaux, France)
S. DUBERNET (Bordeaux, France)
G. VILLENEUVE (Bordeaux, France)
L. BELLOT-GURLET (Thiais, France)
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P. MORETTO (Bordeaux, France)
F. FROHLICH (Paris, France)
M. BOHN (Brest, France)
N. J. G. PEARCE (Aberystwyth, UK)
R. B. SCORZELLI (Rio de Janeiro, Brazil)

Obsidian characterization for raw material provenance studies: some alternatives.

Abstract: Obsidian is probably the easiest rock to characterize for lithic raw material provenance studies. Because it is an aphyric volcanic rock, even small, sub-millimetre sized inclusion-free volumes present the same physico-chemical properties as the bulk rock. Hence a variety of possible ways of obsidians characterization, in addition to their visual appearance (brightness, colour, mineral inclusions, etc.). We review the various techniques currently in use by our group and their limitations, in terms notably of their costs and material

consumption (destructive vs. non-destructive, etc.). They include (i) element contents determination by ICP-AES, ICP-MS, LA-ICP-MS, PIXE, EMP-WDS and SEM-EDS, (ii) obsidian formation age determination by fission track dating and (iii) structural analyses by ESR, vibrational spectroscopy (micro-Raman and infra-red), SQUID (magnetic properties) and Mössbauer spectroscopy. The discussion will be illustrated by examples taken from the Formative to the Integrated Periods of the Ecuadorian Andean area, and in the Neolithic of the Near East and of the Western Mediterranean.

C77-06

Inge DIETHELM (Riehen, Switzerland)

Petrographical composition and provenance of Neolithic "Black stone" artefacts in the collection of the "Museum der Kulturen" in Basel and in archaeological excavations near the shoreline of Lake Neuchâtel, Switzerland.

Abstract: Petrographical investigations on Neolithic ground axes revealed a complex composition of the lithic raw material "Aphanit", including not only but several different sedimentary and volcanic rocks. The mineral components of these rocks are not visible to the naked eye. In analogy to the term "Green Stone" we propose to rename this raw material "Black Stone".

C77-07

Tristan CARTER (Stanford, USA)
Sarah DELERUE (Bordeaux, France)
Marina MILIĆ (Belgrade, Serbia)
Nicholas J.G. PEARCE (Aberystwyth, UK)
Gérard POUPEAU (Bordeaux, France)
M. Steven SHACKLEY (Los Angeles, USA)

Characterizing obsidian from Neolithic Çatalhöyük (Konya Plain, Turkey): a *chaîne opératoire* approach.

Abstract: Discovered in the 1960's, Çatalhöyük is one of the best known and largest Neolithic settlements of Anatolia. In 1990' renewed excavations revealed an earlier Aceramic Neolithic heritage, whereby the occupation sequence now spans ca. 7400-6200 cal BC. The primary raw material employed to make flaked implements during this time was obsidian (>90% of the assemblage) a non-local raw material whose nearest sources lay some 190 km distant. Since 1999 some 300 artefacts have been characterised, involving four laboratories employing six analytical techniques, the elemental compositions obtained mainly using non-destructive methodologies (>60%). The samples were selected from contexts that not only cover the entire chronological sequence (and include all visually distinct types of obsidian), but also embody the various knapping traditions represented at the site. We show that with the exception of one piece, all the obsidian came from southern Cappadocia. During the first half of the occupation obsidians from Göllü Dağ-east dominate, while the second half of the Early Neolithic sequence witnesses a major increase in the consumption of Nenezi Dağ raw materials. Furthermore, when technology and typology are considered the data indicates that we can denote source specific chaînes opératoires, modes of consumption that changed through time.

C77-08

Elin HANSEN (Oslo, Norway)
Lotte EIGELAND (Oslo, Norway)

The Rock that Rocks the Rock.

Abstract: This paper presents results from an experiment on hammerstones carried out at Lejre Research Centre, Denmark, in 2004.

While Stone Age archaeologists have acquired a large range of knowledge about lithic technology from numerous experiments, the hammerstone, the tool used in the replication of many basic tool forms, is a neglected object of research. This experiment was designed to get a general knowledge of how the knapper chooses different stones for different tasks (e.g. size, shape, raw material) and to record the various degrees of wear on hammerstones during production of flakes and tools during the week of experiments.

C77-09

Ana CRUZ (Tomar, Portugal)
Luiz OOSTERBEEK (Tomar, Portugal)
Pierluigi ROSINA (Tomar, Portugal)
Sara CURA (Tomar, Portugal)
Stefano GRIMALDI (Trento, Italy)

Non-flint raw material use throughout time and space in the Middle Tagus Valley (Central Portugal).

Abstract: In the last decades numerous archaeological surveys and excavations recovered thousands of lithic remains belonging both to Palaeolithic and post-Palaeolithic occupation of the Tagus Valley region between Mação and Chamusca. One of the most striking features of these industries is the almost exclusive exploitation of local rocks such as quartzite and quartz pebbles. The intensive exploitation of these rocks (considering their petrographic properties and characteristics and their availability in the region) has been in large part responsible for the difficult chrono-cultural framing of surface collections and for an overall similarity between Palaeolithic and Post-Palaeolithic lithic remains coming from well preserved stratigraphic contexts. Nevertheless a geoarchaeological study of the surface sites and a technological study of all the collections (both from surface and from excavations) allowed for a clarification of some chrono-cultural mistakes as well as the establishment of some techno-economic behavioural patterns associated to the Palaeolithic and Post-Palaeolithic industries.

C77-10

Briagell HUET (Rennes – France)

Raw materials and techno-economic behaviours in the Middle Palaeolithic: the mixed lithologic industries example from the Armorican massif (northwest of France).

Abstract: In the Armorican Massif (northwest of France), several Palaeolithic industries use a large proportion of alternative raw materials (dolerites, microgranites, volcano-sedimentary tuffs, quartz) in association with flint. This particularity provides an opportunity to analyse the techno-economic behaviour adopted by human groups confronted with fundamentally different rocks. The use of non-flint raw materials in this region during this period is strongly linked to the geologic and palaeogeographic local context. To determine the technical and functional constraints conditioned by the nature of the utilized raw materials, a protocol of raw materials study was set up (petrographic study, mechanical characterization, experimental knapping). Associating techno-typological studies of these lithic industries to physical and mechanical characterization of the utilized raw materials, this study underlines the adaptive responses employed at the lithic production level (methods and techniques of debitage) and of the product management. The results of this study allow for a determination of the influence of raw material and thus the weight of environmental constraints on lithic production. They also contribute to a better understanding of the cognitive modes of Neanderthals while sustaining the debate relative to the Middle Palaeolithic assemblage variability.

C77-11

Anna LUNARDI (Siena, Italy)

Quinzano and Rivoli, two Middle Neolithic sites in the Adige Valley (Verona, North Eastern Italy): lithic choices and functional aspects of the non-flint stone implements.

Abstract: Along the Adige Valley (Verona, North Eastern Italy) two important Middle Neolithic sites are located: Quinzano and Rivoli. The study presented herein examines their non-flint stone implements, which are represented by axes, adzes, querns, handstones and various grinding/polishing and pounding tools. The first problem associated with the analysis of them is the great variety of raw materials exploited, represented by local and imported rocks. A study focused on the origin of the raw materials, as well as their lithic characterisation, is necessary to interpret the Neolithic craftsmen choices regarding rocks. The lithologies selection involves numerous socio-economic and cultural aspects such as: the distance and the easiness of supply, the form in which the rocks are gathered, the stone manufacturing, the functional needs and the aesthetic appearance. From the functional point of view, these tools are associated with a wide variety of economic activities referred to food preparation, to manufacturing of raw materials and to the production of implements and ornaments. The study proposes to analyse the *chaîne opératoire* of the stone implements to define their functional aspects such as: the gesture and motion of the work, the intensity of use-wear, the use (single-use/multiple-use/reuse/unused tool), the correlation between raw material and function and the ways to maintain the tool-efficiency. The integration of the experimental replications and the comparison with documented ethnographic contexts is also needed to aid the archaeological data interpretation. Therefore the multidisciplinary approach proposed herein is based on the interactive feed-back between environmental resources and the cultural and economic traditions of the Neolithic people.

Résumé: Le long de la Vallée de l'Adige (Vérone, Italie du nord-est) se situent deux importants sites du Néolithique Moyen, Quinzano et Rivoli, dont cette étude examine les outils en pierre qui sont pas en silex et qui sont représentés par des herminettes, des haches, des meules, des molettes et par différents outils à polir et à broyer. Le premier problème associé à l'analyse de ces pièces est la grande variété de matières premières exploitées, représentées par les roches locales et par d'autres importées. Pour interpréter les choix des artisans néolithiques concernant ces roches il faut se concentrer sur l'origine des matières premières, aussi bien que leur caractérisation pétrologique. La sélection des lithologies implique de nombreux aspects socio-économiques et culturels comme: la distance et la facilité de l'approvisionnement, la forme dans laquelle les roches sont recueillies, la façon de travailler la pierre, les nécessités fonctionnelles des outils et leur aspect esthétique. Du point de vue fonctionnel, ces pièces sont associées à une grande variété d'activités économiques visées à la préparation de nourriture, à la transformation des matières premières et à la production des outils et des parures. Cette étude se propose d'analyser la chaîne opératoire des outils en pierre pour définir leurs aspects fonctionnels: les gestes du travail, l'intensité des traces d'utilisation, l'emploi (exclusif, multiple, réutilisation, pas d'utilisation), la corrélation entre la matière première et la fonction de l'outil et l'entretien de son efficacité. La réalisation de répliques expérimentales intégrée à la comparaison avec des contextes ethnographiques bien documentés est également nécessaire pour aider l'interprétation archéologique des données. Par conséquent l'approche multidisciplinaire ici proposée se fonde sur le *feed-back* entre les ressources d'environnement et les traditions culturelles et économiques des populations néolithiques.

C77-12

André Pierre PROUS (Belo Horizonte, Brasil)
Andrei ISNARDIS (Belo Horizonte, Brasil)
Marcio ALONSO (Belo Horizonte, Brasil)
Maria-Jacqueline RODET (Belo Horizonte, Brasil)
Henrique PILO (Belo Horizonte, Brasil)

Quartz, quartzite and hematite in prehistoric assemblages from Brazil.

Abstract: While chipped industries in Europe are mainly made on flint, this stone is scarce in Brazil. Here, most industries are made on quartz, quartzite, or basalt. Some regions (in Para and Minas Gerais states) have also hematite industry. Based on prehistoric collections and experiments, we show some characteristics of crystal debitage - mainly on anvil stones, discuss the specific marks of soft percussion on quartzite; we also give some information on the chipping preparatory process of axes in quartzite and hematite.

Near Diamantina city are found most of the quartz used in telecommunication industry. Prospectors flake out the cortex of the crystals in the same rockshelters where are found millenary debitage. We present here the technics and waste of both modern and prehistoric flaking.

C77-13

Harry LERNER (Montreal, Canada)

Use-related Wear Accrual on Silicified Wood Tools from Northern New Mexico: Implications for Interpreting Wear Patterns on Archaeological Material.

Abstract: Experimental generation and development of use-related wear has focused largely on different varieties of flint or chert, with relatively little analytical attention being paid to other raw materials that were exploited prehistorically for chipped stone tool production. This paper examines how wear accrues on implements fashioned from yellow silicified wood that was regularly used during the Late Archaic through Early Basketmaker II (1800 BC to AD 200) periods in northwestern New Mexico.

Experiments were conducted to assess rates of wear development on unmodified flake tools manufactured from yellow silicified wood. Employing image analysis (ClemexVision PE) and GIS (Idrisi Kilimanjaro) software, as well as material hardness tests performed with a Hysitron Triboindenter, a combination of surface roughness and hardness was found to be a determining factor in how wear developed over fixed intervals of use. This is illustrated by measurable differences in rates of wear accrual on this material relative to three types of chert also examined as part of a larger study. These results have significant implications for how archaeologists interpret wear patterns as indicators of tool use behaviour and past cultural dynamics.

C77-14

André Pierre PROUS (Belo Horizonte, Brasil)

Filipe AMORELI (Belo Horizonte)

Jorge Manoel COSTA (BOA VISTA, Roraima, Brazil)

Marcio ALONSO (Belo Horizonte)

Grindle for cassava: last lithic tool of South American Lowlands.

Abstract: Jean de Léry, who remained among Tupinamba Indians near Rio de Janeiro during the XVI Century, mentioned grindles for cassava made of wood and chipped lithic elements. There are none of these ancient instruments in the Museums, and it is difficult to recognize their archaeological remains among the lithic industry. Nevertheless, Baniwa and Wai Wai (Amazonian Indians) used grindles for cassava with lithic "teeth" until the XXth century. This paper joins three archaeologists, a Baniwa, whose mother has made this instrument when younger and gave us some material and information, and an anthropologist, who is working with Wai Wai. Our team has studied ethnographic grindles, reproduced the fabrication of lithic elements and analyzed the micro use wear. We also compared experimental and ethnographic material on the one hand, and micro instruments found in a Tupiguarani archaeological site on the other.

Résumé: Les chroniqueur Jean de Léry, qui vécut au milieu des indiens du Brésil du XVI siècle mentionne les râpes à manioc utilisés par les indiens Tupinamba du littoral de Rio de Janeiro. C'étaient des tablettes en bois armées de dents en pierre taillée, dont il n'est pas resté d'exemplaire dans les musées. Il était donc difficile d'identifier les vestiges de ces objets dans les fouilles archéologiques. Heureusement, en Amazonie, deux groupes indigènes ont gardé l'usage des râpes à dents de pierre. Il s'agit des Baniwa du haut Rio Negro et des Wai Wai de Guyane brésilienne. Deux des auteurs de ce texte (AP et FA), archéologues, se sont entraînés à étudier et reproduire les dents de pierre ethnographiques et à utiliser les râpes, puis se sont associés à un Baniwa (GB) dont la mère avait fabriqué des râpes dans sa jeunesse et à un ethnologue (JMC) qui travaille depuis de longues années avec les Wai Wai pour étudier les instruments expérimentaux et ethnographiques, dont les micro-vestiges d'utilisation ont été analysés par MA. On examine ensuite une structure retrouvée dans un site archéologique Tupiguarani qui pourraient représenter une réserve de dents de pierre.

C77-15

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Pitted and grinding stones from Lower and Middle Palaeolithic settlements in Bohemia: a functional study.

Abstract: The systematic research of the Lower Palaeolithic (ca 0,7 Ma) and the older level of the Middle Palaeolithic (ca 0,25 Ma) in central and northwest Bohemia revealed evidence of using different raw materials (quartzite, sandstone, conglomerate, chert, quartz, lydite) for the production of special groups of non-chipped “grinding/crushing” tools. They can be divided into two categories: active tools (hammerstones, pestles or whetstones) and passive rests (anvils, anvil-pallets). Originally, such artefacts were considered to be a part of the *chaîne opératoire* for the chipped industry. However, it seems their function was not only limited to chipping activities. The anvils/pallets are of a different size, from the palm size for grinding of pigments to pallets on huge stone desks with a diameter of 0.5 m, which could have served for grinding/crushing of organic and/or inorganic materials, or could be used for grinding of other tools made from different materials (wood, bone). Recent research of Lower and Middle Palaeolithic settlements, which systematically investigate the full volume of stone artefacts, reveal surprising information about the use of raw materials not only for chipped industry but also for the artefacts assigned to process organic and inorganic materials. The form and function of these artefacts seem to be conserved and stable since the ancient times (Lower Palaeolithic) of human culture until the Neolithic period. The functional and microwear analysis allowed to distinguish between several functions of the analysed artefacts.

C77-16

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Functional analysis of macro-lithic artefacts.

Abstract: Macro-lithic or ground stone tools are among the most abundant artefact categories in the archaeological record. They are made from a wide range of rocks, worked through various techniques, and served to carry out a large array of tasks, beginning in the Palaeolithic and continuing to early historic times. Despite their relevance to the economic and social organisation of past societies, it is only recently that archaeologists have begun to develop specific research methodologies for studying macro-lithic artefacts.

One aspect that deserves increasing attention is the description and analysis of traces on stone surfaces specific to production, maintenance, and use. The aim of this paper is to compare the different approaches to functional analyses of macro-lithic tools, and to achieve a consensus about terms and analytical categories. Issues discussed include the factors governing the formation of use-wear traces, the manifestation of use-wear on surfaces of various rock types, comparisons between macroscopic and microscopic approaches, and the possibilities for photographically documenting observations. The final objective is to standardize methods for functional analyses, thereby facilitating a better technological understanding of the means of production used by pre-industrial societies.

C77-17

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La formation de traces d'usure dans des roches distinctes au silex: le cas de les quartzites et rhyolites, différences et similitudes.

Résumé: Le silex, dans ses différentes textures granulométriques, a été, sans aucun doute, le matériau lithique le plus étudié dans le domaine de la tracéologie. C'est la raison pour laquelle l'application de cette méthode analytique est encore de nos jours très peu répandue à d'autres types de roches, malgré la large exploitation tout le long de la préhistoire des lithologies telles que le quartzite. Dans ce travail nous nous intéressons à la formation de traces d'utilisation dans des roches de différentes origines comme le quartzite (sédimentaire ou métamorphique) ou comme la rhyolite (igné), mais qui ont des traits communs au niveau de leur texture. Ainsi qu'à la nécessité d'analyse de leurs surfaces au microscope en prenant en considération une formation différentielle des traces d'utilisation dans les matrices (comparable à certains silex) et dans les cristaux de quartz (similaire au quartz) en observant les différences et les similitudes des traces d'utilisation entre les diverses lithologies.

C77-18

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Non-flint stone tool technology in the Epipalaeolithic: The example of the Natufian

Abstract: In the Near East, non-flint stone implements represent a significant proportion of the toolkit in the Epipalaeolithic. However, in spite of their abundance, these artifacts have largely been neglected in archaeological studies. This paper examines the diversity of non-flint stone tools during the Natufian period, which corresponds to the transition between the Paleolithic and the Neolithic in the Levant. Use patterns of various kinds of raw materials, mainly limestone, sandstone, and basalt, as well as the techniques involved in the production of the non-flint tools, are detailed here for three Natufian assemblages. The study of these assemblages underlines the significance of pecking, grinding, and abrading techniques. Moreover, the analysis highlights differences in use patterns between non-flint versus flint tools. Use-wear data on grinding implements indicate that at least some of these tools were associated with the exploitation of vegetal resources. In contrast, flint tools appear to be designed specifically for the procurement and processing of game. The Natufian case-study exemplifies the contrasts and complementarities between a flint industry based on small flakes and bladelets, and a non-flint technology dominated by massive and heavy-duty tools.

Résumé: Au Proche-Orient, l'outillage en roches autres que le silex représente une part significative des assemblages des groupes épipaléolithiques. Ces artefacts ont cependant largement été négligés dans les recherches en Préhistoire. Une revue des différents types d'outils en roches autres que le silex utilisés durant le Natoufien permet tout d'abord d'en constater la diversité. Le Natoufien correspond dans le Levant à une période de transition entre des sociétés de type chasseurs-cueilleurs et d'agriculteurs. Les modes d'utilisation des différentes roches non siliceuses exploitées, principalement le grès, le calcaire et basalte, sont détaillés pour trois sites natoufiens. Les techniques de production de l'outillage sont aussi examinées. Cette étude souligne l'importance du piquetage et de l'abrasion et plus généralement d'un registre de techniques différent de celui utilisé pour le silex. Les modes d'utilisation et de gestion des deux catégories d'artefacts peuvent être également contrastés. Les données d'analyses tracéologiques indiquent qu'une certaine partie des outils en basalte de type meule - molette a été utilisée pour la transformation des végétaux. Les outils de silex apparaissent en revanche plus spécialisés sur l'acquisition et le traitement des matières carnées. L'exemple du Natoufien illustre les contrastes et complémentarités existant au sein d'un système technique entre un outillage sur silex dominé par des petits éclats et lamelles et un outillage en roche non siliceuse composé en grande partie d'artefacts de taille plus massive.

C77-19

Astolfo GOMES DE MELLO ARAUJO (São Paulo, Brasil)

Non-flint raw materials in South America: a Brazilian perspective.

Abstract: In the last decades, Brazilian archaeology was subject to a major increase in the number of projects (both academic and contract-based), registered sites and dates. This increase in knowledge now allows a better grasp of regional patterns, especially those related to technological trends, raw material choice, and the related chronology. In this paper, we intend to present an overview of the archaeology of a vast area, what is today Brazilian territory, focusing on the use of different raw materials across space and time by prehistoric populations, and how these differences can be understood in light of the general geological and cultural background.

C77-20

Enza SPINAPOLICE (Rome, Italy and Talence, France)

Lithic industries and raw material in Southern Italy Mousterian: example from Grotta dei Giganti (Salento, Apulia)

Abstract: Salento region in the southern part of Apulia is particularly rich in prehistoric features, with a great concentration of Middle Palaeolithic sites (i.e. Grotta Romanelli, Grotta dei Giganti) and a significant series of Neanderthals fossils. This region is characterized by a scarcity of good quality raw material such as flint, which is only abundant 350km north in the well known Gargano area. Due to this scarcity, the lithic assemblages are made on local limestone, flint pebbles, other siliceous local rocks and even shells: different reduction sequences correspond to different utilized raw materials. Levallois débitage on local limestone is particularly interesting. The origin of exploited flint is currently still debated and new excavations and surveys are in progress to identify the local and non-local raw material sources. For the first time, the preliminary results of an analysis of lithic technology in the different raw materials are presented here.

Résumé: Le région géographique du Salento, dans la partie la plus méridionale des Pouilles, constitue une zone très riche en vestiges préhistoriques, avec une très grande concentration de sites attribuables au Paléolithique moyen (Grotte Romanelli, Grotte dei Giganti ecc.) et une ample série de vestiges fossiles néandertaliennes. Cette zone est en effet très pauvre en matières premières de bonne qualité (silex), qui se abondent au contraire à environ 350 km au Nord, dans la bien connue région du Gargano. Mais malgré cette manque apparente de silex locale, les industrie lithiques sont souvent fabriquées à partir d'une grande variété de matières premières différentes, y compris le silex, tels que les calcaires, la chaille, et les coquillages marines, comme dans les cas de Grotta dei Giganti. Ici on trouve différentes chaînes opératoires selon la matière première employée et en particulier un débitage Levallois sur calcaire. L'origine des silex employés dans ce gisement reste à connaître et une série de prospection ont été mises en place à ce fin dans les deux dernières années. Les données préliminaires sur les matériaux lithiques et les matières premières seront ici présentés pour la première fois.

C77-21

Małgorzata WINIARSKA-KABACIŃSKA (Poznan, Poland)

Obsidian and the Sviderian culture at the Polish Lowland.

Abstract: During excavations at a Sviderian settlement in Central Poland an obsidian workshop was discovered. At the northern part of the Polish Lowland obsidian is recorded in the form of single finds. For the first time, a larger concentration of artifacts made of that exotic raw material was analysed. In the paper, results of the functional analysis of obsidian finds will be considered within the broader context of a very intensive late Palaeolithic settlement at the site. The importance of this settlement will be discussed with a special focus on the mobility of the Sviderian hunters.

C77-22

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The use of quartzite as a Mesolithic chrono-cultural marker in the Low Countries.

Abstract: The presence and use of quartzite is known at many Mesolithic sites in Belgium and adjacent areas. Two varieties were in use: a fine grained variety called Wommersom quartzite and a coarser grained variety called Tienen quartzite. Both originate from the same geological formation and different outcrops of this formation are known in the vicinity of Tienen (Vlaams-Brabant, Belgium). The use of both varieties starts in the Early Mesolithic. Wommersom quartzite becomes very important in the Middle and especially in the Late Mesolithic and is distributed over a large area (circa 40.000 sq km). In contrast, the use of Tienen quartzite is limited to the end of the Early Mesolithic (the period between 9000 and 8500 BP) and its geographic distribution is restricted to western Belgium. It seems that both raw materials were used as territorial markers. Their use started when the inundation of the North Sea took place and Mesolithic territories shifted. The cultural identity of the raw material was further strengthened through an adapted knapping technology which clearly differs from the technology used to knap flint.

C77-23

Peter Charles WOODMAN (Cork, Ireland)

Alternatives to Flint - Even in the Heartlands.

Abstract: Although the North east of Ireland is particularly rich in flint, two other groups of material occur very frequently in the Lower Bann Valley during the later Mesolithic in particular. These are a series of mudstone and shale axes along with a number of large flakes of cherts and other similar raw materials. Their presence raises questions around the assumption that, in this area, flint would always be the preferred raw material.

C77-24

Grégor MARCHAND (Nantes, France)
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Que doit-on sacrifier? De l'analyse mécanique des roches à la variabilité stylistique dans le Mésolithique de Bretagne.

Résumé: Les travaux de P. Gouletquer et son équipe au cours du vingtième siècle finissant ont permis de recueillir un corpus exceptionnel de sites datés du Mésolithique sur le département du Finistère (ouest de la Bretagne, France). Les recherches sur la répartition des matériaux lithiques concurrents du silex laissent voir des résultats contrastés suivant la période chronologique, avec par exemple une restriction des territoires d'acquisition à la fin du Mésolithique et un développement d'économies à large spectre. Les réflexions s'engagent désormais sur la variabilité technique et stylistique en fonction de la nature des roches taillées. La diversité des chaînes opératoires mises en œuvre dépend des caractéristiques physiques, structurelles et volumétriques des matériaux. A partir de ces analyses pétrographiques et mécaniques, nous pouvons nous interroger sur ce que les tailleurs mésolithiques de Bretagne ont dû sacrifier de leurs normes techniques. La nature de ce que les hommes ont accepté de modifier ou au contraire de ne pas négocier est des plus éclairantes pour la compréhension de ces sociétés de la Préhistoire.

C77-25

Hari C. MAHANTA (Assam, India)
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Investigating the Neolithic Cultures of Meghalaya, Northeast India: A New Study of the Garo Hills Sites.

Abstract: Many Neolithic sites have been discovered in Meghalaya since the 1960s. Most of the sites are located in the West Garo Hills district of Meghalaya. As one of the most extensively excavated Neolithic sites in the West Garo Hills, the Selbalgre site has long been regarded as the representative of the Neolithic culture of Meghalaya in general. Its material cultures have been frequently used by many scholars to address the relationship between Northeast India and Southeast Asia, usually with a broader perspective to tracing the early dispersal of Austronesian people. Over the past several years, new research was carried out in the area and one excavation took place at the site Selbalgre. By employing new excavation techniques and more rigorous sampling strategies, our excavations have uncovered a significant amount of new information relating to subsistence and settlement patterns, chronology, dispersal of Neolithic man etc. These new data allow us to re-examine many important issues in the Neolithic archaeology of Northeast India.

C77-26

Ulla RAJALA (Cambridge, UK)
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Quartz and other knapped raw materials of Deccan Neolithic: a comparison of surface assemblages from three Indian ashmound sites.

Abstract: The material culture of Neolithic South India has not always been given the attention that it deserves. Specifically, the lithic assemblages of Neolithic sites have normally been described according to typological divisions without entering the subject of raw material exploitation and availability. Indeed, flint and chert were only a part of a more complex array of raw materials utilised by the Neolithic people.

The study of surface assemblages from three different ashmound sites, in the collections of Karnatak University, has revealed differing patterns of raw material use depending on local natural and social environment. Quartz, chert, chalcedony and flint were all used in varied quantities with different raw materials dominating at different sites. The analysis concentrates on the definition of different modes of quartz exploitation in comparison with other raw materials. Importantly, the procurement and utilization strategies are compared to those in other quartz using areas, such as Nordic countries. The discussion considers the implications of the results with regard to the overall economy of the Deccan Neolithic.

C77-27

Mikkel SØRENSEN (Copenhagen, Denmark)

The Lithic Raw Material Choice in the Eastern Arctic, 2500 BC – 0 AD.

Abstract: The geology of the Eastern Arctic (Greenland) is complex and consists among other things of a variety of lithic raw materials with a conchoidal fracture mechanism; not one of them is flint. Greenland was in prehistory circum-populated twice: by the Early palaeo-Eskimos, termed “Saqqaq” (2500-800 BC) and “Independence I” (2500-1800 BC) and by the Dorset termed “Greenland Dorset” (800-0 BC). Yet the migrating cultural traditions brought and developed their own specific preferences for raw material use. A common trait in all palaeo-Eskimo traditions is that the different raw materials were used specifically for distinct technologies and tool productions. However, the different raw materials are favoured and used differently in each of the palaeo-Eskimo traditions and the raw material choice is therefore, from an archaeological point of view, an important discriminator when distinguishing the different traditions. The problem, which this paper confronts, concerns the reasons for the use of different raw materials in different tool productions in the Eastern Arctic, and explores why the different cultural traditions had different preferences even though they lived in the same landscape.

The first question will mostly concern raw material properties and technology, while the second will touch upon cultural meaning and the formation of “tradition” through transmission of knowledge.

C77-28

Chloé ANDRIEU (Nanterre, France)

Usage, valeur et symbole de la chaille dans l'aire maya classique

Résumé: En dépit de ses piètres qualités à la taille (Matière grenue, nombreuses inclusions), la chaille, matière silicieuse la plus abondante dans les Basses Terres calcaires mayas est le principal support de l'industrie lithique. Elle fait à la fois l'objet d'une production à fort investissement technique, probablement le fait de spécialistes, et d'une production expédiente pour les besoins quotidiens. Les matériaux d'importation, de meilleure qualité (silex du Belize et obsidienne des Hautes Terres du Guatemala), sont dévolus pour la plupart aux pointes de lance et au débitage laminaire, des objets à fort investissement social. Toutefois, les objets culturels, tels que les pointes lancéolées et les excentriques sont autant façonnés sur support de chaille que d'obsidienne ou de silex. Nous discuterons de la composition de ces industries en termes techniques, mais aussi de réseaux d'échanges et d'implications socio-économiques.

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