Chapter 15
Eastern Arctic Under Pressure: From Paleoeskimo to Inuit Culture (Canada and Greenland)

Pierre M. Desrosiers and Mikkel Sørensen

15.1 Introduction

Pressure microblade production appeared with the arrival of the Paleoeskimo people (4500–800 B.P.) in the Eastern Arctic, long after the technique was established in other areas of the world (Fig. 15.1). Previous assumptions have all too quickly proposed that the Paleoeskimo produced microblades by 'pressing them off' from the core. As a result, there was no real attempt made to analyse the techniques employed to detach microblades in later studies. In addition, early studies did not focus on lithic technology in any great detail, which likely explains why our present knowledge is limited with regard to detachment techniques in the Arctic. This study seeks to improve upon our current knowledge of the detachment technique for microblade production employed by the Paleoeskimo.

In this chapter, we define the current state of knowledge of pressure microblade production as well as the context in which lithic technology developed in the study area. Analysis and observation of microblade collections from Canada and Greenland allow us to identify the place of pressure technique in lithic tool production. Initially, we will look at the origin and diffusion of pressure microblade production in the Eastern Arctic until its disappearance at the arrival of Thule/Inuit people (Neoeskimo).

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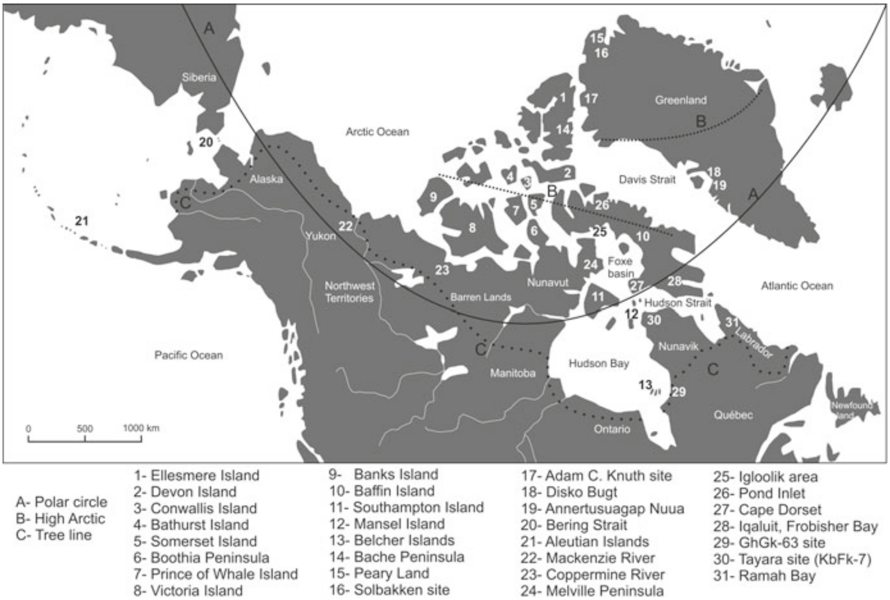

Fig. 15.1 Map of the Eastern and Western Arctic showing locations of the sites discussed in the chapter (Map prepared by Mikkel Sørensen)

In our discussion, we present the pressure tool as well as the use of pressure-flaking techniques employed by the Thule/Inuit people. Furthermore, examining the relationship between pressure tools, pressure flaking for bifacial production, and pressure-produced microblades expands upon our understanding of Paleoeskimo technological organization.

15.2 Early Assumptions Regarding Detachment Techniques

Archaeological investigations in the Arctic increased significantly in the 1950s with the onset of the Cold War and the resulting development of Arctic infrastructure such as airports and the DEW line. Such developments, and the establishment of policies related to Arctic sovereignty, gave archaeologists better access to remote regions and the sites they contained. Initial research focused on defining the cultural history, chronology, material culture, and origin of the Arctic's past inhabitants. Figure 15.2 depicts the broad chronological and cultural sequences of the North American Arctic and Greenland. These are imperfectly defined since differences between subregions reflect not only a broad diversity of environments (i.e. from the tree line to the High Arctic) but also the influence of different archaeologists in each area.

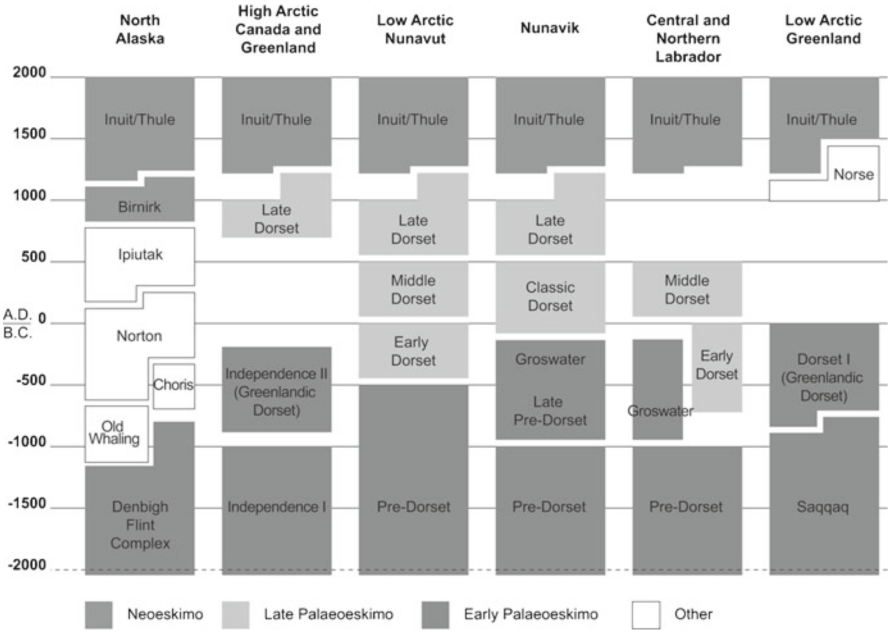

Fig. 15.2 The broad chronological sequence of Arctic culture in North America and Greenland (http://www.avataq.qc.ca/en/Institute/Departments/Archaeology/Discovering-Archaeology/Arctic-Chronology). According to Grønnow and Sørensen (2006) the Greenlandic Dorset (formerly defined as the Independence II and the Dorset I) should be associated with the Late Paleoeskimo. According to Schledermann (1990) and Grønnow and Sørensen (2006) the High Arctic 'North Water' region was, from 2500 to 0 B.C. used by many of the Paleoeskimo cultural groups from both Canada and Greenland: Independence I, Predorset, Saqqaq and Late Predorset/Transitional Canadian Dorset, and Greenlandic Dorset groups. The dating of the Independence I culture is from 2500 to 1900 B.C. In low Arctic Greenland the dating of the Saqqaq is from 2500 to 700 B.C., while the Greenlandic Dorset is dated to 800–0 B.C., thus an overlap in absolute dating appear in Central West Greenland. According to Desrosiers (2009) the situation in Low Arctic Nunavut and Central and Northern Labrador is similar to Nunavik with regards to the so called 'Early and Middle Dorset' periods. Instead, these should be placed within the 'Classic Dorset' period and its chronology

The Dorset was the first Paleoeskimo culture to be distinguished from the Thule culture (the direct ancestors of the present-day Inuit). Jenness (1925) identified Dorset culture, which became better defined in the following decades (Rowley 1940; Wintemberg 1939, 1940). Shortly thereafter, in the 1950s, the simultaneous discovery of spalled burins across the Arctic led to the definition of earlier Paleoeskimo cultures (Giddings 1949, 1951; Irving 1951; Knuth 1952; Meldgaard 1952; Solecki 1950; Solecki and Hackman 1951). Authors such as Meldgaard (1952: 223) proposed that a pressure technique was used to detach the spall from the resultant burin, while Collins (1956: 70) suggested spalls were either 'struck or pressed off'.

By the 1960s and 1970s, this idea extended to 'tip fluting' of harpoon end blades and the flaking of chert points (Giddings 1967: 230; Meldgaard 1960b: 592). It also extended to microblade production: 'At this site no true microblades in the sense of thin parallel-sided lamellar flakes, driven by controlled pressure or percussion flaking from a prepared polyhedral core, have been found' (Maxwell 1962: 28); '… Denbigh artisan pressed his antler flaker tip repeatedly against small flinty stones, turning out the burins, scrapers, microblades, and marvellous miniature arrowpoints and edging blades that we recognize at a glance as the hallmarks of Denbigh culture …' (Giddings 1967: 247); and 'Microblades are undoubtedly removed from microcores by well-controlled pressure flaking process' (Wyatt 1970: 100).

This interest in lithic technology as part of the earlier cultural historical archaeology gradually vanished in the 1970s with the establishment of formal chronological frameworks. Archaeologists often rely more on radiocarbon dates than artefact typologies to assign an assemblage to a specific culture. In addition, the focus of Arctic archaeology shifted towards more diversified topics such as ecological adaptations, the study of settlement patterns and site function, as well as the documentation of architecture and zooarchaeology. The non-recognition of the archaeological context problems associated with occupation admixture led many to adopt a limited view of material culture for distinguishing Paleoeskimo groups (Desrosiers 2009: 120). This inhibited the development of research into lithic technology, with some distinct exceptions. One of them is the microblade study conducted by Owen (1988). If Owen's study did not aim at documenting detachment techniques, it did include interesting general observations based on her meticulous analysis based on a large quantity of microblades: 'The microblade assemblages from the Independence I of Port Refuge and the Early Pre-Dorset are remarkably similar and clearly belong to the same microblade technology. On the basis of microblade form and attributes, it seems likely that they were produced with a well controlled pressure technique' (1988: 122).

It was noted that the size of microblades varies according to the type of raw material used for their manufacture (McGhee 1970: 95–96). Owen also noted: 'It seems likely that the quartz crystal microblades were produced with the same general technique as the other Dorset microblades, probably with pressure. In contrast, the pieces of Ramah chert are larger, more irregular in form, have less carefully prepared platforms and fewer ridge blades. They were probably manufactured with a different technique, i.e. with indirect or direct percussion' (1988: 127). By extension, we can propose that the detachment techniques would vary according to raw material type used by the Paleoeskimos.

As a result of the previous assumptions with regard to microblade production, it would be of interest to better document the removal techniques employed by the Paleoeskimo. The following questions have motivated our research into the subject: Did microblade production techniques vary in space and over time? And were these variations the result of different factors such as the availability of raw material?

15.3 The Origins of Pressure Microblade Production in the Eastern Arctic

Before its appearance in the Arctic, pressure microblade production developed much earlier outside North America (Inizan, et al. 1992). Three theories exist for the origin of Arctic cultures. The first (e.g. Bogoras 1925; Cranz 1770; Dawkins 1874; Markham 1865; Mathiassen 1927; Sapir 1916; Thalbitzer 1914) proposes that the Bering Strait was the point of origin of the Thule/Inuit people. With the discovery of earlier cultures, it was also treated as the region from which the Paleoeskimo cultures had emerged (Collins 1940; De Laguna 1946; Harp 1964: 159–161).

The second theory (e.g. Boas 1888; Murdoch 1892; Rink 1873) proposes that certain Arctic cultures at their origin represent a progressive adaptation of interior Amerindian peoples to coastal Arctic regions. This model was later proposed to explain the origins of Paleoeskimos (Collins 1934: 311; Hoffman 1952; Mathiassen 1935: 421–422; 1936: 130; Meldgaard 1960a, b, 1962). Since the 1950–1960s, archaeological research has demonstrated that there is no clear relationship between the Amerindian peoples in the Subarctic and the development of the Eastern Arctic cultures (e.g. Harp 1964).

Finally, the third theory (i.e. McGhee 1983) asserts the challenging position that the prehistoric cultures of the Eastern Arctic originated in North-Western Russia or possibly Northern Europe. The archaeological record does not present any evidence to lend support to this theory however.

Thus, only the first theory explains the origins of pressure techniques employed for microblade manufacture in the Eastern Arctic. The exact circumstances under which Paleoeskimo pressure techniques had evolved in the production of microblades in the Western Arctic and Bering Strait is still poorly understood. The Westernmost Paleoeskimo culture from Alaska is the Denbigh Flint culture (Fig. 15.2). The Denbigh Flint culture is roughly contemporaneous with other Early Paleoeskimo cultures and is believed to be their direct ancestor due to its Western position (e.g. Taylor 1968).

Both authors have observed Denbigh chert and obsidian microblades from the Iyatayet site of Alaska. During this quick overview, we noted an overall lack of edge regularity. This would hardly attest to the systematic employment of pressure techniques. This overall lack of regularity is also distinguishable from illustration in Giddings' book (1964: 207). In fact, only midsized and small microblades show a significant degree of regularity and other characteristics associated with the use of pressure technique. At present, we can only suggest that pressure was not the only technique employed, particularly for production of the largest microblades, which occasionally get larger towards their distal ends (Fig. 15.3).

The exact detachment technique employed by Denbigh for the manufacture of microblades remains to be fully studied. As well, the relationship between Denbigh and other Paleoeskimo cultures needs to be better understood before a convincing argument on the origin of the pressure microblade technique in the Eastern Arctic can be put forth.

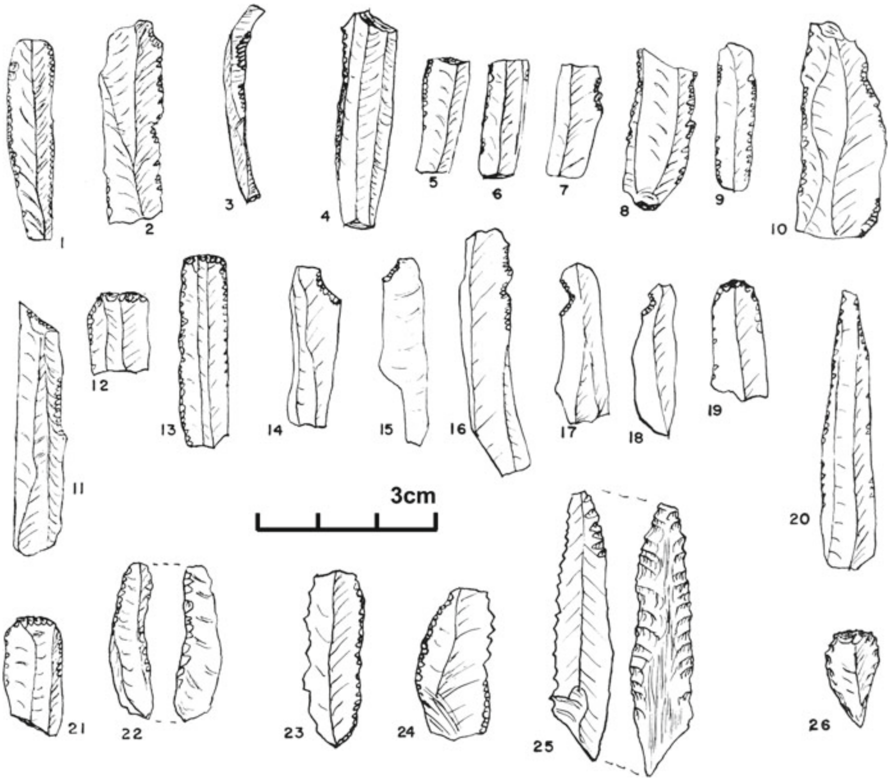

Fig. 15.3 Sample of microblades from the Denbigh Flint Complex (Giddings 1964: 207)

15.4 A Case Study from the Canadian Arctic

Desrosiers (2009) documents the techniques of detachment for several classic Dorset collections from Nunavik (Fig. 15.2). These sites represent lithic technology from the beginning of the Dorset period in the Eastern Arctic and include GhGk-63 site and level II of the Tayara site (KbFk-7) (Fig. 15.1). Both are dated between 2100 and 1800 B.P. These collections demonstrate that relatively similar raw materials were used for microblade production – primarily small-sized pieces of chert and quartz crystal.

The *chaîne opératoire* involved in microblade production for both sites has been described previously (Desrosiers 2007, 2009). Only the results for the identification of the exact detachment techniques are mentioned below. Desrosiers derived the diagnostic criteria through the observation of modern flintknappers (i.e. Jacques Pelegrin, Éric Boëda, Sylvain Sorriano, Mikkel Sørensen, and others), personal experience, and from lithic technology seminars. Descriptions of certain criteria are also provided in the literature (Crabtree 1968; Marchand 1999; Pelegrin 2000, 2002; Texier 1984; Tixier et al. 1980).

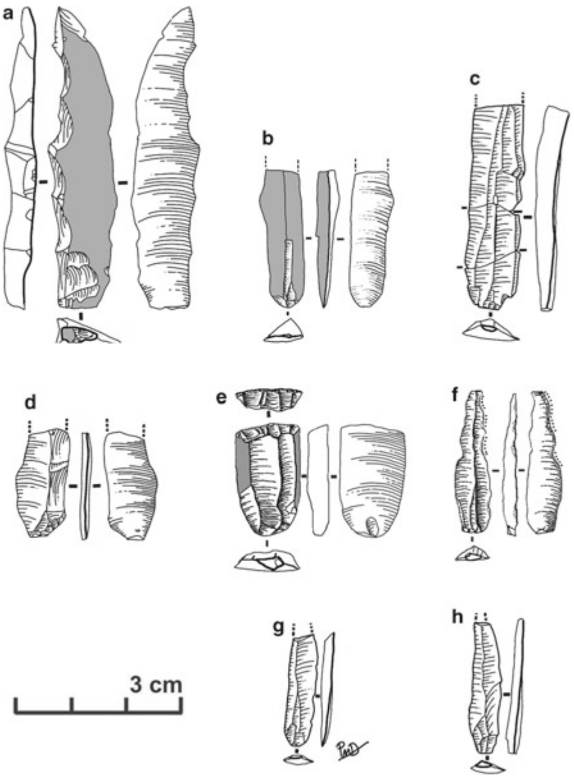

Fig. 15.4 Chert microblades from GhGk-63 site: (**a**) crested, (**b**) with natural surfaces, (**c–d**) refitted fragments, (**e**) end-scraper, (**f**) lateral edge retouched (or use-wear) and (**g–h**) unretouched. (Drawing: Pierre M. Desrosiers)

A definite combination of criteria can rarely prove that a particular technique of detachment was employed over another since identifying a specific technique is a delicate task (Pelegrin 1995: 20–23; Tixier 1982). At times, a particular diagnostic feature could be used to eliminate a detachment technique, for instance a concave butt is unlikely to relate to the use of direct percussion. Our diagnosis of a given detachment technique by and large represents tendencies as opposed to an absolute fail-safe identification. These tendencies demonstrate that microblades would show a combination of characteristics that suggest a given technique of detachment was employed as opposed to others.

The GhGk-63 site dates from the first half of the Dorset period and is situated 100 km within the tree line, on the Eastern coast of Hudson Bay near Kuujjuarapik (Avataq Cultural Institute 1991, 1992; Bernier 1997; Desrosiers 1999, 2009; Desrosiers and Gendron 2004, 2006; Desrosiers and Rahmani 2003). Microblades from this site indicate the use of a variety of detachment techniques. A total of 175 chert microblades were studied. The techniques identified can be summarized as follows: 9 by direct soft hammer percussion, 41 by indirect percussion, 11 by pressure, and 114 undetermined (Fig. 15.4). As for quartz crystal microblades the results are 3 by soft hammer direct

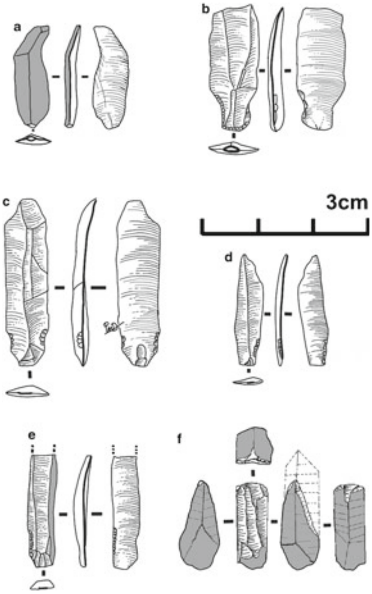

Fig. 15.5 Quartz crystal microblade production at Dorset GhGk-63 site: (**a**) natural surfaces microblade, (**b–e**) tanged microblades and (**f**) microblade core. (Drawing: Pierre M. Desrosiers)

percussion, 3 by indirect percussion, 11 by pressure, and 21 undetermined (Fig. 15.5). The undetermined samples relate to degrees of fracture, the size of the microblades, and the degree of retouch, particularly on the proximal end. Furthermore, on the smallest microblades, it is difficult to distinguish diagnostic attributes (Desrosiers 2009).

The Tayara site (KbFk-7) presents exceptionally deep stratigraphy, which is unusual among sites in the Arctic. The central area of the site includes three layers close to the permafrost. The archaeological context and other aspects of the site are well documented (Desrosiers 2009; Desrosiers et al. 2006, 2007; Desrosiers et al. 2008; Houmard 2006; Avataq Cultural Institute 2002, 2003, 2004, 2006, 2007; Todisco 2008; Todisco and Bhiry 2007, 2008a, b; Todisco et al. 2009; Todisco and Monchot 2008). Chert microblades from the Dorset level II are numerous, with a total of 413 having been identified. Detachment techniques are as follows: 12 by direct soft hammer percussion, 21 by indirect percussion, 115 by pressure, and 265 undetermined (Fig. 15.6). On the other hand, 440 quartz crystal microblades were also produced by various techniques: 12 direct percussion soft hammer, 12 indirect percussion, 187 pressure, and 229 undetermined (Desrosiers 2009).

Considering the fact that the smallest microblades incorporate mainly unidentifiable features in both assemblages, the tendency appears to be that pressure was the main technique employed for the detachment of small- and medium-sized microblades by the Dorset people. This is not only visible on the microblades themselves but on the microblade cores as well, which exhibit regular parallel scars on their knapping surface upon abandonment. This is especially true among quartz crystal cores (Figs. 15.5f, 15.7j–k).

The largest microblades result from indirect or soft hammer percussion. More specifically, they often include crested microblades (Figs. 15.4a, 15.6a–c, 15.7d).

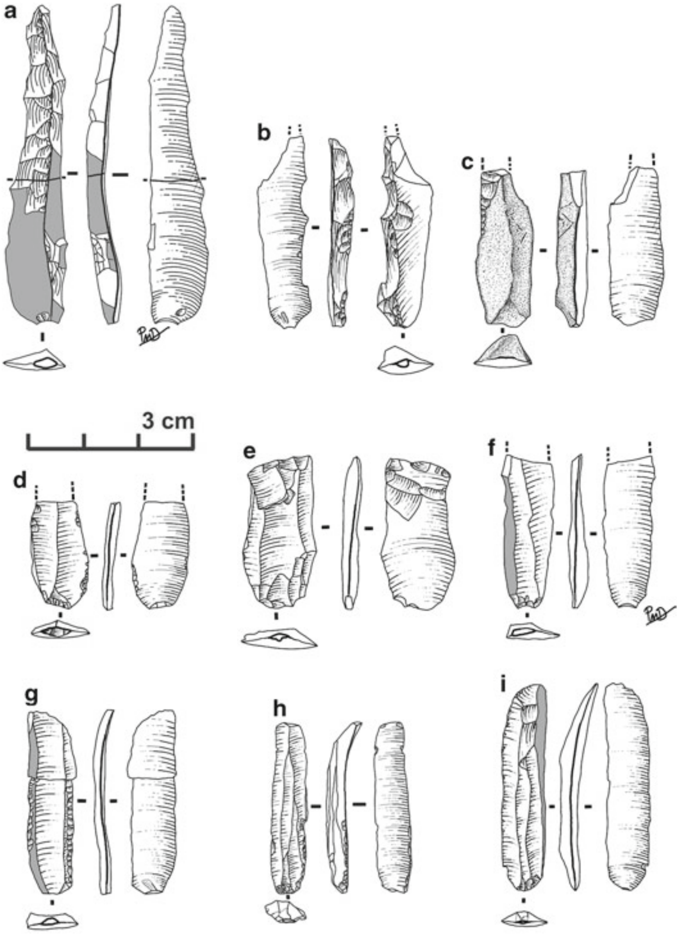

Fig. 15.6 Chert microblades from Tayara site (KbFk-7): (**a–b**) crested, (**c**) with natural surfaces, (**d**) probably detached by soft hammer percussion, (**e**) retouched, (**f**) with concave butt and getting larger toward distal end, (**g**) lateral retouched edges, (**h**) tanged and (**i**). (Drawing: Pierre M. Desrosiers)

The *chaîne opératoire* of microblade production suggests that the crest was shaped by direct and indirect percussion flaking (Figs. 15.4a, 15.6a, b, 15.7a, b) or consists of selecting the intersection of two natural flat surfaces (Figs. 15.4b, 15.5a, 15.6c, 15.7c, d). The crested microblades tend to be much thicker and their edge regularity is poor. On some of the crested microblades, the butt is deeply concave, a characteristic almost incompatible with the use of direct percussion. Those characteristics suggest the use of indirect percussion with a punch (Fig. 15.6a, b).

There was a logical application of various detachment techniques that relate closely to the steps of the *chaîne opératoire* and the microblade size. It seems that pressure

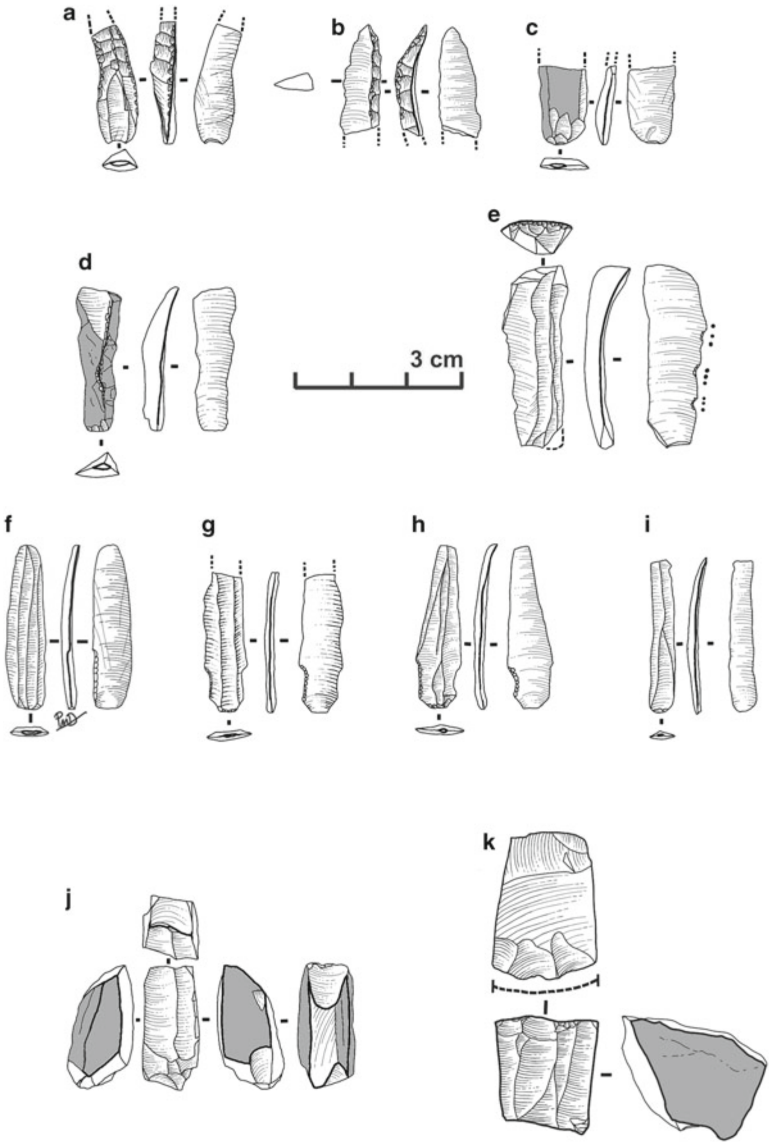

Fig. 15.7 Quartz crystal microblade production at Tayara site (KbFk-7): (**a–b**) crested microblades, (**c–d**) natural surfaces microblades, (**e**) end-scraper, (**f–h**) tanged microblades, (**i**) microblade detached by pressure and (**j–k**) microblade cores. (Drawing: Pierre M. Desrosiers)

could only be applied within a limited range of force (i.e. producing small- and middle-sized microblades), a feature linked to the type of pressure tool and the way it was manipulated. When larger microblades were required, namely, at the beginning of the production sequence, soft hammer and indirect percussion were the preferred techniques. The biggest microblades (most likely not produced by pressure techniques)

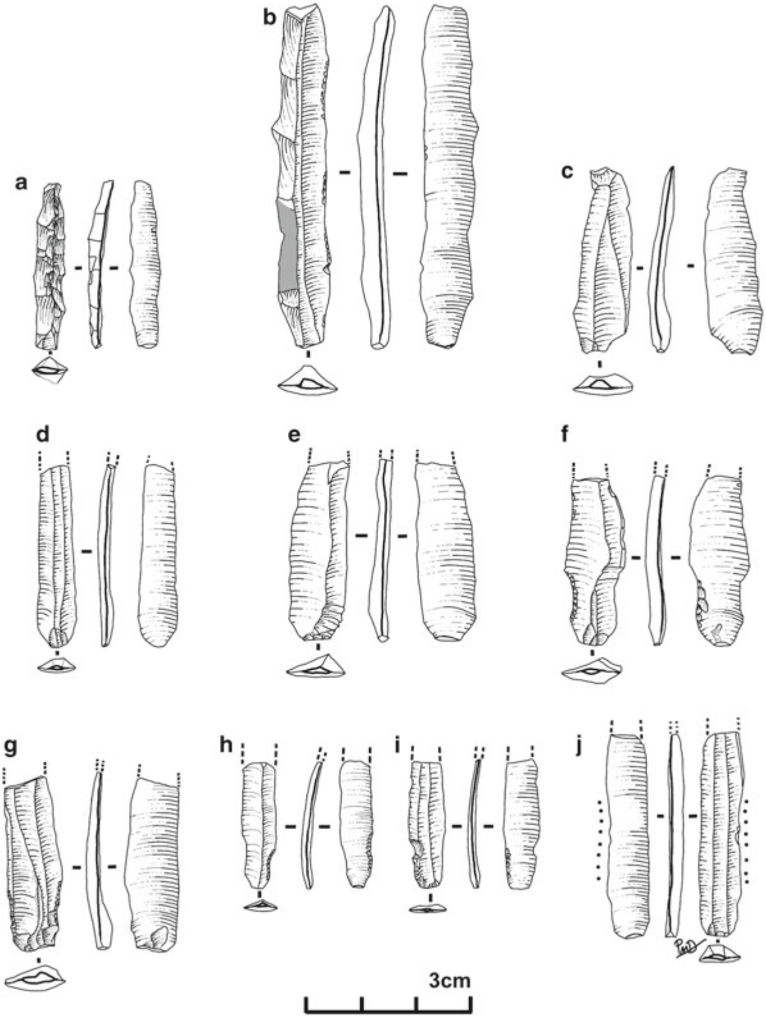

Fig. 15.8 Sample of microblades from T1 site (KkHh-3 [**a**–**g**]) on Southampton Island and Alarnerk site NhHd-1 (**h**–**j**) in Igloolik area. All microblades are in chert with the exception of one (H) in quartz crystal (Drawing: Pierre M. Desrosiers)

were often selected and transformed into tools (Desrosiers 2009). This suggests that regularity was not the main criterion for microblade blank selection.

We compared the results of the microblade study of GhGk-63 and level II of Tayara site (KbFk-7) with collections from Hudson Strait (KkHh-3, NhHd-1, and NjHa-1) and Dorset sites from Labrador (IdCr-6 and JaDb-10). The microblades from Hudson Strait are particularly similar to those of the GhGk-63 and Tayara (level II) sites. A rapid overview indicated that the small- and medium-sized microblades were most likely produced by pressure, while the largest ones were detached by either direct or indirect percussion (Fig. 15.8). By contrast, Ramah

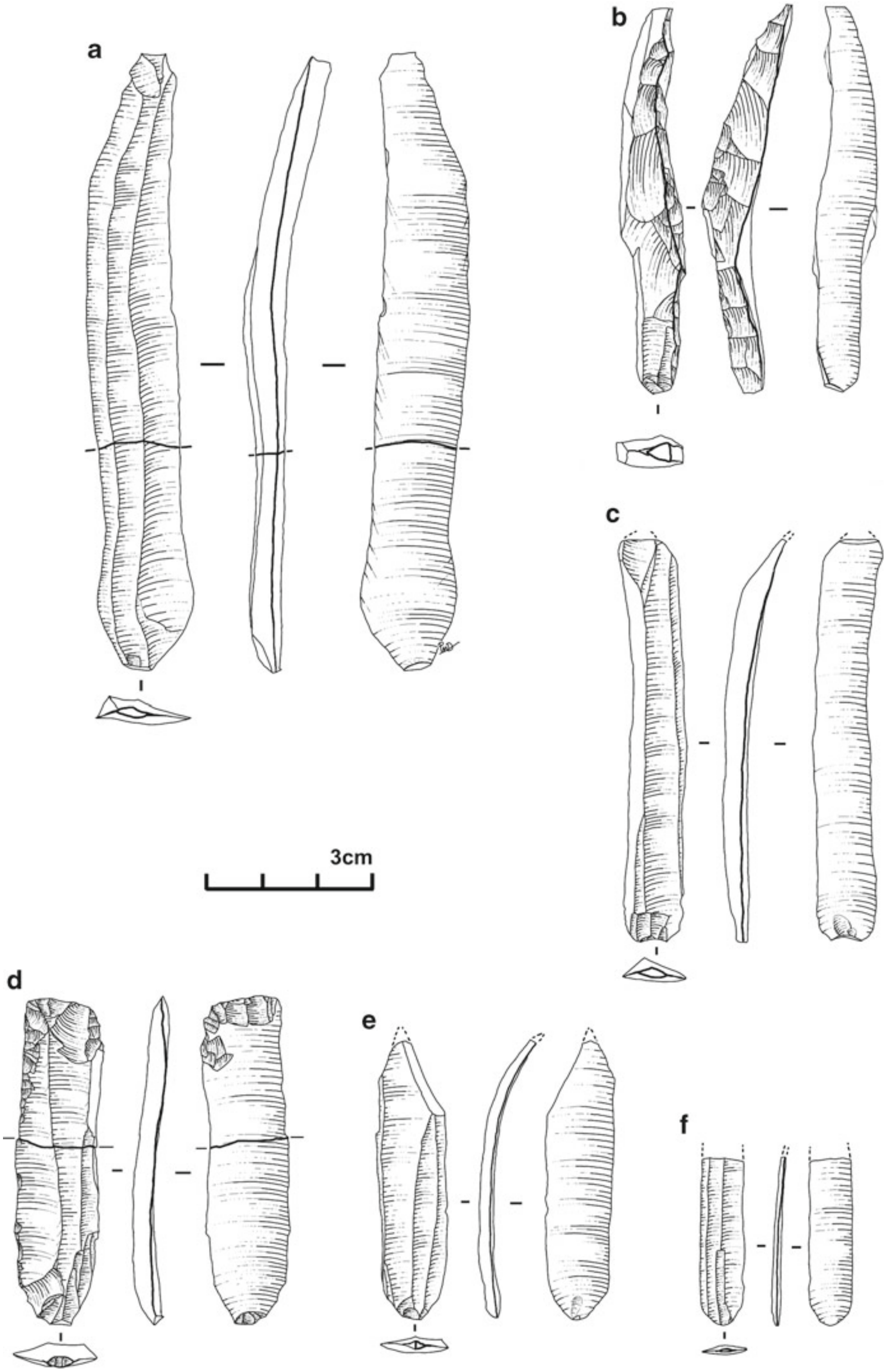

Fig. 15.9 Sample of Ramah chert microblades from Rose Island site Q IdCr-6 (**a**–**c**, **e**–**f**) and Avayalik site JaDb-10 (**d**)

chert microblades from Labrador are often larger and would easily be classified as blades as opposed to microblades. The brief overview of the Labrador collections does not permit a complete understanding of the *chaîne opératoire* involved in their production and whether Ramah chert blades represent a different aim of production than the other regular-sized microblades (Fig. 15.9). Like Owen (1988), we note that it is unlikely that pressure would have been used to detach the large and roughly regular blades. Conversely, the production of regular-sized microblades from the same region seems to follow the same succession of different detachment techniques than other Dorset sites.

15.5 A Case Study from Greenland

Sørensen has analysed the lithic technology of the Paleoeskimo cultures of Greenland (Sørensen 2006a, 2012). Among the Paleoeskimo cultures of Greenland, Independence I (2500–1900 B.C.), Saqqaq (2500–800 B.C.), Greenlandic Dorset (formerly Independence II/Dorset I [Grønnow and Sørensen 2006]) (800–0 B.C.), and Late Dorset (A.D. 800–1400) artefacts reveal the use of pressure microblade production and pressure-flaking techniques (Fig. 15.2). These techniques were employed with some variation over time.

The production from the Independence I Adam C. Knuth site (Jensen and Pedersen 2002; Knuth 1983) and Solbakken site (Grønnow and Jensen 2003) in Northern Greenland is considered here. With the addition of the Greenlandic Dorset site Annertusuagap Nuua, situated in Disko Bugt, they illustrate the differences between the two groups (Fig. 15.1 for location), both of which employed pressure in the production of microblades (Sørensen 2012). In the following, the main focus will be on the blade production method and concept.

At Adam C. Knuth site (Fig. 15.10), microblades are produced from keeled, single-fronted cores with small-faceted platforms prepared from tabular nodules of high-quality microcrystalline quartz (MCQ). One of the narrow faces of the nodule is selected as the platform, and the core is shaped with respect to this platform. The front of the core and its cross section is often shaped by the production of a single central crest on the front. The bottom of the core sometimes has a crest from which the cross section of the core can be controlled. In other situations, the bottom is flat and left unworked. The width of the core is constantly between 20 and 25 mm, and the height of the core can be up to 70 mm during the initial step of production. The angle between the front and platform is generally right-angled during all steps. Prismatic regular and relatively straight microblades are produced from these cores, and possibly up to 50 microblades can be produced from a single core. The platform of the core is repeatedly faceted during microblade production. Microblades from the Solbakken site ($n=56$) have an average width from 7 to 9 mm and a thickness of approximately 2 mm. The length of the microblades is normally between 40 and 60 mm ($n=14$). The butts are usually oval; 28% have a smooth butt ($n=9$), and 68% are facetted ($n=17$). The method employed in their production and modification steps can be described as the Independence I microblade concept (Sørensen 2012: 178).

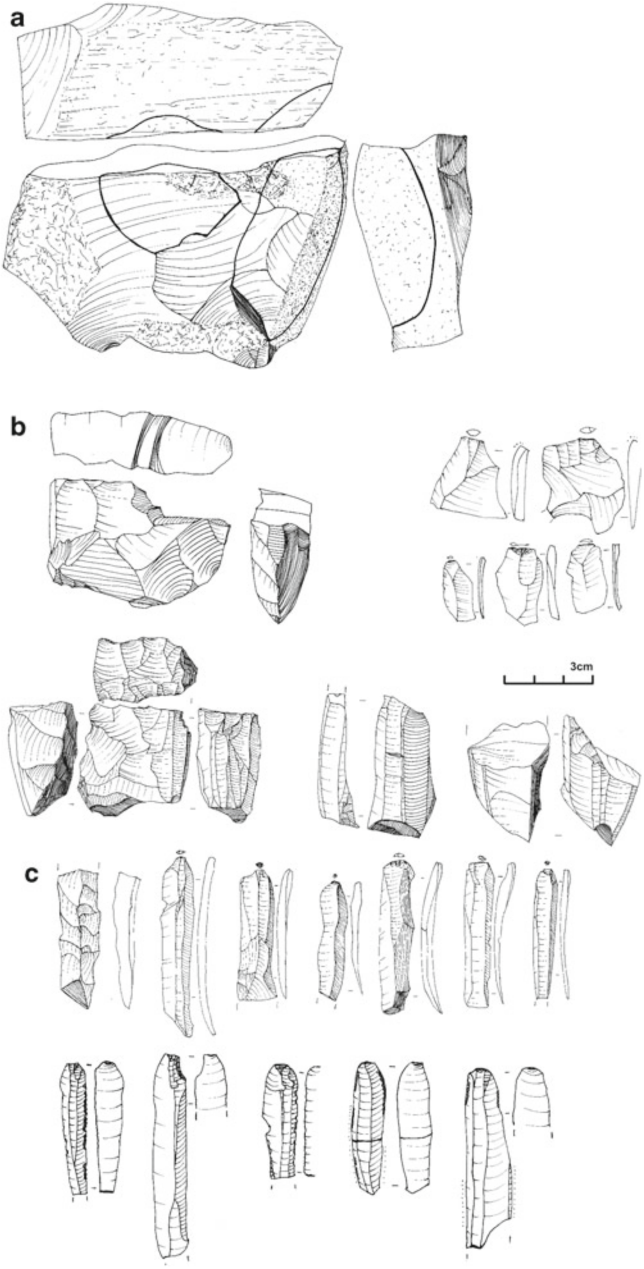

Fig. 15.10 Chert microblade production at the Independence I Adam C. Knuth Site. (**a**) Refitted core preform, (**b**) cores and by-products, (**c**) upper row: a crested microblade and six microblades; lower row: microblade with hafting retouch on proximal ends and use-wear retouch on lateral edges (Drawing: Mikkel Sørensen)

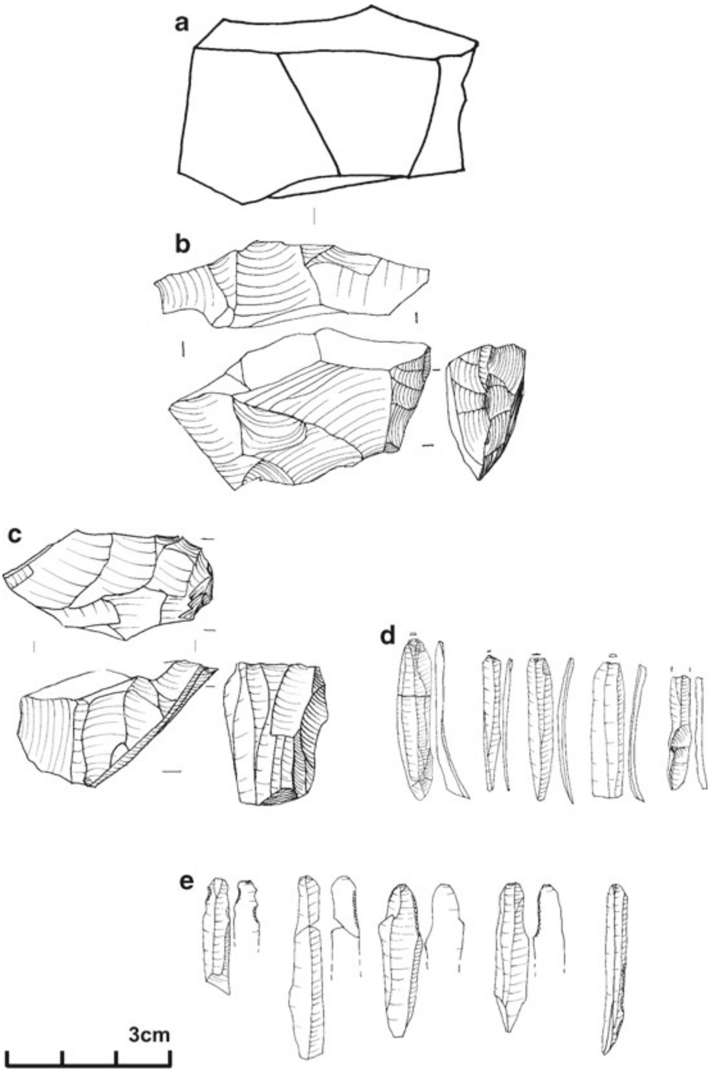

Fig. 15.11 Chalcedony microblade production at the Greenlandic Dorset Annertusuagap Nuua site. (**a**) Typical nodular raw material morphology, (**b**) microblade core preform, (**c**) core, (**d**) microblades, (**e**) tanged microblade knives, retouched at their proximal ends, presumably for a hafting system (Drawing: Mikkel Sørensen)

At Annertusuagap Nuua (Fig. 15.11), the microblades are produced from unipolar and unifacial wedge-shaped cores using MCQ as a raw material as well as quartz crystals. Tabular blanks of MCQ are selected as preforms for microblade cores. The core preform is transformed into a wedge shape. The width of the cores ranges from 15 to 20 mm. The core front is only occasionally created by a crest, as it is more commonly left unprepared before the production. Quartz crystal cores are produced either by creating a platform at the top by a platform flake or by exploiting the crystal from the bottom. The production method and technique employed in the detachment of quartz crystal microblades are the same as for other MCQ types. The core platform is prepared from the side, and the angle between the front and platform is only 50–60°, which is typical for the Greenlandic Dorset. The complete microblades investigated ($n=68$) have a mean width of 5 mm and a mean length of approximately 35 mm. The butts of the microblades ($n=99$) are generally oval; 80% have a smooth butt, and 20% are facetted. During production, the core platform is adjusted by small flake removals from the front. The core's width is not reduced during its stage of blade exploitation. In several cases, a second front is established at the core's rear end using the same platform; in these cases, the core will become triangular. Microblade production generally stops when the core is too small for further detachments and platform preparation. Generalized methods can be described as the Greenlandic Dorset microblade concept (Sørensen 2012: 220).

At both sites, considering the regularity, straightness, and butt as well as bulb attributes, the microblades are generally perceived as produced by means of a pressure technique. Due to the low inertia of microblade cores, it seems most likely that they were mechanically fixed. The size and width of the microblades in conjunction with the results of modern experiments (Pelegrin 1988; Sørensen 2006b) suggests that approximately 20–30 kg of pressure was required for microblade detachment, and possibly more in Independence I production, due to the larger size of the microblades produced and their facetted butts. The analysis of raw material types for microblade and biface production reveals that in many instances, these may have been heat-treated before the pressure technique was applied, especially in the case of the Greenlandic Dorset (Sørensen 2012: 310). The heat-treated raw materials are typically agate and chalcedony-like types of MCQ.

According to the archaeological record, it appears that the Independence I culture arrived in Northern Greenland with a well-developed, pressure-produced microblade technology around 4500 B.P. However, the Saqqaq group that arrived at the same time in Central Western Greenland does not prioritize microblade production as much as Independence I, as they favour killiaq, a metamorphosed slate which is not appropriate for this process. The Greenlandic Dorset culture appeared at around 2800 B.P. and brought with it a pressure microblade concept that is somewhat different. Their cores are narrower, which results in the production of narrower microblades, and the front platform angle is more acute when compared with the cores of earlier cultures. The pressure tool now had a square cross section (Fig. 15.13b) and different hafting, and for microblade detachment, it was often placed on a smooth part of the platform instead of a facet.

The Late Dorset people had a similar microblade concept as the one performed by the Greenlandic Dorset, but the results were lower in quality. For instance, these microblades are generally shorter and irregular; the cores exhibit less preparation. At the same time, larger microblade types, most likely detached by indirect percussion, also appear (Sørensen 2012: 296).

15.6 Pressure Techniques from Paleoeskimo to Thule/Inuit Culture

Did the detachment techniques employed in microblade production evolve from the earliest Paleoeskimo cultures through to the end of the Late Dorset Period? Owen's (1988) study of a large quantity of microblades from the earliest to the latest Paleoeskimo periods provides a starting point for research into this topic. She observed no major changes from Early Pre-Dorset to the beginning of the Dorset period (Owen 1988: 124–126). However, she stated that 'Microblades decrease in frequency in the Middle and Late Dorset and production becomes less carefully controlled … There is also a corresponding rise in the number of irregularly shaped pieces' (Owen 1988: 126). It appears that the most significant changes happened towards the end of the Dorset period. On the other hand, Paleoeskimo sites in Nunavik indicate that towards the end of the Pre-Dorset, a period sometimes referred to as Groswater-like (Gendron and Pinard 2000), there are an unusually large proportion of microblades in these assemblages; however, this phenomenon remains to be better understood.

In Greenland, it has been noted that pressure blade production was more common in the Independence I and Greenlandic Dorset groups, as opposed to the Saqqaq and Late Dorset groups (Sørensen 2012). Moreover, considerable differences in the pressure microblade concept have been observed between the Early Paleoeskimo groups (Saqqaq and Independence I) and the Dorset groups (Greenlandic Dorset and Late Dorset) (Sørensen 2012).

Throughout the Eastern Arctic, microblade production vanished with the disappearance of the Dorset culture, which was marked by the arrival of the Thule people. The question one may ask is why microblade production was abandoned following the arrival of a new culture into this region? This is mainly explained by the fact that Thule culture is not contiguous with the previous Paleoeskimo cultures.

We know from the ethnographic work that Inuit had employed pressure-flaking techniques for bifacial reduction: 'Selecting a log of wood, in which a spoon-shaped cavity was cut, they placed the splinter to be worked over it, and by pressing gently along the margin vertically, first on one side, then the other, as one would set a saw, they splintered off alternate fragments until the object, thus properly outlined, presented the spear or arrow-head form, with two cutting serrated sides' (Belcher 1861: 138–139). In Greenland, pressure-flaking techniques employed by the Thule only occurred upon their first arrival in the High Arctic, a period otherwise termed as the Ruin Island phase, where few examples of chipped points demonstrate this technology (Holtved 1944; McCullough 1989). However, this was abandoned probably when meteoritic iron began to be exploited for tool manufacture (Sørensen 2010).

Despite the fact that the Thule brought with them the knowledge of pressure flaking, they did not, however, use it to produce microblades. The origin of the Thule people remains to be better understood in the Bering Sea region in order to know why microblade production was abandoned in the Eastern Arctic.

15.7 Paleoeskimo Pressure Flaking and Pressure Tools

The Paleoeskimo people used pressure flaking for the production of bifaces. Their finely chipped points are among the most characteristic elements that demonstrate the well-controlled use of pressure flaking in Early Paleoeskimo (Fig. 15.12a–d). The later Dorset people also used pressure flaking (Fig. 15.12e–i). When the tip-fluting spall method was first identified on Dorset harpoon head end blades, it was believed to have been produced by pressure: 'The end-blade has first been chipped equally on both sides, like the ordinary type, whereafter two long flakes were pressed off from the pointed end on the same side, each removing approximately one half of the chipped surface' (Meldgaard 1960b: 592). This interpretation of the method used to detach spalls survives up until today (e.g. Maxwell 1985: 152). Plumet and Lebel's (1991, 1997) elaborate attribute analysis reached the same conclusion; however, this understanding of the situation is not entirely convincing.

The main problem with this interpretation is that the spalls get progressively wider towards their distal end (Fig. 15.12h–i), a characteristic usually incompatible with the use of pressure techniques (Pelegrin, personal communication). Preliminary experimental tests on detaching tip-fluting spalls were briefly conducted by Mikkel Sørensen and Jacques Pelegrin. These attempts did not succeed in producing by pressure the characteristic spalls that become larger towards the distal end. They reveal that elaborate experiments must be conducted before we can reach any sound conclusion.

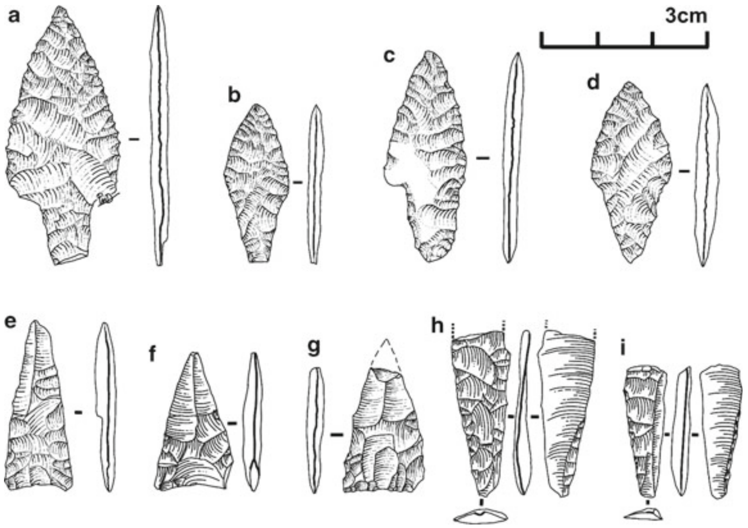

Fig. 15.12 Sample of finely chipped chert points (**a**–**g**) from Pre-Dorset occupation of KcFr-5 (**a**, **b**), GhGk-4 (**c**) and IgDj-2 (**d**) sites. Also, examples of Dorset tip fluted chert points (**e**–**g**) and tip fluting spalls (**h**, **i**) from Dorset occupation of T1 (**e**), GhGk-63 (**f**–**i**) and Tayara (**g**) sites (Drawing: Pierre M. Desrosiers)

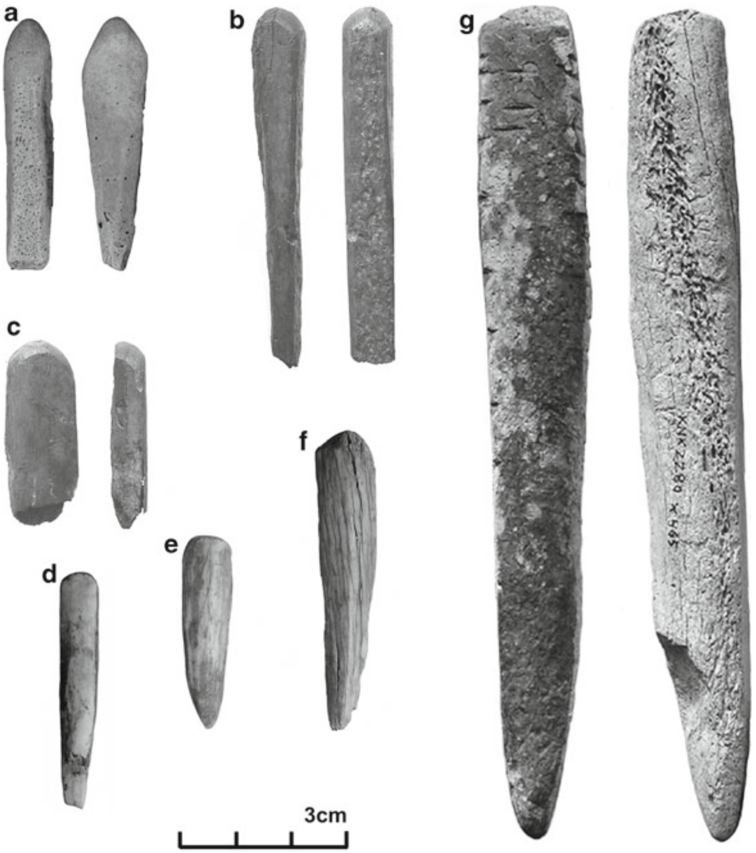

Fig. 15.13 Presumed pressure tool tips (**a**–**f**) and one complete pressure tool (**g**). (**a**) Tayara site (KbFk-7), (**b**, **c**) Malmquist site, (**d**) Solbakken site, (**e**, **f**) Den blå flints boplads (*blue flint site*), (**g**) Qerqertaaraq site. (Photo: Pierre M. Desrosiers (**a**) and Mikkel Sørensen (**b–g**))

Another issue worth examining would be to determine if different tools were used for pressure microblade production and for pressure flaking. The tool for pressure flaking was most likely handheld and can only produce a limited amount of force. The tendencies noted for microblades indicate that pressure tools involved in their production could probably only detach small- and midsized microblades. Therefore, the use of a long pressure tool, such as the one employed in the production of Mesoamerican blades upon which a knapper's full body weight can be applied, seems unlikely.

It has been proposed by Maxwell (1985: 151–152) that short wooden handles and punches carved from walrus baculum would be lashed together and used as a pressure tool. Unfortunately, both elements have not been found in direct association by him. Moreover, observations of probable punch tips, such as the one found at the Tayara site and in other collections, often do not exhibit any evidence of use wear (Fig. 15.13a).

In Greenland, tips of presumed pressure tools are known from several Independence I sites, e.g. the Solbakken site and 'Den blå flints boplads' (blue flint site) (Grønnow and Jensen 2003), and at Greenlandic Dorset sites such as the Malmquist site. Preserved Independence I pressure tips are typically made from walrus tusk and have oval cross sections, are up to 5 cm in length and 1 cm wide with a rounded distal end characterized by extensive use wear (Fig. 15.13d–f). In order to make such a small tip function as a pressure tool, it would need to be fixed into a handle in order to properly direct the force. Grooved wooden handles that fit pressure tips with oval cross sections have been recovered from the Saqqaq site Qeqertasussuk. These suggest that the pressure tips were fixed to a rather short handle (Grønnow 1996: 24). Modern experiments with this hafting type demonstrate that it functions rather well when employed in pressure flaking. One reason for this is that lashing provides a minimal degree of flexibility in the application of pressure, which increases the contact time during detachment.

At the Greenlandic Dorset sites, and contemporary sites found in the Central Canadian Arctic regions (Meldgaard 1962), a difference is observed in the design of presumed pressure tool tips when compared with the Early Paleoeskimo groups. These tips have a square or rectangular cross section and may approach 6 cm in length and 1 cm in width (Fig. 15.13b). Preserved specimens are made from bone, possibly walrus baculum. Due to their specific design, they must have functioned within a different hafting system when compared to Early Paleoeskimo cultures. From Late Dorset contexts at the site of Qeqertaaraq (Appelt and Gulløv 1999), a pressure tool in which the handle and tip were produced from a single piece of walrus baculum has been identified (Fig. 15.13g). Similar pressure tools have been documented in Late Dorset contexts on Ellesmere Island such as the Shelter site (Schledermann 1990: 275) and in the Captain Comer collection acquired from Sadlermiut people of Southampton Island (Boas 1901: 63).

At present, we do not have definitive proof that the artefacts currently identified as pressure tool or punch tips necessarily functioned as such. It is tempting to make an analogy to the well-documented hafted pressure tools used by Thule/Inuit people; however, the characteristic spoon-shaped handle of such implements (Holmes 1919: 319; Murdoch 1892: 287–289; Nelson 1899: 91) has not been identified in Paleoeskimo assemblages.

From the experiments conducted by Sørensen, we know that pressure tips combined with short hafts identified in Paleoeskimo assemblages would constitute an efficient tool for pressure flaking; however, it would hardly explain the whole range of microblade size produced by pressure (small and midsize). Using the same tips, two different hafting methods relating respectively to microblade manufacture and pressure flaking may have existed.

Finally, another problem to solve is the holding method of the small-sized and low-inertia microblade cores. They were almost certainly held in a fixation device during pressure detachment. The volumetric concept of Paleoeskimo cores implies that microblades were produced from a single narrow surface at a time. Among other possibilities, this would have allowed the side of the core to be held in some sort of pliers-like device. The holding device remains to be identified in an archaeological context.

15.8 Concluding Remarks

According to current knowledge, pressure microblade production was introduced to the Eastern Arctic with the first eastward migration of Paleoeskimo people from the Bering Strait region around 4,000–4,500 years ago. These Early Paleoeskimo peoples spread southwards as far as the treeline and northwards to the High Arctic, inhabiting a vast territory that spans from Alaska to Greenland (more than 5,000 km from west to east and more than 3,000 km from north to south). In other words, pressure technique was carried from the West and not independently invented in the Eastern Arctic.

Paleoeskimo technology developed until the end of the Dorset period. The role of the pressure technique and the exact nature of its evolution remain to be fully documented. Based on the cases studied in this chapter, we can state that different detachment techniques were employed and used in combination to produce microblades. Moreover, pressure microblade manufacture, so long assumed to have been the technique used in the Eastern Arctic, has now been demonstrated as a fact that needs to be studied in relation with other detachment techniques for both microblades and bifacial tools.

The roughly regular microblade blanks that result from this type of production appear to have fulfilled the needs of the Paleoeskimo. The largest microblades that were most likely not detached by pressure were often selected to be transformed into tools. Consequently, from the Western Arctic Denbigh culture to the Eastern Arctic Late Dorset culture, it is difficult to conceive that the pressure technique was employed to respond to a need for the production of very regular microblades with parallel sides. In fact, the pressure technique was employed in a standard sequence. This sequence involved direct and/or indirect percussion in the first steps of the *chaîne opératoire*, when the core permitted the production of long microblades. This was followed by the use of pressure as the core was gradually reduced to a smaller size. In instances where a small quartz crystal was used, the whole production sequence involved the use of pressure.

The flintknapper most likely wanted to produce the longest microblades possible; however, this was limited by the properties of the raw material and the knapping tools, as well as the skill and strength of the knapper. For instance, the homogeneous Ramah chert of Labrador permits the production of much longer microblade blanks. The choice of detachment technique was made according to size and the possibilities offered by raw material.

Improvement of our present understanding of pressure detachment techniques is related to our understanding of poorly preserved pressure tools in the archaeological record of the Paleoeskimo. Our current knowledge excludes the likely use of pressure tools capable of generating great amounts of force for the detachment of microblades. It seems likely that the pressure tools of the Paleoeskimo were shorter and more portable than those of the Mesoamericans, which stand as one of the best known examples (Clark 1982; Crabtree 1968).

A crucial effort remains to be invested in the study of different techniques used to detach microblades. During our preliminary study, one of the major problems encountered was the particularly small size of microblades in the Eastern Arctic. The smaller the microblades, the smaller the associated attributes and, therefore, the greater the difficulty in recognizing and identifying associated techniques of detachment. Considering the fact that lithic technology research is still in its infancy in this part of the world, we expect this situation to improve greatly in the future.

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References

Appelt, M. and H.C. Gulløv 1999 *Late Dorset in high Arctic Greenland, Final Report on the Gateway to Greenland Project*. Danish Polar Center Publication 7. Dansk Polar Center, Copenhague.

Avataq Cultural Institute 1991 *Archaeological Salvage Excavation of the GhGk-63 site, 1990, Kuujjuarapik, Nunavik*. Report presented to the Municipality of Kuujjuarapik. Copies available from Avataq Cultural Institute AR 010.

Avataq Cultural Institute 1992 *Archaeological Salvage Excavation of the GhGk-63 site, 1991, Kuujjuarapik, Nunavik*. Report presented to the Municipality of Kuujjuarapik. Copies available from Avataq Cultural Institute AR 011.

Avataq Cultural Institute 2002 *Rapport de la fouille archéologique 2002 sur le site de Tayara (KbFk-7), Nunavut, dans le cadre du Programme de Recherche ARUC "Des Tuniit aux Inuits"*. Présenté au Government of Nunavut, Inuit Heritage Trust, Prince of Whales Northern Heritage Centre, Canadian Museum of Civilization et à la Municipalité de Salluit. Copies available from Avataq Cultural Institute No. AR 062.

Avataq Cultural Institute 2003 *Rapport de la fouille archéologique 2002 sur le site de Tayara (KbFk-7), Nunavut, dans le cadre du Programme de Recherche ARUC "Des Tuniit aux Inuits". Volume 2: Catalogue*. Présenté au Government of Nunavut, Inuit Heritage Trust, Prince of Whales Northern Heritage Centre, Canadian Museum of Civilization et à la municipalité de Salluit. Copies available from Avataq Cultural Institute No. AR 063.

Avataq Cultural Institute 2004 *CURA 2001–2003 from Tuniit to Inuit: Three years of research at the Tayara site (KbFk-7), Qikirtaq. Summer fieldwork 2003 and preliminary synthesis*. Présenté au Government of Nunavut, Department of Cultural Heritage, Inuit Heritage Trust, Prince of Whales Northern Heritage Centre, Canadian Museum of Civilization et à la municipalité de Salluit. Copies available from Avataq Cultural Institute No. AR 064.

Avataq Cultural Institute 2006 *Tayara Site (KbFk-7), Qikirtaq, Summer Fieldwork 2005*. Rapport présenté au Government of Nunavut, Inuit Heritage Trust, Prince of Wales Northern Heritage Centre, Canadian Museum of Civilization, Municipality of Salluit, et au Qaqqalik Landholding. Copies available from Avataq Cultural Institute No. AR 241.

Avataq Cultural Institute 2007 *Tayara site (KbFk-7), Qikirtaq, summer Fieldwork 2006*. Rapport présenté au Government of Nunavut, Inuit Heritage Trust, Prince of Wales Northern Heritage Centre, Canadian Museum of Civilization, Municipality of Salluit et au Qaqqalik Landholding. Copies available from Avataq Cultural Institute No. AR 248.

Belcher, E. 1861 On the Manufacture of Works of Art by the Esquimaux. *Transactions of the Ethnological Society of London* 1: 129–146.

Bernier, L. 1997 Analyse archéologique de quatre habitations paléoesquimaudes du site GhGk-63, Kuujjuarapik, Arctique québécois, Université de Montréal, Montréal.

Boas, F. 1888 The Central Eskimo, pp. 399–669. Annual Report of the Bureau of Ethnology. Vol. 6, J. W. Powell, general editor. Government Printing Office, Washington D.C.

Boas, F. 1901 *The Eskimo of Baffin Land and Hudson Bay. From Notes Collected by Capt. George Comer, Capt. James S, Mutch, and Rev. E. J. Peck.* Bulletin of the American Museum of Natural History XV, Part I. Knickerbocker Press, New York.

Bogoras, W. 1925 Early Migrations of the Eskimo between Asia and America. *Proceedings of the XXIième Congrès International des Américanistes*. Göteborg.

Clark, J.D. 1982 Manufacture of Mesoamerican Prismatic Blades: An Alternative Technique. *American Antiquity* 47(2): 355–376.

Collins, H.B. 1934 Eskimo Archaeology and Somatology. *American Anthropologist* 36(2): 309–313.

Collins, H.B. 1940 Outline of Eskimo Prehistory. *Smithsonian Miscellaneous Collections* 100: 533–592.

Collins, H.B. 1956 The T1 Site at Native Point, Southampton Island, N.W.T. *Anthropological Papers of the University of Alaska* 4(2): 63–90.

Crabtree, D.E. 1968 Mesoamerican Polyhedral Cores And Prismatic Blades. *American Antiquity* 33(4): 446–478.

Cranz, D. 1770 *Historie von Grönland*. Barby.

Dawkins, W.B. 1874 *Cave Hunting Researches On The Evidence Of Caves Respecting The Early Inhabitants Of Europe*. Macmillan & Co, Londre.

De Laguna, F. 1946 The Importance of the Eskimo in Northeastern Archaeology. In *Man in Northeastern North America*, edited by F. Johnson, pp. 106–142. Papers of the Peabody Foundation for Archaeology 3. Phillips Academy, Andover.

Desrosiers, P. 1999 Les traditions lithiques au Paléoesquimau. Approche technologique préliminaire de l'industrie du Dorsétien moyen de Kuujjuarapik (GhGk-63) Nunavik, Canada. Caractérisation du débitage lamellaire, Université Paris 1, Panthéon-Sorbonne, Paris.

Desrosiers, P. 2007 Palaeoeskimo Lithic Technology: Constraints and Adaptation. *Lithic Technology* 32(1): 17–38.

Desrosiers, P. 2009 A l'origine du Dorsétien, apport de la technologie lithique des sites GhGk-63 et Tayara (KbFk-7) au Nunavik, Université Paris 1, Sorbonne, Paris.

Desrosiers, P., and D. Gendron 2004 The GhGk-63 Site: A Dorset Occupation in Southeastern Hudson Bay, Nunavik. *Canadian Journal of Archaeology* 28(1): 75–99.

Desrosiers, P., and D. Gendron 2006 Étude de la production d'outils en schiste dorsétiens et thuléens au Nunavik, Hypothèses préliminaires sur les schémas techniques. In *Préhistoire de l'Amérique. Actes of the XIVth UISPP Congress (section 17)*, edited by S.D. Congrès. British Archaeological Reports. Vol. 1524. Archeopress, Oxford.

Desrosiers, P., D. Gendron, and N. Rahmani 2006 Harpoon Head Seriation and the Dorset Phases: About the Tayara Sliced and the Other Types. In *Dynamics of Northern Societies. Proceedings of the SILA/NABO Conference on Arctic and North Atlantic Archaeology, Copenhagen, May 10th–14th, 2004*, edited by J. Arneborg and B. Grønnow, pp. 131–144. Studies in Archaeology & History. Vol. 10. National Museum of Denmark, Copenhague.

Desrosiers, P., D. Gendron, and N. Rahmani 2007 Trois ans de recherche sur le site de Tayara (KbFk-7), 2001–2003. In *Des Tuniit aux Inuits. Patrimoine archéologique et historique au Nunavik*, edited by D. Arsenault and D. Gendron, pp. 27–44. Nunavik Archaeology Monograph Series. Vol. 2. CELAT, Université Laval, Avataq Cultural Institute, Québec.

Desrosiers, P., D. Gendron, D. Todisco, H. Monchot, N. Rahmani, N. Bhiry, and C. Houmard 2008 Tayara (KbFk-7) et le Dorsétien: recherche pluridisciplinaire sur un site-clé du Paléoesquimau du détroit d'Hudson (Nunavik, Canada) *L'Anthropologie* 112(4–5): 757–779.

Desrosiers, P., and N. Rahmani 2003 Analyse spatiale du site GhGk-63 (Kuujjuarapik, Nunavik): apports à la compréhension de l'architecture dorsétienne. *Études Inuit Studies* 27: 131–153.

Gendron, D., and C. Pinard 2000 Early Palaeo-Eskimo Occupations in Nunavik: A Re-Appraisal. In *Identities and Cultural Contacts in the Arctic, Proceedings from a Conference at the Danish National Museum, Copenhagen, November 30 to December 2 1999*, edited by M. Appelt, J. Berglund and H. C. Gulløv, pp. 129–142. The Danish National Museum, Danish Polar Center, Copenhague.

Giddings, J.L.J. 1949 Early Flint Horizons on the North Bering Sea Coast. *Journal of the Washington Academy of Science* 39(3): 85–90.

Giddings, J.L.J. 1951 The Denbigh Flint Complex. *American Antiquity* 16(3): 193–203.

Giddings, J.L.J. 1964 *The Archaeology of Cape Denbigh*. Brown University Press, Rhode Island.

Giddings, J.L.J. 1967 *Ancient Men of the Arctic*. Alfred A. Knopf, New York.

Grønnow, B. 1996 The Saqqaq Tool Kit - Technological and Chronological Evidence from Qeqertasussuk, Disko Bugt. In *The Paleo-Eskimo Cultures of Greenland, New Perspectives in Greenlandic Archaeology*, edited by B. Grønnow, pp. 17–34. Vol. 1. Danish Polar Center, Copenhague.

Grønnow, B., and J.F. Jensen 2003 *The Northernmost Ruins of the Globe. Eigil Knuth's Archaeological Investigations in Peary Land and Adjacent Areas of High Arctic Greenland*. Meddelelser om Grønland, Man & Society 29. National Museum of Denmark, Copenhague.

Grønnow, B., and M. Sørensen 2006 Paleo-Eskimo Migrations into Greenland: the Canadian Connection. In *Dynamics of Northern Societies. Proceedings of the SILA/NABO Conference on Arctic and North Atlantic Archaeology, Copenhagen, May 10th–14th, 2004*, edited by J. Arneborg and B. Grønnow, pp. 59–74. Studies in Archaeology & History. Vol. 10. National Museum of Denmark, Copenhague.

Harp, E.J. 1964 *The Cultural Affinities of the Newfoundland Dorset Eskimo*. National Museum of Canada Bulletin 200.

Hoffman, B.G. 1952 Implications of Radiocarbon Datings for the Origin of the Dorset Culture. *American Antiquity* 18(1): 15–17.

Holmes, W.H. 1919 *Handbook of Aboriginal American Antiquities. Part 1 Introductory. The Lithic Industries*. Bureau of American Ethnology Bulletin 60. Smithsonian Institution, Washington.

Holtved, E. 1944 Archaeological Investigations in the Thule District. *Meddelelser om Grønland* 141(1–2).

Houmard, C. 2006 The Tayara Site (KbFk-7, Dorset Period, Nunavik): Preliminary Results of a Typo-Technological Study *Proceedings of The View from Here: History and Ecology of the North Atlantic Region, NABO (The North Atlantic Biocultural Organisation) Conference*. Québec.

Inizan, M.-L., M. Lechevallier, and P. Plumet 1992 A Technological Markers of the Penetration into North America: Pressure Debitage in the Indo-Pakistani Subcontinent. In *Materials Issues in Art and Archaeology III*, edited by G.S. Wheeler and I.C. Freestone, pp. 661–681. Materials Research Society symposium proceedings. Vol. 267. Materials Research Society, Pittsburgh.

Irving, W.N. 1951 Archaeology in the Brooks Range of Alaska. *American Antiquity* 17: 52–53.

Jenness, D. 1925 A New Eskimo Culture in Hudson Bay. *Geographical Review* 15(3): 428–437.

Jensen, J.F., and B. Pedersen 2002 Jordens nordligste stenalder. *Nationalmuseets Arbejdsmark* 71–85.

Knuth, E. 1952 An Outline of the Archaeology of the Peary Land. *Arctic* 5(17–33).

Knuth, E. 1983. The Northmost Ruins of the Globe. *Folk* 25: 5–21.

Marchand, G. 1999 *La néolithisation de l'ouest de la France: caractérisation des industries lithiques.* International Series 748. British Archaeological Reports.

Markham, C.R. 1865 On the origin and migrations of the Greenlander Eskimaux. *Journal Royal Geographical Society of London* 35.

Mathiassen, T. 1927 *Archaeology of the Central Eskimos II, The Thule Culture and its Position Within the Eskimo Culture*. Report of the Fifth Thule Expedition 1921–24 IV (2). Gyldendalske Boghandel, Nordidsk Forlag, Copenhague.

Mathiassen, T. 1935 Eskimo Migrations in Greenland. *Geographical Review* 25(3): 408–422.

Mathiassen, T. 1936 The Eskimo Archaeology of the Julianhaab District. *Meddelelser om Grønland* 118(1).

Maxwell, M.S. 1962 Pre-Dorset and Dorset Sites in the Vicinity of Lake Harbour, Baffin Island, N.W.T., A Preliminary Report. *National Museum of Canada Bulletin* 180: 20–44.

Maxwell, M.S. 1985 *Prehistory of the Eastern Arctic*. Academic Press, New York.

McCullough, K.M. 1989 *Ruin Islanders. Early Thule Culture Pioneers in High Eastern Arctic*. Mercury Series 141. Canadian Museum of Civilization, Hull.

McGhee, R. 1970 A Quantitative Comparison of Dorset Culture Microblade Samples. *Arctic Anthropology* 7(2): 89–96.

McGhee, R. 1983 Eastern Arctic Prehistory: the Reality of a Myth? *Musk-Ox* 33: 21–25.

Meldgaard, J. 1952 A Paleo-Eskimo Culture in West Greenland. *American Antiquity* 17(3): 222–230.

Meldgaard, J. 1960a Origin and Evolution of Eskimo Cultures in the Eastern Arctic. *Canadian Geographical Journal* 60: 64–75.

Meldgaard, J. 1960b Prehistoric Culture Sequences in the Eastern Arctic As Elucidated by Stratified Sites at Igloolik. In *Men and Cultures: Selected Papers of the Fifth International Congress of Anthropological and Ethnological Sciences, 1956*, edited by A.F.C. Wallace, pp. 588–595. University of Pennsylvania Press, Philadelphia.

Meldgaard, J. 1962 On the Formative Period of the Dorset Culture. In *Prehistoric Cultural Relations between the Arctic and Temperate Zones of North America*, edited by J.M. Campbell, pp. 92–95. Technical Paper. Vol. 11. Arctic Institute of North America, Montréal.

Murdoch, J. 1892 Ethnological Results of the Point Barrow Expedition. *Annual Report of the Bureau of American Ethnology* 9: 1–441.

Nelson, E.W. 1899 *The Eskimo About Bering Strait*. Annural Report of the Bureau of American Ethnology 18. Smithsonian Institution, Washington.

Owen, L. 1988 *Blade and Microblade Technology. Selected Assemblages from the North American Arctic and the Upper Paleolithic of Southwest Germany*. BAR International Series 441. B.A.R., Oxford.

Pelegrin, J. 1988 Débitage expérimental: «Du plus petit au plus grand». In *Journée d'études technologiques en Préhistoire*, edited by J. Tixier, pp. 37–53. CNRS, Paris.

Pelegrin, J. 1995 *Technologie lithique: le Châtelperronien de Roc-de-Combe (Lot) et de la Cote (Dordogne).* Cahier du Quaternaire 20. CNRS, Paris.

Pelegrin, J. 2000 Les techniques de débitage laminaire au Tardiglaciaire: critères de diagnose et quelques réflexions. In *L'Europe centrale et septentrionale au Tardiglaciaire. Table-ronde de Nemours, 13–16 mai 1997*. Mémoires du musée de Préhistoire de l'Île-de-France. Vol. 7, Nemours.

Pelegrin, J. 2002 Principes de la reconnaissance des méthodes et techniques de taille. In *Tell'Atij Tell Gudeda industrie lithique*, edited by J. Chabot. Cahier d'archéologie du CELAT. Vol. 13. CELAT & Université Laval, Québec.

Plumet, P., and S. Lebel 1991 Les pointes à cannelures distales dorsétiennes, seconde invention américaine. In *25 ans de technologie en préhistoire. XIe rencontre internationales d'archéologie et d'histoire, octobre 1990: Bilan et perspectives.*, pp. 337–355. Éditions APDCA, Juan-les-Pins.

Plumet, P., and S. Lebel 1997 Dorset Tip Fluting: A Second "American" Invention. *Arctic Anthropology* 34(2): 132–162.

Rink, H. 1873 On the Descent of the Eskimo. *Journal of the Anthropological Institute of Great Britain and Ireland* 2: 104–108.

Rowley, G. 1940 The Dorset Culture of the Eastern Arctic. *American Anthropologist* 42(3): 490–499.

Sapir, E. 1916 *Time Perspective in Aboriginal American Culture, A Study in Method.* Anthropological Series 90. Canada Geological Survey.

Schledermann, P. 1990 *Crossroads to Greenland, 3000 Years of Prehistory in the Eastern High Arctic*. Komatik Series 2. The Arctic Institute of North America of the University of Calgary, Calgary.

Solecki, R.S. 1950 A Preliminary report of an archaeological reconnaissance of the Kukpowruk and Kokolik rivers in northwestern Alaska. *American Antiquity* 16(1): 66–69.

Solecki, R.S. and R.J. Hackman 1951 Notes on two archaeological discoveries in northern Alaska, 1950. *American Antiquity* 17(2): 55–57.

Sørensen, M. 2006a The Chaîne Opératoire Applied to Arctic Archaeology. In *Dynamics of Northern Societies. Proceedings of the SILA/NABO Conference on Arctic and North Atlantic Archaeology, Copenhagen, May 10th–14th, 2004*, edited by J. Arneborg and B. Grønnow, pp. 31–44. Studies in Archaeology & History. Vol. 10. National Museum of Denmark, Copenhague.

Sørensen, M. 2006b Rethinking the Lithic Blade Definition - Towards a Dynamic Understanding. Skilled Production and Social Reproduction - Aspects on Traditional Stone Tool Technologies. In *Skilled Production and Social Reproduction - Aspects on Traditional Stone Tool technologies*, edited by J. Apel and K. Knutsson, pp. 277–299. Societas Archaeologica Upsaliensis, Stockholm.

Sørensen, M. 2010 Thulekulturens anvendelse af bjergarter til fremstilling af redskaber i Nordøstgrønland. *Tidskriftet Grønland* 58(4): 288–297.

Sørensen, M. 2012 *Technology and Tradition in the Eastern Arctic, 2500 BC–AD 1200: A Dynamical Technological Investigation of Lithic Inventories in the Paleo-Eskimo Traditions*. Meddelser om Grønland 350. Museum Tusculanum Press, Copenhagen.

Taylor, W. E. 1968 *The Arnapik and Tyara Sites, an archaeological study of Dorset culture origins*. Memoirs of the Society for American Archaeology 22, Salt Lake City.

Texier, P.-J. 1984 Le débitage par pression et la mécanique de la rupture fragile. Initiation et propagation des fractures. In *Préhistoire de la pierre taillée 2. Éconimie du débitage laminaire.*, pp. 139–147. Cercle de recherche et d'études préhistoriques, Paris.

Thalbitzer, W. 1914 The Ammassalik Eskimo: Contributions to the Ethnology of the East Greenland Natives. *Meddelelser om Grønland* 39: 1–755.

Tixier, J. 1982 Techniques de débitage: osons ne plus affirmer. In *Tailler ! pour quoi faire: Préhistoire et technologie lithique II. Recent progress in microwear studies*, edited by D. Cahen and URA28duCRA, pp. 13–22. Sudia Praehistorica Belgica. Vol. 2. Koninklijik Museum voor Midden-Afrika, Tervuren.

Tixier, J., M.-L. Inizan, and H. Roche 1980 *Préhistoire de la pierre Taillée 1. Terminologie et technologie*. Cercle de recherche et d'études préhistoriques, Antibes.

Todisco, D. 2008 Géoarchéologie et processus de formation d'un site paléoesquimau en contexte périglaciaire: l'exemple de Tayara (KbFk-7), île Qikirtaq, Nunavik (Canada), Département de géographie, Université Laval, Québec.

Todisco, D., and N. Bhiry 2007 Genèse et évolution du site paléoesquimau de Tayara (KbFk-7), île Sugluk, détroit d'Hudson, Canada: données préliminaires. In *Des Tuniit aux Inuits. Patrimoine archéologique et historique au Nunavik*, edited by D. Arsenault and D. Gendron, pp. 167–184. Nunavik Archaeology Monograph Series. Vol. 2. CELAT, Université Laval, Avataq Cultural Institute, Québec.

Todisco, D., and N. Bhiry 2008a Micromorphology of Periglacial Sediments From the Tayara Site, Qikirtaq Island, Nunavik (Canada) *Catena* 76(1): 1–21.

Todisco, D., and N. Bhiry 2008b Palaeoeskimo Site Burial by Solifluction: Periglacial Geoarchaeology of the Tayara Site (KbFk-7), Qikirtaq Island, Nunavik (Canada) *Geoarchaeology* 23(2): 177–211.

Todisco, D., N. Bhiry, and P. Desrosiers 2009 Palaeoeskimo Site Taphonomy: An Assessment of the Integrity of the Tayara Site, Qikirtaq Island (Nunavik, Canada). *Geoarchaeology*.

Todisco, D., and H. Monchot 2008 Bone weathering in a Periglacial Environment: the Tayara Site (KbFk-7), Qikirtaq Island, Nunavik (Canada). *Arctic* 61: 87–101.

Wintemberg, W.J. 1939 Eskimo Sites of the Dorset Culture in Newfoundland. *American Antiquity* 5(2): 83–102.

Wintemberg, W.J. 1940 Eskimo Sites of the Dorset Culture in Newfoundland, Part II. *American Antiquity* 5(4): 309–333.

Wyatt, D. 1970 Microblade Attribute Patterning: A Statistical Examination. *Arctic Anthropology* 7(2): 97–105.