Migrations and interactions in prehistoric Beringia: the evolution of Yakutian lithic technology

Yan Axel Gómez Coutouly*

* *Laboratory of Prehistory and Technology (UMR 7055), Institute for Archaeology and Ethnology, 21 Allée de l'Université, 92023 Nanterre cedex, France (Email: yanaxel@northpacificprehistory.com)*

Flaked-tool technology can provide insights into social and cultural changes and interregional connections. This study of changing tool production covers the Upper Palaeolithic to the Late Neolithic in the Yakutia region of eastern Siberia. This region is home to the Palaeolithic Dyuktai complex, the Mesolithic Sumnagin complex and Neolithic traditions; it thus enables a better understanding of the material culture of these societies in Siberia and improves our knowledge of the complex migration processes towards the New World.

Keywords: Yakutia, Siberia, Upper Palaeolithic, Late Neolithic, lithic technology

Artefacts selected for this study

All of the archaeological material presented here comes from the Museum of the Center for the Archaeology and Palaeoecology of Arctic People (Russian Academy of Sciences, Siberian Branch, Yakutsk, Russia) (Figure S1). Discussion will be limited to individual artefacts (cores, blades, microblades and so on), rather than entire assemblages or specific sites. A total of 507 lithic artefacts were included in the analysis (Table S1). Of these, 205 are from the Palaeolithic sites of Dyuktai Cave and Verkhne-Troitskaya, described in more detail by Mochanov and Fedoseeva (1996a & 1996b) and Gómez Coutouly (2011a). One hundred and seventy-six are from the Mesolithic (Ust-Timpton I) and 126 from the Neolithic (including Belkachi I, Sumnagin I, Tommot I, Onn'yosskogo). For the Mesolithic and Neolithic, only individual artefacts were analysed (those on display at the Museum's exhibits).

Figure S1. Map of Yakutia showing the main sites mentioned in the text.

Table S1. Lithic artefacts analysed for this study.

Artefact type	**Dyuktai complex**	**Sumnagin complex**	**Syalakh complex**	**Belkachi complex**	**Ymyakhtakh complex**
Microblade cores	31	26	3	4	5
Microblades	69	124	6	8	21
Blade cores	–	–	4	6	1
Blades	5	4	4	4	–
Flake cores	9	–	–	–	–
Bifacial tools	23	–	8	10	17
Burins	16	4	3	5	4
End scrapers	10	15	–	4	7
Other	42	3	–	2	–
Total	205	176	28	43	55

These artefacts had been assigned to specific prehistoric periods (i.e. Palaeolithic, Mesolithic and various stages of the Neolithic) by our Russian colleagues (e.g. Mochanov 1977; Mochanov *et al*. 1983; Mochanov & Fedoseeva 2008; Mochanov *pers. comm.*).

Comments on pressure-flaking

Crabtree's experiments on pressure flaking and blade production clearly demonstrated that "the wider the blade, the greater the amount of pressure that is required [to produce it]" (Crabtree 1968: 468). Following Crabtree, various modern flintknappers have experimented with pressure-flaking of microblades and blades (e.g. Texier 1984; Tixier 1984; Callahan 1985; Flenniken 1987; Pelegrin 1988, 2003, 2012; Ohnuma 1993; Tabarev 1997; Flenniken & Hirth 2003; Gryba 2006). Pelegrin's data is used in this study as he has worked on different modes (from pressure microblades to pressure blades), and it has been possible to apply his experimental results in detail to the statistical analysis of hundreds of pressure microblades and blades (Gómez Coutouly 2011a).

While width is the most important criteria to differentiate these modes (Figure S2), there are other aspects such as length (Table S2) and regularity (Pelegrin 1988, 2012; Gómez Coutouly 2011a). Length is, however, less relevant than width, as it can be strongly influenced by core morphology and size.

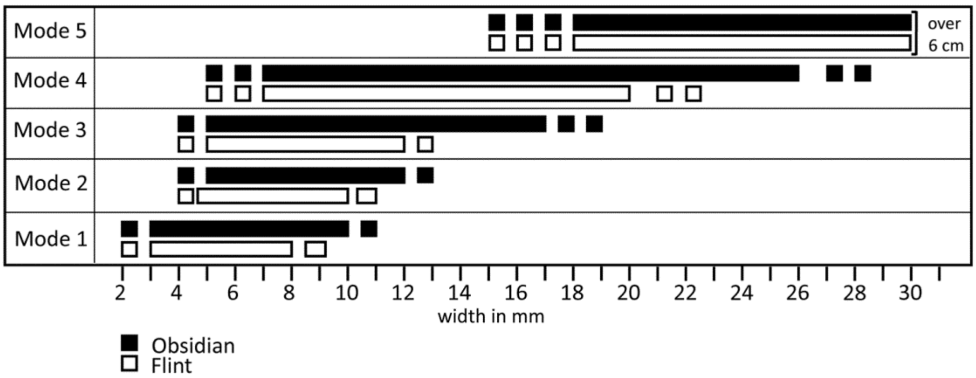
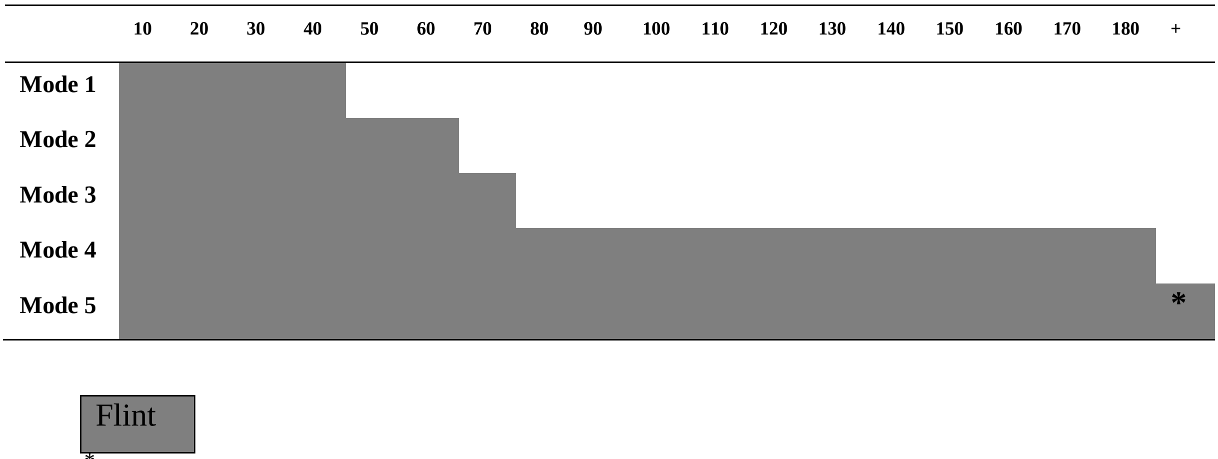


*Figure S2. Width range (in mm) for the five experimental pressure-flaking modes (adapted from Pelegrin 1988, 2012); notes: * = up to 29mm, ** = over 60mm.*

Table S2. Length range (in mm) for the five experimental pressure-flaking modes (based on Pelegrin 1988, 2012).



Note: * = over 400mm.

Experimental research on obsidian gives larger and wider microblades and blades than when they are produced on flint (Table S2), but none of the artefacts discussed here are made from obsidian. The technical characteristics of pressure-flaked microblades and blades have been extensively described elsewhere (Crabtree 1968; Tixier 1984; Inizan *et al*. 1992; Inizan *et al.* 1999; Gómez Coutouly 2011a).

The interpretations presented here are based solely on length and width measurements and the regularity of microblades and microblade removal scars observed on the cores, as none of the tools used to produce the experimental examples (e.g. punches, crutches, levers) have been found in an archaeological context.

The Dyuktai complex (Upper Palaeolithic): information on pressure-flaking modes

Virtually all pressure-flaked microblades produced during the Palaeolithic in Siberia are made using the hand-held or shoulder-crutch technique (modes 1 and 2) (Gómez Coutouly 2011a). This is also the case for other regions such as the Russian Far East or Alaska (Gómez Coutouly 2011a). The width of pressure-flaked microblades recovered from Dyuktai complex sites rarely exceeds 8 or 9mm, which correlates well with measurements taken on microblades produced using modes 1 and 2, as well as with experimental flaking of wedge-shaped cores using a hand-held pressure-flaking technique (Flenniken 1987; Tabarev 1997). The use of pressure-flaking mode 3 (short abdominal crutch) appears to be rare in Siberian Palaeolithic microblade assemblages, but evidence for its use was found at Dyuktai Cave (Gómez Coutouly 2011b; Gómez Coutouly 2016: Figure 2: a) and Druchak-Vetrenny (Gómez Coutouly 2011a).

The Sumnagin complex (Mesolithic): information on core morphology and core-holding devices

Microblade cores of the Siberian Mesolithic are no longer wedge-shaped as were those of the Dyuktai complex. Wedge-shaped cores are rarely found in presumed Mesolithic contexts (cf. Mochanov & Fedoseeva 1986). One example (Gómez Coutouly 2011a: fig. 8.1: e) of a Mesolithic wedge-shaped bifacial core seems to be in an early stage of production. The change in core morphology is of major importance because it has direct implications for the core-holding device. Indeed, wedge-shaped cores were probably held with a clamp system (e.g. Callahan 1985; Tabarev 1997), while conical cores were probably held with a grooved system (e.g. Pelegrin 2012). For conical cores, the device might have been “a small, grooved piece of wood, bone or antler. […] The groove keeps the flaking surface free of contact and thus prevents the microblade from terminating in a hinge or step against the palm” (Pelegrin 2012: 469).

The Sumnagin complex (Mesolithic): Ust-Timpton I pressure-flaking modes

Based on the analysis carried out, the mean width of microblades from the Sumnagin complex at the Ust-Timpton I site seems to suggest a combination of modes 1 or 2 with mode 3 pressure-flaking (Figure S3).

Some of the laminar products assigned to Mesolithic assemblages (Gómez Coutouly 2016:Figure 5: a & l) are best described as bladelets or blades rather than microblades. One of them (Gómez Coutouly 2016: Figure 5: a) is, according to current experimental data, too wide (11mm) and too long (87mm) to be pressure-flaked via modes 1 or 2. These small blades therefore represent either the highest range of pressure microblade production using mode 3, or are a rare case of mode 4 pressure-blade production during the Mesolithic. It is also possible that these blades are actually Neolithic blades recovered outside their primary context.

Siberian Neolithic cultures: evidence of pressure-flaking of blades (mode 4)

The most distinctive feature of Siberian Neolithic tool includes the appearance of pottery (Figure S4) and polished tools (Figure S5), and also the widespread use of pressure-blade production mode 4.

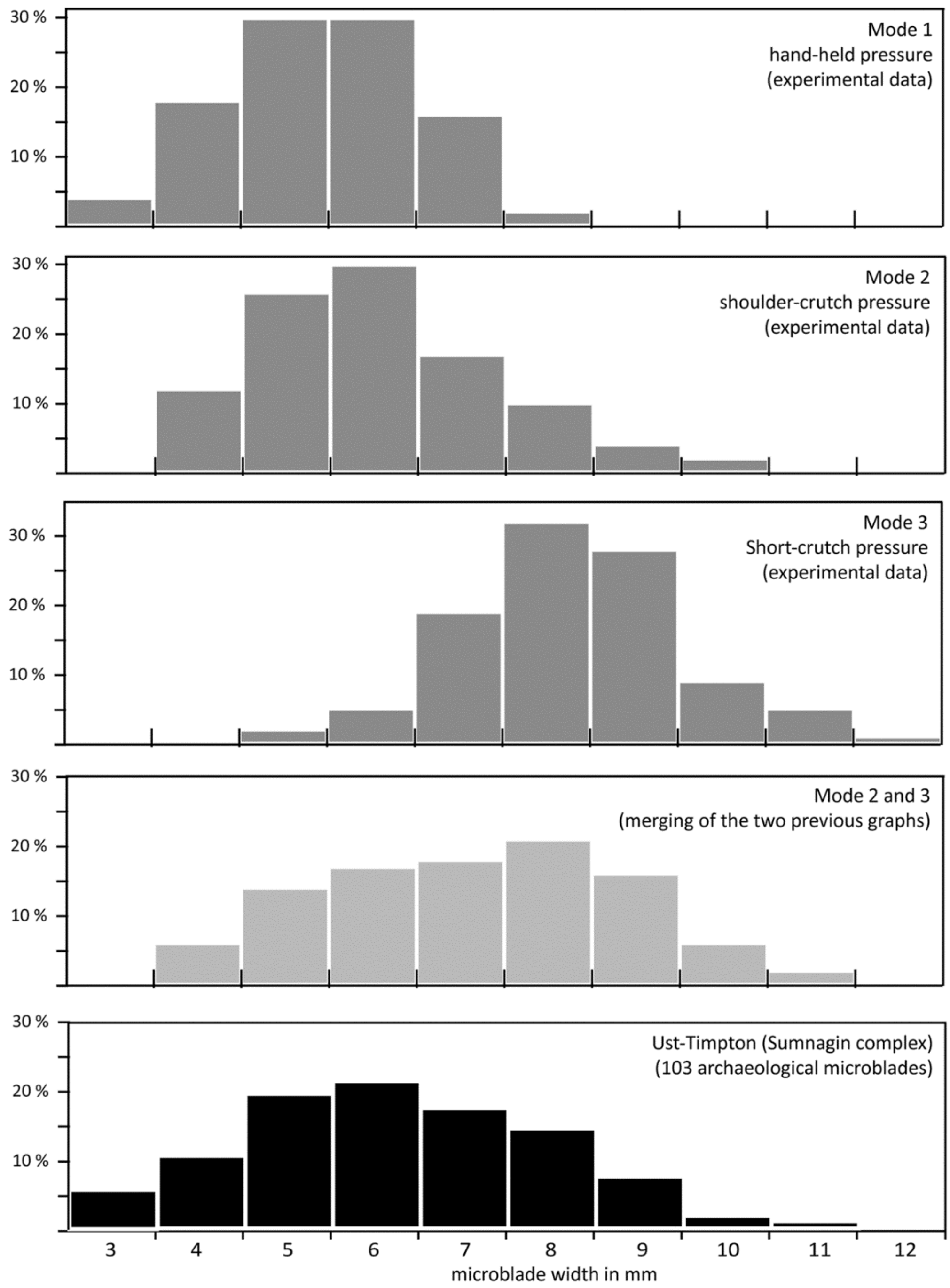


Figure S3. Microblade widths from experimental data using modes 1–3 compared with the archaeological data from Ust-Timpton I (Sumnagin complex); number of microblades: mode 1 (100 experimental microblades), mode 2 (103 experimental microblades), mode 3 (111 experimental microblades), modes 2 and 3 (214 experimental microblades, merging of the two previous modes) and Ust-Timpton I (103 archaeological microblades).

Figure S4. Ceramics from the Belkachi complex (Middle Neolithic).

Syalakh complex (Early Neolithic)

Use of the mode 4 technique was determined from analysis of two cores and four blades. First, the symmetry of the blade scars on the core (Gómez Coutouly 2016: Figure 6: c) is characteristic of pressure-blade removal. Second, the length (over 130mm) and width (up to 12mm) of the detached blades are unachievable using modes 1–3. Third, the core is in the later stages of manufacture, which suggests that blades larger than these were produced earlier in the reduction sequence. Finally, the large size of some blades (Figure 8: a & h–j) suggests the mode 4 technique of manufacture. One of the four blades (Gómez Coutouly 2016: Figure 8: a) provides the clearest example, not so much from its width (12mm) but rather from its length (130mm) and extreme regularity. The other three blades (Gómez Coutouly 2016: Figure 8: h–j) also point towards the mode 4 method (respectively 10, 11 and 14mm width), although width measurements between 10 and 11mm overlap with the higher range of mode 3.

Belkachi complex (Middle Neolithic)

Two of the six Belkachi blade cores analysed for this study are illustrated here (Gómez Coutouly 2016: Figure 9: a–b). Although the visible blade scars on the cores only measure up

Figure S5. Polished tool from the Belkachi complex (Middle Neolithic).

to 12mm in width, the length of the scars (over 8cm) suggests the mode 4 technique. This is supported by the presence of larger, pressure-flaked blades (Gómez Coutouly 2016: Figure 9, b–c), which have widths between 12–14mm.

Evidence and information on pressure-flaking with a lever device (mode 5)

The production of large, pressure-flaked blades and blade cores first appears during the Early Neolithic. In most cases, these cores are pressure-flaked using mode 4, but there is at least one example of the use of the mode 5 technique (Gómez Coutouly 2016: Figure 7). Evidence for this technique comes from a single core assigned by Mochanov to the Syalakh complex. The regularity, length and width of the blade scars visible on the core (Gómez Coutouly 2016: Figure 7) are typical of pressure-flaking with a lever device. The various blade scars measure over 20mm in width, a width that has only been replicated by the mode 5 lever technique. Furthermore, the regularity of the blade scars and the length of the core (over 230mm) suggest that pressure-flaking was most probably the technique used for the removal of such large blades. None of the blades produced by this technique were identified during this study.

While this core is the direct evidence of pressure-flaking with a lever device, there are other indications of this technique during the Early Neolithic, especially around Ushki Lake in Kamchatka (Siberia). At Ushki Lake-2, fragments of obsidian blades are consistent in size with the use of pressure-flaking with a lever (Gómez Coutouly 2011a: fig. 8.5: a–c). The widths of these obsidian blades (17, 23 and 27mm) are also comparable, however, to experimental obsidian pressure-blades produced using the mode 4 technique. In the Early Neolithic level of Ushki Lake-5, a very large obsidian core preform was found measuring 300mm high and weighing around 4kg (Gómez Coutouly 2011a: fig. 8.5: d; Ponkratova *pers. comm.*). At first glance, it might seem premature to use a preform to propose a particular type of pressure-flaking. There are, however, the following additional factors to support this hypothesis:

1) Most blade cores from the Siberian Neolithic are, to my knowledge, pressure-flaked. In other words, there are very few blade cores from Neolithic components (especially at Ushki Lake) that have been clearly reduced using direct or indirect percussion. Also, there does not seem to be many flake cores either at Ushki Lake or in the Siberian Neolithic. Therefore, the evidence seems to indicate that this preform was intended to produce blades and that it was going to be pressure-flaked.
2) Based on modern experimental data, the size of this preform is compatible with pressure-flaking with a lever, and seems too large for any other type of pressure-flaking technique (such as the use of a long crutch).
3) As mentioned above, large obsidian blade fragments comparable in size to pressure-flaking with a lever device have been found in the same Early Neolithic component of Ushki Lake.

In addition to the Ushki Lake sites, evidence of pressure-flaking with a lever is found in more distant regions. There is evidence for the use of this technique from Finland and northern China. In Finland, several pressure-flaked blades with sizes corresponding with the lever technique have been unearthed at the Sujala site (Rankama & Kankaanpää 2008; Pelegrin *pers. comm.*). In northern China, a large obsidian blade core discovered by Oba Masayoshi (Gómez Coutouly 2011a: fig. 8.6; Pelegrin *pers. comm.*) in a surface context suggests the presence of this technique in that region.

Ymyakhtakh complex (Late Neolithic)

There is no direct evidence for the use of pressure-flaking with a lever device during the Late Neolithic (Ymyakhtakh complex). Some tenuous evidence could indicate the presence of this technique, but it is far from being demonstrated at present. On the one hand, the large blade core (Gómez Coutouly 2016: Figure 11: d) shows a few blade scars that were made prior to the current platform (i.e. the proximal end of these blade scars can no longer be seen due to the platform removals). Therefore, the core was originally bigger than it is now and there is a possibility that the first reduction phase was made with the lever technique, although there is no way to confirm it. On the other hand, the rectangular bifacial retouched insets (Gómez Coutouly 2016: Figure 12: g–k) may also be evidence of pressure-flaking with a lever. Given the size of these insets, if they were made on blades, they would probably be made with a lever device. Unfortunately, it is quite difficult to identify the original blank for these tools, as they are completely retouched.

References

CALLAHAN, E. 1985. Experiments with Danish Mesolithic microblade technology. *Journal of Danish Archaeology* 4: 23–39.

CRABTREE, D.E. 1968. Mesoamerican polyhedral cores and prismatic blades. *American Antiquity* 33: 446–78. http://dx.doi.org/10.2307/278596

FLENNIKEN, J.J. 1987. The Paleolithic Dyuktai pressure-blade technique of Siberia. *Arctic Anthropology* 24(2): 117–32.

FLENNIKEN, J.J. & K.G. HIRTH. 2003. Handheld prismatic blade manufacture in Mesoamerica, in K.G. Hirth (ed.) *Mesoamerican lithic technology: experimentation and interpretation*: 98–107. Salt Lake City: University of Utah Press.

GOMEZ COUTOULY, Y.A. 2011a. Industries lithiques à composante lamellaire par pression du Nord Pacifique de la fin du Pléistocène au début de l'Holocène: de la diffusion d'une technique en Extrême-Orient au peuplement initial du Nouveau Monde. Unpublished PhD dissertation, Paris West University Nanterre La Défense.

– 2011b. Identifying pressure-flaking modes at Dyuktai Cave: a case study of the Siberian Upper Paleolithic microblade tradition, in T. Goebel & I. Buvit (ed.) *From the Yenisei to the Yukon: interpreting lithic assemblage variability in Late Pleistocene/Early Holocene Beringia*: 75-90. College Station: Texas A&M University Press.

– 2016. Migrations and interactions in prehistoric Beringia: the evolution of Yakutian lithic technology. *Antiquity* 90: 9–31. http://dx.doi.org/10.15184/aqy.2015.176

GRYBA, E.M. 2006. An assessement of the free-hand pressure-flaking technique of pre-contact North America. *Lithic Technology* 31: 57–77.

INIZAN, M.-L., M. LECHEVALLIER & P. PLUMET. 1992. A technological marker of the penetration into North America: pressure microblade debitage, its origin in the Paleolithic of North Asia and its diffusion, in P.B. Vandiver, J.R. Druzik, G.S. Wheeler & I.C. Freestone (ed.) *Material issues in art and archaeology III*: 661–81. Pittsburgh (PA): Material Research Society. http://dx.doi.org/10.1557/proc-267-661

INIZAN, M.-L., M. REDURON-BALLINGER, H. ROCHE & J. TIXIER. 1999. *Technology and terminology of knapped stone*. Nanterre: CREP.

MOCHANOV, Y.A. 1977 (trans. 2009). *The earliest stages of settlement by people of north-east Asia*. Translated by R.L. BLAND. Novosibirsk: Nauka.

MOCHANOV, Y.A. & S.A. FEDOSEEVA. 1986. Main periods in the ancient history of north-east Asia, in V.L. Kontrimavichus (ed.) *Beringia in the Cenozoic Era*: 669–93. New Delhi: Amerind.

– 1996a. Dyuktai Cave, in F.H. West (ed.) *American beginnings: the prehistory and palaeoecology of Beringia*: 164–74. Chicago (IL): University of Chicago Press.

– 1996b. Verkhne Troitskaya, in F.H. West (ed.) *American beginnings: the prehistory and palaeoecology of Beringia*: 180–84. Chicago (IL): University of Chicago Press.

– 2008. *Archaeology, the Paleolithic of north-east Asia, a non-tropical origin for humanity, and the earliest stages of the settlement of America*. Burnaby: Archaeology Press, Simon Fraser University.

MOCHANOV, Y.A., S.A. FEDOSEEVA, A.N. ALEKSEYEV, V.I. KOZLOV, N.N. KOCHMAR & N.M. CHERBAKOVA. 1983. *Arkheologicheskiye pamyatniki Yakutii. Basseyny Aldana i Olekmy*. Novosibirsk: Nauka.

OHNUMA, K. 1993. Experimental studies in the determination of manners of micro-blade detachement. *Al-Rāfidān* 14: 153–81.

PELEGRIN, J. 1988. Débitage expérimental par pression ‘du plus petit au plus grand’. *Technologie Préhistorique* 25: 37–53.

– 2003. Blade-making techniques from the Old World, in K.G. Hirth (ed.) *Mesoamerican lithic technology: experimentation and interpretation*: 55–71. Salt Lake City: University of Utah Press.

– 2012. New experimental observations for the characterization of pressure-blade production techniques, in P.M. Desrosiers (ed.) *The emergence of pressure knapping: from origin to modern experimentation*: 465–500. Québec: Springer.

RANKAMA, T. & J. KANKAANPÄÄ. 2008. Eastern arrivals in post-glacial Lapland: the Sujala site 10 000 cal BP. *Antiquity* 82: 884–99. http://dx.doi.org/10.1017/S0003598X00097659

TABAREV, A.V. 1997. Paleolithic wedge-shaped microcores and experiments with pocket devices. *Lithic Technology* 22: 139–49.

TEXIER, P.-J. 1984. Un débitage expérimental de silex par pression pectorale à la béquille. *Bulletin de la Société Préhistorique Française* 84: 25–27. http://dx.doi.org/10.3406/bspf.1984.8606

TIXIER, J. 1984. Le débitage par pression, in J. Tixier, M.-L. Inizan & H. Roche (ed.) *Préhistoire de la pierre taillée. 2: economie du débitage laminaire*: 57–70. Paris: CREP.