Chapter 1
Introduction: Breaking Stones Without Striking Them

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Human cultural development was a long and steady process in which stone tool manufacture was a fundamental element. With the improvement of lithic technology, humans were able to exploit their environment with greater efficiency as well as colonize and subsist in new territories, innovate, and develop new ways of life. Certain innovations are well documented and include the control of fire, the domestication of plants and animals, as well as the manufacture of ceramics, and the development of writing. Some were invented in different locations and spread by cultural contact and diffusion, while others were invented at different points in time by separate human groups and ultimately became chrono-cultural markers. Furthermore, some of these phenomena have been intensely studied, while others have yet to be thoroughly investigated.

This book seeks to fill part of this information gap. The phenomena in question here are the invention, diffusion, and adoption or reinvention of pressure blade making.[1] The adoption of this production technique corresponds to the exploitation of new environments as well as the appearance of other phenomena such as the Neolithic way of life. Through meticulous experimentation, archaeologists have greatly enhanced their ability to identify pressure blades, and it is now possible to provide a global overview of our current knowledge regarding this technological breakthrough on a global scale.

A brief introduction on the origins of research on pressure blade production will help the reader understand the context in which this book takes place. In doing so, we wish to point out some of the most influential publications on this topic.

[1]The term blade is used here without any consideration of size and thus includes bladelets and microblades.

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1.1 The Study of Pressure Techniques

The term "technology" is more commonly interpreted as applied technology, and the first image that comes to mind is anything related to modern technological advances, such as a sophisticated new machine. Nevertheless, for most of the specialists involved in this volume, (either consciously or unconsciously) lithic technology refers not only to a topic of research but to the science of studying stone tool production. This is a social science aimed at understanding the evolution of certain human behaviors by studying the remnants of their production activities. It could be placed within a broader trend in research that connects human behavior to the production of material culture (i.e., Haudricourt 1964; Haudricourt and de Garine 1968; Inizan et al. 1995; Leroi-Gourhan 1943, 1945, 1964, 1965).

Over 99% of what we know about the long history of human evolution is represented by worked stone material; it is no surprise that lithic technology is important to archaeologists (Crabtree 1975). If we consider archaeology's early years when the antiquity of man was being realized, the interest in understanding flintknapping was centrally important. The most accessible examples were those of the gunflint knappers (i.e., Barnes 1937; Clarke 1935; de Mortillet 1908; Schleicher 1927) and a few rare ethnographic cases, often based on secondhand accounts (e.g., Fowke 1891; Holmes 1919; Nelson 1899; Nelson 1916), as well as unique individuals such as Flint Jack, who reproduce antiquities for a living (Vayson de Pradenne 1932). When pressure techniques were first investigated, just how a stone could be broken without being struck and by using softer materials such as antler was not apparent. The most acute observations were probably those made from the stone work of Ishi since it was, after all, a firsthand observation (Heizer and Kroeber 1979; Kroeber 1961; Nelson 1916; Pope 1913).

Holmes (1919: 304–329) had summarized ethnographic data regarding "pressure fracture processes" in a 26-page chapter which probably stands as the first modern research devoted to the topic. His important book probably constitutes the beginning of research on the pressure techniques and other related aspects of lithic technology. If pressure bifacial flaking was readily understood, pressure blade production proved to be a different case however. It seems that the only information about this type of production came from Mesoamerica (Holmes 1919: 322–323).

These accounts had an important impact on the first organized experiments, especially for the use of the T-shaped tool, and the now famous article about Mesoamerican prismatic blades by Crabtree (1968). Crabtree's paper likely constitutes the second most important work to be published on the subject of pressure blade production, and it has inspired a whole generation of archaeologists that investigate this topic. For example, experimentation has since proven that the Mesoamerican pressure tool had a different shape and the core could effectively be held between the feet (Clark 1982).

A third important contribution to the study of pressure blade production is the book *Préhistoire de la pierre taillée 2, économie du débitage laminaire* (CREP 1984). It contains different papers, among which some represent a major breakthrough in

our understanding of pressure blade production in the Ancient World and in the development of pressure blade experimentation. It has been a starting point for many of the contributors to this book, and now some of them are presenting their most recent work on this topic in the present volume (Chaps. 2, 7, and 18). Among them, Inizan (Chap. 2) provides insights into the development of research on pressure blades in the Ancient World as well as tracking the most recent evidence for the earliest pressure blade production.

A fourth important reference is *Mesoamerican Lithic Technology, Experimentation and Interpretation* edited by Hirth (2003). This book not only contains the most accurate experimentation results on the subject but places an emphasis on the social importance of craft specialization as well. The social aspects of pressure blade production are now better understood and are the focus of Chaps. 16 and 17 in this volume. A complete history of experimentation applied to the understanding of Mesoamerican prismatic blades can also be found in Chap. 3.

Finally, this volume is intended to compliment the above series of reference works aimed at better documenting the phenomena of pressure blade production, and is the result of a collaborative effort that began in 2006 during a session of the UISPP conference in Lisbon, Portugal. The idea for this session was conceived by Noura Rahmani, who had recently completed a significant research project on the first appearance of pressure blade production in North Africa (Rahmani 2003, 2004; Chap. 4, this volume), by defining a more precise chronological framework for the introduction of pressure in the Maghreb. The notion was put forth that this technique could have either been the result of invention or diffusion. Investigating this hypothesis requires a better understanding of the overall situation regarding pressure blade production in time and space as well as more extensive experiments.

1.2 Contributions in Honor of Tixier and Inizan

Nearly 50 years ago, a meeting between French and American archaeologists working on lithic technology spurred the dawn of a new era (Jelinek 1965; Smith 1966; also see Chap. 2, this volume). If we attribute the identification of pressure blade production to Donald Crabtree and Jacques Tixier in the New and Old Worlds, respectively, we certainly owe our gratitude to Marie-Louise Inizan for having taken this realization to a new level, as will be evident upon reading Chap. 2.

Experimentation has been a key element in the recognition of pressure techniques and has led to the development of modern approaches to lithic technology. Tixier developed a particular approach in France that focused on the development of a terminology permitting the description of this technology in spite of its dynamism (Tixier 1967, 1972, 1978; Tixier et al. 1980). As the cofounder of this new approach, Inizan continuously updated it, thereby making it accessible to a broader audience (Inizan et al. 1999; Inizan et al. 1995). She also tracked pressure technique across the world, including those from North Africa, Middle East, Asia, and North America (e.g., Inizan 1976, 1984; Inizan et al. 1992). This is why the contributions to this

book are set up to honor the work of Tixier and Inizan. Both are key researchers who may be considered, along with Crabtree, as the most significant contributors to the development of modern research on pressure blade production. All three have been a major source of inspiration in guiding the careers of many researchers, including many of the authors who contributed to this book.

1.3 Pressure Blade Making: From Origin to Modern Experimentation

As the title dictates, the major research theme in this book concerns the emergence, diffusion, and experimentation relating to pressure blade making. Furthermore, these themes cover a wide range of topics, among them: handling the core, core stabilization, body techniques, craft specialization, diffusion, invention, adoption, product size, know-how, knowledge, identification, and characteristics, as well as the link between pressure blade production and biface pressure flaking.

This book has been divided into three parts, with the chapters arranged according to the following themes: (1) history of research, (2) pressure blade production around the world, and (3) the recent advances in experimentation. Some chapters may have legitimately fit into different sections of the book; however, they were organized according to their primary focus.

The first part of the book is devoted to the history of research and includes two chapters. Chapter 2, by Inizan, is an overview of research developed in the Ancient World and includes the most accurate information about the problem of the origins and invention of pressure blade production. Chapter 3, by Clark, constitutes an extensive overview of the development of research in Mesoamerica and of experiments in pressure blade making. Additionally, in Chap. 18, Pelegrin provides numerous insights with regard to the development of experimentation for the understanding of pressure blade production.

The second part of the book deals with pressure blade production around the world, or more specifically every region where it has been identified. The aim of each chapter is to provide an accurate account of the current knowledge for a given region in terms of the origins, development, and abandonment of pressure blade production. These accounts are inspired by the different traditions of research and the particular interests that have influenced archaeologists working in different areas.

Researchers in Mesoamerica and Maghreb have played an important role in the discovery of pressure blade production. Following Crabtree's contribution, prismatic blade production practically became a topic of research in and of itself in Mesoamerica (Hirth 2003). Due to the intensity of the research and the influence of the American Anthropological approach, social implications linked with the development of pressure techniques were emphasized, particularly with regard to craft specialization, in the evolution of Mesoamerican societies (Chaps. 3, 16, and 17). These elements, along with specific core preparation methods and other aspects of

lithic technology, have also been better documented by Darras, as presented in Chap. 17.

In the Maghreb, Tixier and Inizan initiated research on pressure blade production (Inizan 1976, e.g., 1984; Tixier 1967). They developed a specific approach to lithic technology that was influenced by Leroi-Gourhan and psychological approaches focusing on the artisan (Desrosiers 2007). Following this initial activity, research into pressure blade production in the Maghreb has progressed at a slower pace and does not focus on the identification of pressure techniques, with the exception of one study (cf. Sheppard 1987). More recently, Rahmani has brought new life to this topic in North Africa, and the reader will find more of her results in her collaborative work with Lubell (Chap. 4). They present their research from Kef Zoura D (Algeria) and discuss the implications of understanding the circumstances surrounding the adoption of pressure blade production in North Africa.

Following the earliest research in Mesoamerica and in the Maghreb, researchers have progressively identified pressure blade production in many areas of the Ancient World. In the Near East and the Caucasus, the use of pressure techniques for blade production was adopted at the beginning of the Neolithic and progressively evolved until a lever was adopted and employed in their production (Chaps. 5 and 6). In Europe, the adoption of pressure blade production preceded the Neolithic in most regions (Chaps. 7 and 9); however, it became increasingly widespread at the onset of the Neolithic, as demonstrated by the evidence from the Southern Iberian Peninsula (Chap. 8).

Giving particular consideration to Asia, Europe, and the Near East, Darmark addresses the question of "surface pressure flaking" versus pressure blade production in Chap. 10. This work, however, remains inconclusive and brings to light further unanswered questions. Considering the possible relationship between the developments of both aspects is certainly innovative, and it clearly points out a direction for future research.

The first manifestations of pressure blade techniques are found in Asia, as described by Inizan in Chap. 2. More specifically, in the same chapter, Inizan considers the fact that Japan and Korea are now known to contain some of the earliest manifestations of pressure blade manufacture. Detailed information about Japan can be found in Chap. 11 by Takakura, while in Chap. 12 Brunet addresses the question of diffusion or innovation in Central Asia, and Tabarev (Chap. 13) gives an overview of the situation in Russian Far East (Eastern Siberia). With regard to its introduction in North America, Gomez Coutouly presents the context in which pressure blade production emerged in Alaska (Chap. 14), while Desrosiers and Sørensen discuss its diffusion from Alaska to Greenland (Chap. 15).

Part 3 of this book includes two important chapters on improving upon our knowledge acquired through experimentation. In Chap. 18, Pelegrin goes far beyond the simple recognition of the technique of detachment. This new experimental study of pressure blade production greatly improves our understanding of the phenomena of invention and diffusion of pressure techniques. Controlled experiments distinguish the work of Kelterborn (Chap. 19) and provide information toward the systematic study of the mechanics of pressure techniques.

1.4 Toward a Global Understanding of Pressure Techniques

Throughout the course of compiling this book, it had been tempting to propose our conclusions on the invention, diffusion, and reinvention of pressure blade techniques. However, these would not have necessarily been shared by all contributors. Rather, the aim of the book was more to compile a large amount of information on the topic and present the phenomenon as a whole on a global scale. This approach demonstrates the different stepping stones that have emerged in time and space, through carrying out many meticulous experiments and data collection. Over the course of humankind's evolution, many of these stones are still missing which makes stepping between them all the more hazardous. It is to be expected, however, that some of the best architects among us will undertake the task of framing a theoretical bridge that could possibly span these gaps. More importantly, it could be expected that archaeologists will undertake the task of unearthing new stepping stones, the emergence of which will lead us down new paths which follow pressure techniques within the evolutionary framework of humankind.

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