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Original Paper

Theoretical and Epistemological Thoughts on Archaeology and Experimental Lithic Technology

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Abstract

In the wide field of archaeology, stone tool remains are one of the main pieces of evidence used for assessing knowledge and understanding of the archaeological record. To cope with its analysis and interpretation as a branch of experimental archaeology, one field of research that has become more notable is experimental lithic technology. Based on experience and development of this discipline in the southern cone of South America, and with the aim of contributing to the growing theoretical perspectives in this field, this paper addresses the theoretical and epistemological issues that deal with theoretical, variability, classification, and deontological concerns.

Keywords

epistemology, theory, anthropology, archaeology, experimental archaeology, experimental lithic technology, stone tool analysis

1. Introduction

In the wide field of archaeology, stone tool remains are one of the main pieces of evidence used for assessing knowledge and understanding of the archaeological record. During the last fifty years, through their significant influence on different theoretical perspectives, and employing broad methodologies, lithic studies have become a more sophisticated field of study (e.g., Andrevsky, 2002; Odell, 2003; Harrison, 2010; Shott, 2014). By artificially replicating or simulating activities based on archaeological remains, Experimental Archaeology (EA) is a field of knowledge (*sensu* Bunge, 1985a, 2001) which tries to generate and test hypotheses about, explore, understand, know, and explain facts about the past (Ascher, 1961; Coles, 1973, 1979; Callahan, 1981, 2008; Nami, 2010a, 2010b;

Graves-Brown, 2015). Additionally, EA is also used for educational purposes, helping students to gain a good sense of both content and process (Kamp & Whittaker, 2014, p. 79).

In order to cope with the various issues related to understanding stone tools, a field of research has appeared which has made notable advances as a branch of EA, Experimental Lithic Technology (ELT). Experiments in this line of research are mainly based on flintknapping, which, in order to obtain a flaked stone tool, is the process of working rocks with conchoidal or similar fractures (Whittaker, 1994, pp. 11-12). This activity is an important tool for ELT, although not the aim itself. Although some experience in working stone for research purposes was gained around the turn of the 20th century (M'Guire, 1892; Evans, 1897; de Mortillet, 1910; Warren, 1914; among others), it was not until a half century later that in different parts of the world there were increasing numbers of experiments about diverse topics related to prehistoric technologies (e.g., Crabtree, 1966, 1968, 1973; Bordes & Crabtree, 1969; Newcomer, 1971; Sheets & Muto, 1972; Callahan, 1979; among many others). As a non-academic activity, at the same time, contemporary flintworking done by commercial and amateur western knappers also showed a remarkable increase (Whittaker & Stafford, 1999; Whittaker, 2004). Although their aims had no research purposes, their empirical knowledge may be useful when discussing archaeological and experimental issues (Nami, 1997, 2010c).

Bearing in mind the archaeological experience in the southern cone of South America, inspired by the developing discipline -mainly in Argentina- and departing from previous epistemological and theoretical concepts on this topic (Nami, 1982, 1983a, 1985, 1997, 2010a; among others), this paper addresses some issues that contribute to the discussion and growth of these matters in this field.

2. General Considerations

Since the advent of the so-called "new" or "processual archaeology" in the 1960s (Rice, 1985; Schiffer, 1996), the development of different levels of theory in archaeological research has been proposed (Binford, 1977). Scientific theories are explanations of a natural or social behavior, event, or phenomenon as a system of constructs or concepts, and its relationships which present a logical, systematic, and coherent justification within certain assumptions and boundaries. Just as a heap of bricks is not a house, a theory is not simply data, facts, typologies, taxonomies, or collections. More than just describe or predict, theories should explain why things happen, as explanations require causality or an understanding of cause-effect relationships (Bhattacherjee, 2012).

According to the degree of abstraction and generality, there are different levels of theory. In this regard, one of the contributions of processual archaeology during the 1970s was the introduction of the Middle Range (MR) theory concept and its related MR research (Binford, 1981; Raab & Goodyear, 1984). Different to high-level theories that seek to answer broader aspects of phenomena that evolve into large "why" questions (Bacharach, 1989; Gibbon, 1996; Nami, 2010a, 2010b, 2011a), "MR thinking" on social research (Laughlin, 1995) and, in particular, the MR theory notion, were both introduced in Robert K. Merton's 1947 talk (Merton, 1949). In archaeology, this basically refers to a set of schemes and propositions that bridge the gap between empirical observation and broad, general, or high-level theories, which are often abstract and untestable. Considered to be "actualistic" research, it is mainly performed by ethnoarchaeology and EA (Binford, 1981). MR theory building is necessary to gain a clear understanding of the dynamic processes that created the archaeological record, but its ultimate goal is the elucidation of prehistoric cultural behavior (Maschner, 1996) by proposing hypotheses that link the past record with the natural or man-made processes that produced them. In the latter case, it connects the observable archaeological record with invisible and extinct socio-cultural activities. Like MR research, ELT may have a bearing on processes either because it provides knowledge regarding the objects of action -for example, techniques- or because it is concerned with the activity itself; for instance, the decisions that preceded and guided stone tool manufacture or use. In this sense, ELT is devoted to building basic research that can be applied to the relevant archaeological problems (Nami, 1988a, 1991a). In other words, ELT attempts to understand and explain many of the aspects of the stone tool record. MR data, facts, and findings operate at the empirical or observational level, but feeding MR theories means working on a more conceptual plane. This approach is neither infallible, nor is it a panacea; nonetheless, it has yielded a great deal of data and insight.

As an actualistic investigation, EA is extremely useful, not only for understanding and explaining a myriad of archaeological issues (e.g., Coles, 1979; Callahan, 2008; Ferguson, 2010; Nami, 2010b). In particular, ELT deals with varied and diverse topics related to rock remains (e.g., Jennings, 2011; Tsirk, 2014). One of the main ones is understanding production processes, which are dynamically interrelated systems of actions with the goal of transforming certain elements. In this way, raw materials became products (Note 1), although different aims are employed within a socio-cultural system (e.g., White, 1968; Carneiro, 1979; Whittaker, 1996; Whittaker & Kamp, 2016). Hence, as a useful research strategy, ELT can generate basic knowledge on past lithic technologies, with several authors having tackled this issue with diverse viewpoints (e.g., Amick & Mauldin, 1989; Apel, 2006, 2010; Nami, 2010a; Morgado & Baena Preysler, 2011; Eren et al., 2016). Currently, ELT is practiced in many countries around the world (e.g., Baena Preysler & Carrión Santa Fe, 2010; Nunn, 2010; Lund, 2015).

In Argentina, despite there being only a few experiential antecedents in this matter (Ameghino, 1918; Nami, 1982), it was proposed as a systematic research method in the early 1980s (Nami, 1982, 1983a, 1983b, 1985, 1988a, 1988b; among others). In the 1970s and early 1980s, a few archaeologists were in favor of changing their perspectives, with various ongoing discussions about the nature of archaeological research. At that time, national archeology was mostly governed by the cultural history (*sensu* Dunnell, 1978) approach, and lithic artifacts were dealt with using strong descriptive, intuitionist, and sophistic views (Nami, 1988b, 1991a, 1991b). However, despite the attacks and destructive resistance from the more conservative and reactionary members of the archaeological establishment, fortunately, EA and ELT is now seen as a normal activity in archaeological research (Nami, 2001/2002; Sario & Pautassi, 2012; Weitzel et al., 2014; De Angelis et al., 2018; among many others). Since that time, a lot of water has passed under the bridge, and many diverse visions have been incorporated and/or discussed by archaeologists' worldwide (e.g., Moro Abadía, 2007), and particularly in Latin America (e.g., Politis, 1992). As we become more familiar with this topic, and as it goes hand in hand with international advances on this subject, currently, lithic studies demonstrate a wide variety of theoretical and methodological approaches (e.g., Nami, 2001; Flegenheimer & Bellelli, 2007; Cattáneo et al., 2018). As it evolves into a scientific archaeology (Smith, 2016, 2018), diverse views with different scientific levels help to build better prospects for understanding stone tools and knowing about the human past. However, not everything is so optimistic; despite a certain amount of progress being made due to current scientific and technological advances, sometimes there still remain traces of both old and new pseudo-scientific (*sensu* Bunge, 1985b) positions with an incomplete understanding of the variability in the lithic record and of the causes affecting its diversity. Therefore, there must be ongoing discussions to pursue the application and employment of scientific methods, principles, and values.

3. A glimpse of Experimental Lithic Technology

To understand, know, and explain stone tools' technological issues, some experiments have been carried out using various devices and methods (e.g., Warren, 1914; Bonnichsen, 1977; Eren et al., 2011; Iovita et al., 2016). However, it is worth mentioning that, in order to perform certain experiments -mainly the so-called "replicative" ones- it is sometimes necessary to be an accomplished knapper, such as those who generally lived during prehistory (e.g., Figure 1). However, it is one matter to practice knapping as a craft, but it is entirely another to use it as a means of generating useful information for archaeology. In fact, despite the existence of many contemporary academic, commercial, and amateur knappers, not many generate useful and reliable data for archaeological research (Whitakker & Stafford, 1999). This difference is not clearly understood by some members of the archaeological community, who believe that being an accomplished craftsman -or just having taken a course with a good knapper-guarantees a kind of advantage and/or superiority with regard to understanding stone tools. Obviously, to have some skill in this technique helps a lot when dealing with the lithic archaeological record from several viewpoints (Nami, 2010a). Nevertheless, it is not enough; the underlying theoretical background plays a vital role in the final research product; although for many researchers, theory might be irrelevant to practice (Bunge, 2001, p. 208). It should be added that experimental knowledge is achieved through complex cognitive processes and reasoning that go far beyond the empirical data and which involve finding the causes of phenomena. Thanks to experimental practice, it is possible to know about the existence of a multitude of technical variations, properties, and processes that are only accessible using scientific methodology and that constitute a large part of what it is currently known about lithic technology. Here are just a few examples: the physical mechanisms underlying fracture mechanics in raw materials (Cotterell & Kamminga, 1987; Tsirk, 2014); the structuring of various reduction sequences (Newcomer, 1971; Callahan, 1979; Flenniken, 1988); and the functions played by tools in traditional technological systems (e.g., Hayden, 1979; Keeley, 1980).

In the southern cone of South America, a number of scholars usually employ the term “experimental flintknapping” (“talla experimental”) when referring to the above mentioned EA and ELT research. Actually, instead of just flaking by itself -as mentioned previously- its aim is experimental replication in order to know and understand lithic technologies (Crabtree, 1975a, 1975b). It is important to emphasize this difference because it is a topic that is not very well understood by many archaeologists, even among those devoted to lithic analysis. Also in this regard, there is an interesting anecdote which goes back to the early 1980s, when an article introducing EA and ELT with a title according to its content was submitted for publication. The journal’s editors changed it to *Talla experimental* (experimental flintknapping) without consulting the author (Nami, 1983a). It is worth noting that several archaeologists just (pejoratively?) have put the label of “flintknapper” on their colleagues who, among multiple research activities, use flake stone when trying to generate detailed basic data for archaeological research.

Figure 1. Experimental Replicas of Neolithic Danish Daggers Made by Errett Callahan. Manufacturing These Sorts of Objects Represents the Pinnacle of Stone Tool Technology (Photo by the Author)

The factual and theoretical corpus of ELT is varied and diverse. Due to the nature of used materials, the studies of various stone tools are governed by the principles and laws of natural and physical sciences (e.g., Cotterell & Kamminga, 1987, 1990; Luedtke, 1992; Tsirk, 2014). Also, lithic remains are the result of socio-cultural behavior, and hence constitute a “fossilized” record of human conduct regarding empirical traditional procedures and techniques (Nami, 1992). Lithic artifacts are a kind of craftsmanship made as a product of a particular piece of shared technological knowledge with their own *recipes for fabrication* that involve the *know-how* and *know-why* for making goods (Schiffer & Skibo, 1987; Nami, 1994, 1997, 2003, 2010a, 2011b). This kind of technological information is stored and maintained in the procedural memory (Anderson, 1982; Bullemer et al., 1989; Squire, 2004) of the individuals constituting a specific socio-cultural system.

When analyzing regional stone tools, it is important to bear in mind that cultural variations are not randomly distributed in space. Human populations living in the same geographical region tend to share through their social or historical relationships more norms, traditions, and languages with each other than they do with people chosen randomly from distant areas (Miller-Atkins & Premo, 2018). In this regard, through sharing particular technological and morphological features, many stone tools reflect the "fossilized" behavior resulting from a particular piece of socio-cultural technological knowledge that existed within a certain time span and space on Earth (e.g., Figure 2). Despite some shared characteristics, there are variations because they are individually made and not mass produced with molds, industrial machines, and other methods of uniform fabrication (Note 2). Therefore, there is an inner variability in artifacts made with the same manufacturing style (e.g., Sackett, 1982; Weedman, 2008; among others), which is understood as a particular technological way of making things (Nami, 1997-1998). As can be seen in the following section, one of the main goals of ELT is to understand and explain a number of these issues.

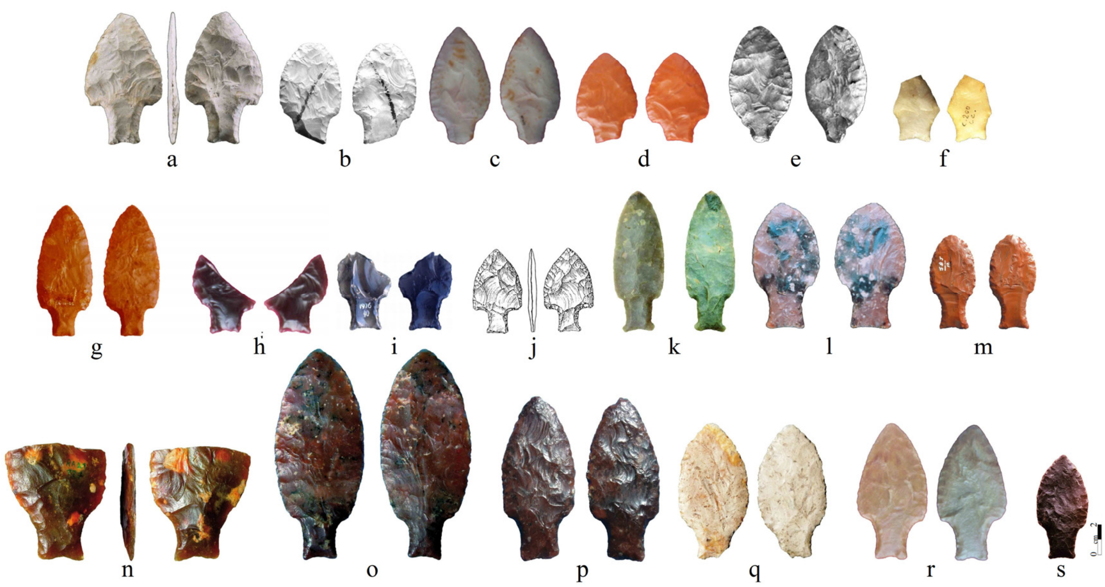
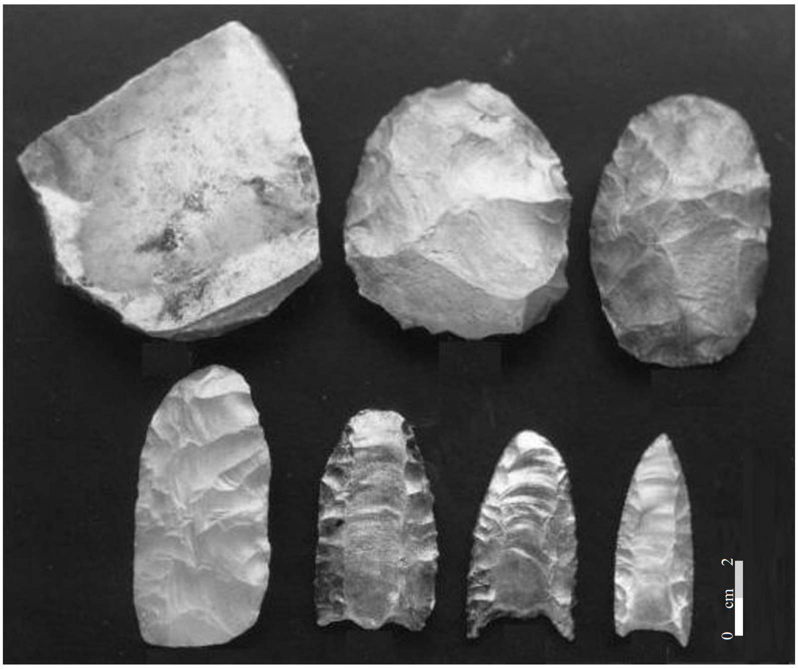


Figure 2. Archaeological Examples of "Fishtail" or Fell Projectile Points (ca. 10,000-11,000 Radiocarbon Years before the Present) Which Were Distributed over a Wide Area in Central and South America. a) Belize, b) Costa Rica, c-e) Panama, f) Venezuela, g-i) Ecuador, j) Peru, k) Brazil, l-q) Uruguay, r) Argentina, s) Chile (Modified after Nami 2014, Figures. 18-19). These Artifacts Constitute a Remarkable Example of Shared Technological Knowledge over a Large Geographical Area within a Short Period of Time

4. Variability, Processes, and Artifact Classifications

A topic of concern for the last half century is the variability existing in the archaeological record (Sullivan & Olszewski, 2016), and, in particular, in lithic remains. As pointed out by Krieger (1944, p. 284, cit. by Flenniken, 1984, p. 191), the artifact types illustrated in the published literature only take into account the best specimens and attributed this to a "failure to handle the problem of variability". The word "variability" generally means a lack of consistency or fixed pattern; a liability to vary or change (Note 3). In science, it has different connotations in different disciplinary fields. In archaeology, the revolutionary approaches developed during the 1960s demonstrated that it is a crucial and fundamental concept for understanding and explaining archaeological facts (Binford, 1962; Binford & Binford, 1966, 1969). In this regard, a great deal of the lithic record is subject to variability; however, in spite of variations in artifacts during their reduction processes, stone tool production is not a random, chaotic, and unorganized sequence with tendencies and regularities that may or may not be understood and explained. They can also have rules (*sensu* Bunge, 2001, p. 183) and demonstrate generalizations that must be explored by considering a large number of cases when available, and not only a few observations, which can give rise to "Mickey Mouse" laws, as early defined by Flannery (1973, p. 51), a sort of generalization (Note 4) that does not account for the nuances and variations, which constitute the complexity of many archaeological phenomena. For example, in order to fabricate certain finished products, it is necessary to start from an initial piece (called a blank) with appropriate characteristics which allow it to reach its goal; then, as a part of tool decision-making, its selection is a planned and rational action. In particular, in lithic technology -among other things- it can describe the inner variations existing in artifacts belonging to the same set. For instance, the shape variants that are present in the early stages of a manufacturing process are in the finished product, whether bifacial or unifacial (e.g., Newcomer, 1971; Callahan, 1979; Nami, 1983b, 1988b, 2017; Nami & Civalero, 2017; and many others). Through seeing fabrication in action and the constant changes in shape, variability has become a basic principle of ELT. In fact, as a non-machine or mold would make, due to the materials' nature and extractive procedures -mainly during the production process- lithic artifacts are not exactly equal to each other. These differences can mainly be observed in the early stages of manufacture, and sometimes archaeologists can barely recognize this variability as something that might be expected. In search of some precision in order to deal with this issue, from a hypothetical-deductive standpoint, the methods of successive approaches (Bunge, 1969; Nami, 2000a), as well as politethic models that use bands to understand this wide range of variations, are useful for describing and explaining processes and/or complex phenomena (e.g., Callahan, 1979; Nami, 1986, 1988b, 2003, 2017).

Among others, the most basic and primary procedures in many research activities are the classification of evidence and data. One of the oldest approaches for dealing with lithic implements was typology, one of the main tools to be used from a cultural historical perspective that understood the human past from an ideographical standpoint (Lyman & O'Brien, 2004). However, in certain archaeological communities, it is still in use but with an updated makeup. It is also known that the epistemological background underlying typological thought relies on an idealistic philosophical perspective. For this reason, with this sort of approach it is common to use an “ideal type”, which is a group of objects from the same class as an idealized model of things or processes. They are made by using attributes that are considered typical or remarkable, and rejecting other ones that are believed to be irrelevant, despite the fact that on closer inspection they may be significant (Bunge, 2001). Leaving aside typological idealism, it is worth pointing out that a necessary step in scientific research in general and lithic studies in particular is classification. This is the exhaustive division of a collection into sub-sets (species) that are reciprocal disjuncts, or its grouping into superior categories (taxa) such as a genus. This includes two logical relationships, for instance, an individual belonging to a class, and the inclusion of one class in another with a higher category; hence, all classifications are models of a set theory (Bunge, 2001, p. 25). Despite the need for classifications in lithic studies, rigid, ideal, and typological views as a general archaeological approach have been dominant for several decades in North and South America. However, a strong emphasis is still in vogue with a few lithic analysts and recently reappeared mixed with new and apparently innovative views (e.g., Aschero & Hocsman, 2004). In fact, in Argentina there is some influence from a small group of archaeologists who insist on using confusing jargon and, sometimes, false patterns to explain complex facts and/or processes, which they reveal as being uniquely true. Usually, with a certain kind of ideal typological background, some studies present their results based on observations of a limited number of cases, or a few select specimens that simply describe or fit one version of variability. In these kinds of cases, as can be seen below, they believe that they have discovered a particular and “correct” way of doing something, rejecting other variations and possibilities. This is common behavior, which not only occurs when trying to understand shaped artifacts, it also happens in raw material classification (Nami, 2015, pp. 135-ff.).



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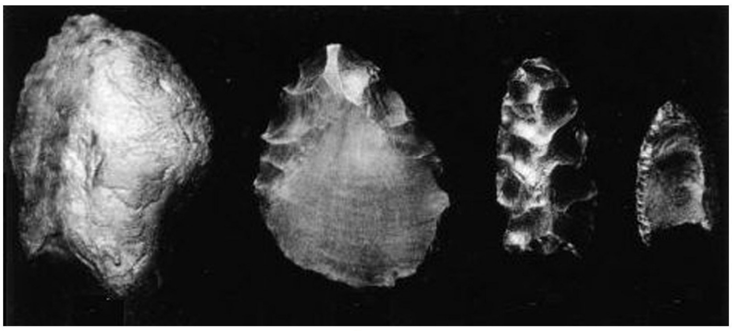

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Figure 3. Experimental Examples of the Bifacial Folsom Reduction Sequence with (a) and without (b) Bifacial Thinning. Note the Variability in the Manufacturing Stages Prior to the Finished Products. Modified after Nami (2010c, Figures. 25-26)

An interesting example of this occurred during the 1970s, when a model was proposed regarding the production of the well-known Paleoindian Folsom points (Figure 3). They were made using a sophisticated flaking method by selecting a specific and relatively thin flake-blank that was thinned slightly without using bifacial thinning before the end product (Flenniken, 1978). However, a study of the archaeological remains showed that the suggested manufacturing sequence was only represented in a few specimens, and bifacial reduction was in more widespread use (Nami, 1999; see also Frison & Bradley, 1980; Root, 1993; among others). A similar case is as follows. In fact, in the early 2000s, a preliminary experimental reduction sequence model was proposed to explore a certain class of bifacial artifacts from northeastern Argentina (Nami, 2006a), Paraguay, and southwestern Brazil. Prior to performing the experiment, I visited some quarry-workshop sites and observed and documented dozens of examples of early manufacturing stages, preforms, and finished products from archaeological collections. Furthermore, Riris and Romanowska (2014) studied similar pieces, and, erroneously assuming that the experimental model was made by only looking at finished products, as well as wrongly affirming that the early stages were completed using "standard bifacial" reduction, they discounted the proposed early manufacturing stages of the preliminary and exploratory model. Based on a selected sample of artifacts and showing only a few specimens, the authors identified and discovered the "correct way" of doing the reduction sequence. To explain how to do it, they showed a particular class of blank, believing that it was the only variation used; they also explained its further flaking that, because of asymmetries in cross section and shape, thus it was necessary to flake in that way. However, it is important to bear in mind that on the regional archaeological record there are thousands of bifacial flaked artifacts with different shapes that are shown to fit some unpublished and published experimental units, and, therefore, that might be early manufacturing stages. Thus, the suggested blank selection might only be one version of variability, and not a unique and particular mode. As previously indicated, in local archaeological collections there are thousands of non-classifiable bifacial flaked artifacts that might be early manufacturing stages of these particular tools. To understand them, there will need to be large, well-documented, and archaeologically controlled experiments that study, understand, and explain the variability in producing these, as well other artifacts in this region.

With regard to the previous paragraph, of course, the proposed reduction methods may be true in certain cases; however, from another perspective they might simply be "partially true". Beyond the debate about the utility of this concept in science (Quintanilla, 1985), it is also useful for discussing issues of scientific interest (Artigas, 1995). In this debate, to describe the fact that among the *n* possibilities of blank selection and decision making during their reduction, some scholars believe that just one was used, while other options were rejected, thus resulting in variability. In this sense, scientific knowledge is always partial, and the proposed blank variety might be true, although it is not the only one that might have been utilized. It is worth mentioning that in other research contexts, when speaking of partial truth, it should not be thought of as defective knowledge, because to achieve authentic knowledge, at the same time it is partial, approximate, and imperfect (Artigas, 1995). The above-mentioned account might be irrelevant when comparing archaeological problems with broader interests, but it is useful for discussing the underlying thought that exists in many lithic studies. A crisis can occur when possibilities just as valid as other ones are discounted, a partial observation becomes a generalization, and is treated as the actual way of doing something, then minor differences might be considered "life or death" situations while being subjected to more useless debates (Nami, 2015, 135-ff.).

Finally, the following is another example that, in this case, has major consequences for the interpretation and knowledge of archaeological processes. In cultural-historical archaeology, while ignoring the "variability" concept, projectile points were mostly used as "markers" of different "cultures", "periods", or "phases", as well as other constructs for interpreting the human past (e.g., Miller, 1987; Schmitz, 1987; among many others) (Note 5). While lacking factual chronological data, but due to certain differences in general shape, it has been suggested that the so-called *Yaguarí-Yaguanesa-Paso del Puerto-Zapucai* points represented "temporal types" in the regional archaeological process in part of the Uruguay Republic (Iriarte & Femenías, 2000). Of course, any differences with regard to morpho-technological issues must be seriously addressed, but in this particular region it is crucial to search for stratigraphic sites with critical, objective, and unbiased studies on chronology and geoarchaeology, mostly of an alluvial nature (Nami, 2013; Feathers & Nami, 2018). However, a closer look at the regional projectile points from a technological viewpoint, allows the observation that many of these artifacts share several features, thus suggesting that they were made by people who shared similar technological knowledge. In particular, as well as showing a comparable manufacturing method, as seen in Figure 4, a remarkable characteristic in many armature tips from this area is the use of beveled edges and helical cross-sections, a rare feature in South American points (Nami, 2018). Strikingly, as a remnant of older perspectives, this sort of analytical and interpretative background is still in vogue. In fact, it is sometimes risky and difficult to emphasize unique attributes in order to establish clear typological differences which have implications when explaining socio-cultural regional evolution. For instance, the use of supposed type markers defined by minimal details in the shape -and selected from other coexisting forms of projectile points- differentiated, for instance, Paleo American "techno-complexes" (e.g., Suárez, 2017), as was formerly used in North American archaeology (e.g., Roberts, 1935).

To use a narrow typological approach and thought when searching for ideal "constructs" or "types" may generate a kind of cognitive bias. This refers to a psychological effect that can cause a deviation in cognitive processing that sometimes leads to perceptual distortions, inaccurate judgments, illogical interpretations, or, what is often called irrationality (Haselto et al., 2005). This bias is linked to other types of bias, which are closely related to self-enhancement and an illusion of superiority, false agreement and uniqueness, as well as other defects (Hoorens, 1993). It is worth noting that one problem that affects the difficulties in recognizing variability may be associated with "reinforcement syndrome" also a psychological phenomenon perceived in scientific research, wherein a hypothesis, model, and/or concept are repeatedly reinforced by additional data (Watkins, 1971). This can occur in many fields of experimental research, including the so-called "historical sciences", as it can be very difficult, or even impossible, to disprove a claim about the past. This usually happens when the data support a concept or hypothesis, which soon becomes established in scientific thought and is very difficult to eradicate; the hypothesis becomes an assumption and the data are used selectively to fit the concept.

Figure 4. Projectile Point Morphological Variability from Uruguay (a-c, g-w) and Northeastern Argentina (d-f). Despite Differences in the Stem and Blade Shapes, They All Have in Common a Similar Manufacturing Style. Among Other Variations, Many of Them Share Helical Cross-Sections and Beveled Edges (after Nami, 2018). Using a Traditional, Normative, Typological Approach, Some of These Artifacts Might Be Grouped as Belonging to Different Archaeological Constructs (e.g., Phases, Traditions, Techno-Complexes)

Finally, in the real world, things are varied, diverse, and subjected to influences from many complexities. For this reason, it should be noted that classifications might take into account the variability that occurs in processes and the evolution affecting these phenomena; also, a large number of specimens should be studied instead of a few whenever possible. Needless to say, not all of the attributes that are proposed as an "ideal type" occur in reality. In this regard, it is important to bear in mind the variability imposed by the socio-cultural and craftsmanship nature of stone tool remains, their morphological variations, and changes that occur during the reduction process and life-story.

5. Deontological Briefs

The professional practices related to researching different topics with regard to phenomena and events from the past have led me to seriously consider and think about the deontological aspects (Nami, 1997/1998, 2007, 2011b), a subject that I would like to focus on in this paper. In fact, in underdeveloped, emergent, or third-world countries -or whatever else they are called- as well as economic problems, there are numerous other problems that can affect the work of original and hard-working researchers who do not want and/or who are not in a strong enough position to, or who simply do not, agree with the irrational and almost feudal way some research and/or academic institutions are organized. There are numerous problems, but one of the most worrying and harmful is related to plagiarism, which in the scientific community means representing someone else's intellectual work as one's own by replicating or duplicating it without referring to the source. This felony is committed by copying original ideas, concepts, phrases, clauses, sentences, paragraphs, or longer extracts from published or unpublished products (Bouville, 2008, 2009, 2010). Sometimes, plagiarism is disguised by criticizing the stolen concept but then making it one's own with a slight modification or synecdoche (Nami, 1997/1998, 2011b). In this regard, with a kind of parochial amateurism, there are some regional archaeologists who think that no one will realize that most of their supposedly original proposal is just a plagiarism of the national and international, published or unpublished scientific literature. The following is another anecdote; I used to be a member of a committee at one of the most important institutions devoted to supporting scientists in Argentina. On one occasion, I was acting as a reviewer and informant for an application related to one of my main research topics, lithic technology. Interestingly, the theoretical approach of the proposal "shared" many of its topics with the theoretical background to my doctoral thesis (Nami, 2000a), but with no references to it. Although they were many years different in age, the candidate and this author shared the same dissertation director, who, curiously enough, was also the committee chairman and the formal applicants' promoter at the institution. Needless to say, these kinds of scholars only simulate true knowledge (Bunge, 1998; Nami, 1997-1998, 2010a, 2011b); they are generally accustomed to plagiarizing original concepts or texts, which have already been digested and matured by others, as if they are their own intellectual creations. One of the most common tricks for taking over the academic work of other authors is to refer directly to the literature used by them, and/or to embellish the text with additional recent citations that only circumstantially address the issues in hand (see Nami, 2011b, pp. 83-86).

The above-mentioned behavior is closely linked to another practice. In fact, several distinguished scholars (Paz, 2000; Gissi, 2002; Bunge, 2014) have pointed out that a sociological characteristic, and a fairly common practice in several Latin American academic communities, is known as *ninguneo* (Note 6), which is derived from *ningunear* ("nobody" as a verb). It refers to a colloquial Spanish word that is used to express an action that involves turning somebody into a nobody (Paz, 2000, pp. 48-49) by ignoring or nullifying their presence, as a kind of disrespect; acting as if there is no one there, and as if the space is occupied by no one, which comes from the word "none", which also means "nothing". This action is not a simple act of involuntary indifference; *ninguneo* is specifically planned and carried out by one person or community against another. It can also occur in other forms where indifference is not present, but through attacks that belittle the other person, their achievements, interests, and opinions, due to envy or some kind of resentment that exists in one person against or for the other. *Ninguneo* can also mean to try to detract from something, to make it look bad in front of other people. In other words, in various social institutions and communities, *ninguneo* is a form of aggression, which usually does not involve physical violence, but verbal and even psychological, because it tries to do everything possible to make the individual under attack feel despised, assaulted, and underestimated on many different levels of his/her personality (e.g., Neuman & Baron, 2005). In my opinion, this type of discrimination and its subsequent waste of valuable human resources -among many others- is one of the reasons why these kinds of countries do not develop, are stagnant, or are simply in decline.

Another useful concept for discussing certain practices in archaeology, and in lithic studies in particular, is the "post-truth" notion. Generally, it is used in politics to define a fact that is related to a situation where people are more likely to accept a claim based on their beliefs and emotions -sometimes following a powerful guru- rather than one supported by facts and data (https://dictionary.cambridge.org/es/diccionario/ingles/post-truth); in brief, a post-truth is an absent or prefabricated truth. In archaeology, and in stone tool analysis in particular, certain academic practices can collaborate with post-truths when trying to tell a lie that is transformed into truth through the sheer force of being repeated by the academic community at meetings and in publications, during university classes, and in other ways. It is simply a case of belonging to the establishment at scientific institutions that, in third-world countries, are generally reduced to just a few scientists' supporters and cronies. Closely related to this, an excellent example of "post-truth" is the supposed typological difference between "bifacial thinning" and "bifacial reduction" (Note 7), also identified according to their imaginary and ambiguous waste flakes (Aschero & Hocsman, 2004). While avoiding proposing useless and irrational discussions about words and formal problems (Bunge, 2002; Sanchez Palencia, 2015, p. 92), it is worth mentioning that both terms are usually used as equivalents in many places around the world and the supposed difference is just a game of words and an empty concept leading to confusion. Besides, during the thinning process there is a great deal of variability in the waste sub-products, and as only samples of those considered "typical" bifacial thinning flakes can result from this activity, those defined as "bifacial reduction flakes" may have originated from the same process. In fact, when making bifaces, there is a great deal of variability in the debitage and -among others- both "types" of flakes (e.g., Callahan, 1979; Nami, 1986, 1991c, 2017); also, similar waste is produced when doing covering unifacial flaking (Nami & Civalero, 2017; Civalero & Nami, 2018). Therefore, it is impossible to seriously recognize one from the supposedly other due to this equifinality effect in lithic technology (Nami, 1997, 2000a, 2000b, 2003, 2010a, 2010b).

Beyond strictly academics and intellectual matters -such as the above-mentioned plagiarism and *ninguneo*- in the real world and daily life, the previous paragraphs also have major consequences. In general, one of the most important goals for people with these characteristics is to have access to powerful management positions and to use their innumerable extra-academic resources to obtain what they want to the detriment of others. These include the influence peddling to obtain grants and/or human resources, thus creating a kind of academic clientelism, which is understood as a social system based on the client-sponsor relationship. In this sort of system, an obsequious client gives some sort of support to his/her sponsor in exchange for or acknowledgment of privileges or benefits such as ongoing recognition, blind and uncritical adherence to their ideas, among others. In brief, individuals with these traits often became untouchable and remain unpunished, as they can do anything they want, sometimes even committing various felonies such as work-place harassment (Neumann et al., 2005). Needless to say, one of the most disastrous consequences of the above-mentioned behavior is the disintegration of the social fabric in academic groups and communities (Bunge, 2000); or, at least, they remain together through maintaining socially and psychologically unhealthy and toxic relationships.

6. Final Remarks

To sum up, the theoretical, methodological, and factual advances in archaeology in the southern cone of South America have been remarkable. However, certain old issues remain unsolved, or are simply overlooked as they are not regarded as being of any significance, some of which have been addressed in this paper. If we continue working on them, EA and ELT are excellent and promising fields of study. However, it is important to bear in mind that, as in many aspects of scientific research, hardly any experiments are crucial and definitive. They are only individual bricks in the ELT disciplinary wall, from both a factual and a theoretical perspective. Like a bottle in the sea, an experiment -or, principally, the model that derives from it- is only ever a small part of understanding the complexity of stone tools. Sometimes, it is just the start, like an anchor from which we can begin to look at and know what was going on in an extinct process, but which often becomes a great contribution (e.g., Crabtree, 1968; see Clark, 2012). For this reason, it is crucial to bear in mind that partial knowledge only lasts a short time, and that the total sum of galileic experiments (*sensu* Medawar, 1979; Nami, 2010a, 2011a) and models (Sheets, 1973; Nami, 1983b) will contribute to a more rigorous and precise understanding of traditional prehistoric technologies and their highly complex archaeological record.

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Notes

Note 1. The finished products are subjected to a number of modifications that transcend time, space, and culture. In many ways, whether stone tools, plastic or glass bottles, cars, or whatever, they all go through various recycling, discarding, reclaiming, and a myriad of other natural and cultural processes (Schiffer, 1987). For these reasons, some authors have suggested that the "finished product" concept is a fallacy (Dibble et al., 2017), a stance that, from the above-mentioned perspective, might itself become an erroneous belief.

Note 2. Amongst the variations, the following can be taken into consideration: personal or individual, different levels of skill and knowledge, from rejuvenation, recycling and reclaiming, and socio-cultural origins. In my opinion, for discussing diverse and wider issues of an anthropological nature, the latter are more important. However, intrinsic variability during the reduction process can also be highly significant for understanding and discussing archaeological topics.

Note 3. Retrieved from *English Oxford Living Dictionaries* on Aug. 18, 2018, from https://en.oxforddictionaries.com/definition/variability

Note 4. For the last few years, in lithic studies and with certain theoretical implications, there have been some generalizations in use which have been uncritically accepted by distracted archaeologists. This is the case for "bifaces as cores", including in this broad -and sometimes ambiguous- category artifacts that are obviously in early stages of manufacture, and sometimes which are clear preforms, even those that due to their thinness would not have allowed useful flakes to be detached for stone tool making. Additionally, during the bifacial reduction process, the early stages are flexible and versatile artifacts (*sensu* Nelson, 1991), which might have been used in many different ways (Callahan, 1979). Needless to say, the flakes detached from their reductions may have been employed for manufacturing diverse unifacial and bifacial tools. Finally, it is useful to recall that "bifacial cores" are a set of artifacts used for obtaining flakes (Nami, 2006b), and even exhausted bifacial cores can be used as blanks for continuing the reduction of any other kind of bifacial implement (e.g., Davis et al., 2012, Figure. 3.2, 3.3).

Note 5. Currently, it is accepted that well-dated diagnostic tools might be used as chronological markers (Dunuweera & Rajapakse, 2018).

Note 6. In this article, I prefer to use the Spanish word, despite the various translations into English (see http://www.spanishdict.com/translate/ningunear,
https://www.collinsdictionary.com/dictionary/spanish-english/ningunear).

Note 7. It is worth recalling that, following Flenniken (1984, p. 191), whatever the desired result (bifacial, unifacial, blade, flake detachment, etc.), a reduction technique is a specific set and sequence of stages produced while manufacturing a specific product (Nami, 2000a). Within this framework, a bifacial reduction may include (or not) bifacial thinning stages (e.g., Figure 4). In other words, the latter might be a part of a bifacial reduction sequence.