Experimental artefacts in research on prehistoric and aboriginal technology: a standardised terminology and registry code based on alpha-taxonomy and the *chaîne opératoire*

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Abstract In research on prehistoric and aboriginal technology, terms such as ‘replica’, ‘reproduction’ or ‘imitation’ are still used as generic labels for (non-original) experimental objects, their intended meaning becoming potentially confusing. Because the implementation of a standard terminology is required in order to allow individuals involved in research on prehistoric and aboriginal technology to speak the same language, an experimental artefact terminology, based on alpha-taxonomy and the *chaîne opératoire*, is presented. In this terminology, alpha-taxonomy takes into account three stages of the operational scheme of the *chaîne opératoire* as couplets: (1) the raw material used, (2) the method employed for shaping a given object, and (3) its resulting final shape. Additionally, a registry code suitable for labelling experimental artefacts is also presented. Although the lexicon presented in this paper does not intend to solve all the problems related to experimental artefacts in prehistoric and aboriginal technology, it represents a user-friendly approach to experimental realities, by establishing a shared language – which, to date, has still not been implemented – for experimental items. While this terminology and code system are primarily addressed to prehistoric and aboriginal technologists concerned with experimental work, they are equally relevant to museum curators and can also be of value to individuals involved in many other human endeavours, from the contemporary-art trade to the mechanics industry.

Keywords Material culture · Use-wear analysis · Residue analysis · Conservation science · Prehistoric archaeology · Aboriginal anthropology

Introduction

Alpha-taxonomy (from the Greek τάξις, *taxis*, arrangement, and νόμος, *nomos*, law) deals with the identification, description, and naming of entities (living things, objects, languages, etc.). Although it is primarily the part of biosystematics preceding phylogenetics (beta-taxonomy), it has been introduced to non-biological fields such as research on prehistoric technology (e.g. Conard et al. 2004). Furthermore, the theoretical bases of prehistoric systematics have been widely treated in R. C. Dunnell's influential work *Systematics in Prehistory* (1971). The basic methodological tool of alpha-taxonomy is a pathway, single-access key using step-by-step choices. The purpose of such a conceptual key is to assist in differentiating one type of entity from another by using contrasting characters. Each character of a key is called a 'couplet' (*c*), whereas each choice (contrasting character or separate statement) of a couplet is referred to as a 'lead' (*l*). Although single-access keys can be polytomous (multifurcating couplets), most of them are dichotomous (bifurcating couplets). Because in a dichotomous key each couplet consists of two leads, the choice of one lead takes the user to an identification end-point or a pointer to the next couplet (Timme 1991; Walter and Winterton 2007).

On the other hand, the concept of *chaîne opératoire* (English 'operational sequence') was originally created to define the set of stages in an object's 'life', from raw material procurement, through manufacture and then to discard (e.g. Szabó et al. 2007: Fig. 6). According to Goren-Inbar (2011), the *chaîne opératoire* can be defined as "the technological process of making an object: a sequence that consists of focusing on a mental template (the pre-planned shape of a lithic object), selecting sets of actions needed for its execution, and actualizing them through physical action upon matter". In a broader sense,

the *chaîne opératoire* can be described as "a chronological segmentation of the actions and mental processes required in the manufacture of an artifact and in its maintenance into the technical system of a prehistoric group" (Sellet 1993). Used as a methodology of analysis, this sequencing can produce a sort of fingerprint for the studied objects (Farbstein 2011: comment by W. Antl-Weiser). The *chaîne opératoire* can be divided into two schemes: operational (the physical stages of the object's making) and conceptual (the mental image of the projected object) (Forestier 1995). In prehistoric archaeology and ethnology, the *chaîne opératoire* approach is applied to a wide spectrum of items, from stone implements to horticultural products and even chimpanzee 'tools' (e.g. Farbstein 2011; Bicho et al. 2010; Boesch 2013; Boesch et al. 2009; Cavulli et al. 2009; Coupaye 2009; Dayet et al. 2013; De La Fuente 2011; Domingo et al. 2012; Forestier 2000; McCall 2012; Porraz et al. 2013). The term *chaîne opératoire* was first used by A. Leroi-Gourhan, who did not formalize it, but opened the path for its future use in ethnology and archaeology (Soressi and Geneste 2011, and references therein). In (prehistoric) lithic analysis, Shott (2003) suggested that this French notion is essentially the same as the American concept of reduction sequence, although this opinion has been challenged by Tostevin (2011). The *chaîne opératoire* involves the choice and selection of raw materials, the various methods of knapping hard rocks, the specific shape modification designed to obtain a set of products, and the spatial organisation of lithic economy on a regional scale (Bar-Yosef and Van Peer 2009).

In research on prehistoric and aboriginal technology, terms such as 'replica', 'reproduction' or 'imitation' are still used as general labels for (non-original) experimental objects (e.g. Barkai et al. 2010; Gould 1978; Lafayette and Smith 2012; Moreno Rudolph and Clemente Conte 2010; O'Flaherty 2007; Pétillon et al. 2011; Praisler et al. 2013; Shea

et al. 2001; Shott and Sillitoe 2004; Volkova 2012; Wells et al. 2014). Following Reynolds (1999), an experiment is "a method of establishing a reasoned conclusion, against an initial hypothesis, by trial or test". There have been previous attempts to fix some terms in experimental archaeology, a discipline whose fundamentals have been treated in depth by Reynolds (1999) by exploring the nature of experiment in archaeology, assessing its potential role in archaeological interpretation, defining the meaning of experiment, and dissociating archaeological experiments from both education and experience. Based on previous works of E. Callahan, Wescott (1999) suggested several term definitions/explanations, as follows *verbatim*:

− Reconstruction (dictionary). From given or available information. Falls within what is the inferred range of variation of the original, based on non-tangible materials. Does not imply complete accuracy, one of many ways it could have been done.

− Replication/replica (dictionary). Close to or exact copy or reproduction. Falls within what is the range of variation of the original, based on tangible materials.

− Simulation. Only approximates attributes of the original. Does not fall within the range of variation of the original.

− Reproduction (dictionary). To make a copy duplicate, or representation, through reconstruction, replication or simulation.

− Recreate. Cannot be done: anything beyond actual/tangible evidence is speculation.

Jolie and McBrinn (2010) have attempted to delimit the scope of three concepts used in research on ancient fibre artefacts. According to these authors, "*Replication* connotes the production of an exact replica or copy, based on a complete or almost complete original. (...) *Reconstruction* refers to taking a fragmentary artifact and mending it or extrapolating from it to create a complete or nearly complete artifact. (...) *Recreation* is, at best, an

approximation of the original based on a combination of iconographic imagery, written documents, sculpture, or some other visual representation of the object of interest". As can be perceived from the two latter cases, the attributes that different authors assign to some experimental terms can be very dissimilar. Thus, for Jolie and McBrinn 'recreation' entails possible "approximation", for Wescott it connotes pure "speculation".

The original problem of ambiguity of non-original object terminology is far from being fully solved. Since in practice a term is used to denote different types of final products, it becomes ambiguous and, thus, its intended meaning is potentially confusing. To overcome in part this problem, a qualifying adjective is sometimes added to complete the meaning of the noun. However, the use of a qualifying adjective in this way does not solve the problem of a term's ambiguity because it implies that the meaning of the main term can be altered by other adjectives. One example is the case of the term 'replica'. In the early 1990's, Carrell (1992) confined this word to "those objects that are authentic in design, manufacture, and materials". However, an adjective accompanying this noun has been used long after Carrel's definition of 'replica'. Thus, the expression 'working replica' (Prior 2000) involves conceptually the possible existence of its opposite 'non-working replica'. Likewise, the notion of 'true replica' (Apel 2008) entails the possibility of a 'false replica', or that of an 'exact replica' (Jolie and McBrinn 2010) implies the existence of an 'approximate replica', so the term 'replica' still remains undefined even in these cases.

An example of technological approach where 'replica' and related words ('replicated', 'replication', and so forth) are commonly used is that of experimentation in use-wear and residue analysis (e.g. Binneman and Deacon 1986; Hamon 2008; Hardy and Garufi 1998; Khreisheh et al. 2013; Roberts and Ottaway 2003; Schultz 1992; Wadley et al. 2004). In this approach, the underlying difficulty of using the word 'replica' in a broad

sense is that it can designate at once a variety of possible experimental artefacts differing in shape and physical properties. This is because, to test mechanisms of use-wear formation and document residue preservation, the most important aspect is not the entire shape of the copy used as a model of the original artefact, but rather the accuracy of the shape of its working area (the knife's blade, the spear's point, the grinding surface, etc.), as well as its physical properties (hardness, permeability, surface roughness, etc.). This is coincident with Outram (2008), who stipulates that not all materials and methods used in an archaeological experiment need to be authentic, but only those that are pertinent to the hypothesis that has been formulated. In traditional societies − whether prehistoric or ethnohistorical −, artefacts were made from a large variety of natural raw materials. Apart from the widespread use of stone, many biological materials (bone, shell, wood, etc.) have also been employed (e.g. Betts 2007; Cranstone 1961: 49–73; Holdgate 1961; Margaris 2014; Thieme 1997; Waguespack et al. 2009; Willis and Des Lauriers 2011; Zhilin 1998). The physical properties of implements made of biological materials will be determined by factors such as the species or the anatomical part. Joined together, the shape of the working area and the material's physical properties give an implement its functional appropriateness for certain tasks over others, determining the types of residues left on/in the object (blood, fat, plant tissue, etc.). This applies both to prehistoric and to aboriginal implements, irrespective of whether they were made of stone or of biological materials.

Consequentially, the use of a standard terminology for non-original objects is required. Putting into practice a pre-arranged lexicon would allow individuals involved in actualistic studies of prehistoric and aboriginal technology to speak the same language. With this aim, a standardised terminology and, additionally, a registry code for experimental artefacts are presented below.

A terminology for experimental artefacts in research on prehistoric and aboriginal technology

An ‘artefact’ (from Latin phrase *arte factum*, to make with skill; from *ars*, skill, and *facere*, to make) may be regarded as any object that is modified by humans, from items that have been merely transported to those that have been mentally designed and/or intentionally manufactured from naturally occurring materials (Jones and Keegan 2001). More or less similar definitions of ‘artefact’ are widely found in the specialized literature, for example “anything which exhibits any physical attributes that can be assumed to be the results of human activity” (Dunnell 1971: 117, 201), “something changed or modified by people” (Hurcombe 2007: 5), or “any object (article, building, container, device, dwelling, ornament, pottery, tool, weapon, work of art) made, affected, used, or modified in some way by human beings” (Kipfer 2007: 17). Not only human items but also those of other animals may be included in definitions of ‘artefact’, such as “any material phenomenon that exhibits one or more properties produced by a given species.” (Schiffer 1999: 120). Different viewpoints for defining an ‘artefact’ may also be found, for instance in Read (2007: 183–187). A ‘designed artefact’ can be characterised by three groups of variables: structure (describing the components of the object and their relationships, i.e. what it is), function (describing the teleology of the object, i.e. what it is for), and behaviour (describing the attributes that are derived or expected to be derived from the structure variables of the object, i.e. what it does) (Gero 1990; Gero and Kannengiesser 2004). For our purposes here, the expression ‘experimental artefact’ will be used to refer to any copy

of an everyday tool (e.g. woodworking adzes, in Sillitoe 1998: 116 Fig. 8.1, 117 Pl. 8.1), of any weapon or movable ritual object not used on a daily basis (e.g. war shields, in Sillitoe 1980; anthropomorphic statuettes, in Mazel et al. 2006), or of any personal ornament (e.g. shell beads, in Stiner et al. 2013), manufactured by humans from natural raw materials and suitable for using (everyday tools, weapons) or manipulating (movable ritual objects) by hand, or being worn (personal ornaments). On the other hand, the terminology used by archaeologists for ancient artefacts and that used by anthropologists for aboriginal ones is the same, for instance 'reproduction' and 'replica' in Graburn (1999).

In archaeology, the meaning of the concept 'prehistoric technology' is plain. Conversely, although in the anthropological literature 'aboriginal technology' is widely employed (e.g. Balée 2000; Cane 1992; Guindon 2015; Hammett 1992; Moodie et al. 1992), the use of this concept in this work requires clarification. Here, 'aboriginal technology' refers to artefacts made of natural raw materials – either mineral (chert, obsidian, iron meteorites, native copper, etc.) or biological (wood, bone, antler, shell, etc.) – resulting from an operational sequence of manufacture carried out by peoples practising, at least until the end of the 19th century, a subsistence economy based on hunting, gathering, fishing, and/or some forms of basic agriculture (e.g. horticulture) and pastoralism (e.g. transhumance). Examples are Arctic peoples like the Inuit ('Eskimo'), Nenets ('Samoyeds') and Sami ('Lapps'), Amazonian ethnic groups like the Yanomami, Tucano and Xingu, the Canoe Indians of Tierra del Fuego, the Pygmies of Central Africa, the San ('Bushmen') of Southern Africa, New Guinea natives like the Asmat, Dani and Abelam, and the Australian Aborigines (for an overview of the latest traditional peoples, see Bosch-Gimpera 1928; Evans-Pritchard 1973; Weyer 1959).

The terminology presented here for experimental artefacts is based on alpha-taxonomy and the *chaîne opératoire*. In this terminology, alpha-taxonomy uses three stages of the operational scheme of the *chaîne opératoire* as couplets: (1) the raw material used, (2) the method employed for shaping a given object, and (3) its resulting final shape. Furthermore, the type and arrangement of the couplets follow the hypothesis contrast step of the scientific method (observation, hypothesis, hypothesis contrast, and thesis). In scientific articles, this step is displayed in the 'Materials and methods' and 'Results' sections, in a sequential way. The constructed single-access key is dichotomous, and has a genetic basis, from the genuine object (i.e. 'the original') to the derived ones. As a standard term to denote any object derived from an original one, the noun 'copy' (from Latin *copia*, abundance) is used in this work in the sense of opposite to the original, as previously employed by Bruner (1994). That is to say, 'copy' is equated to 'non-original'. Moreover, from the conservation point of view, the artefacts used in experimentation must not be the original pieces. Consequently, any 'experimental artefact' should be a 'non-original artefact' and, hence, a 'copy'. This does not imply the opposite (i.e. that any 'non-original artefact' should be an 'experimental artefact'), because copies are also made for educational and commercial purposes.

Table 1 displays the concluded dichotomous key, which leads to the terminology and is arranged in a user-friendly form. The procedure applied to develop this terminology for experimental artefacts is explained in Appendix A, whereas the (dictionary-style, intensional) definitions of the terms for non-original objects are provided in Appendix B. Lastly, three case studies to show how this schema can be applied are presented in Appendix C.

A registry code for experimental artefacts in research on prehistoric and aboriginal technology

The procedure applied to develop the terminology for experimental artefacts has also been used for building a registry code suitable for labelling them. The information provided by the tree diagram shown in Figure A1 (Appendix A) is capable of being accommodated in any alphanumerical arrangement of objects in the form of a three-digit code. The code will be either *l.l.*1 or *l.l.*0+, where *l* is the lead value for the two first couplets (i.e. 1, 0+, or 0−); if desired, a C can be added before the digits to denote that the object is a copy. Thus, for example, the code of an exact copy of a war shield manufactured with the same technique and tool type would be C:1.1.1 and terminologically equivalent to a 'duplicate', a resin cast of a stone tool would be C:0−.0−.1 and terminologically corresponding to a 'replica', and an exact copy of a bone dagger manufactured with electric tools would be C:1.0−.1 and terminologically equivalent to an 'imitation'.

Discussion

Each experimental artefact's term was not arbitrarily chosen, but rather it was selected according to the etymology that, in relation to the original object, best reflects the raw material, the method of production, and the resulting shape of the copy. Epistemologically, these terms can be considered descriptive ideational units (O'Brien and Lyman 2002, and references therein) or Dunnell's (1971: 45–46, 200) *significata*. On the other hand, it must

be noted that, because not all copy types are as commonly used, not all terms will be applied to the same extent. For example, provided that the repetitions are less common than their opposites (the replicas), it is foreseeable that the use of the term repetition would be less widespread than that of replica. This does not exclude the fact that reducing all the possible terms for non-original objects to a sole one would be inappropriate.

Although the three couplets used in the constructed dichotomous and polytomous keys are considered sufficient to characterise an experimental object, it is always possible to add more couplets depending on the user's needs. For instance, an object's colour(s) or the geographic source of its raw material. In this sense, there is no difficulty in adding more terms from a key containing such extra couplets by assigning more ranking labels. For example, 'level 1' for same colour and raw material source (*l.l*.0+.1.1 if in code), 'level 2' for same colour and different raw material source (*l.l*.0+.1.0+/− if in code), 'level 3' for different colour and same raw material source (*l.l*.0+.0+/−.1 if in code), and 'level 4' for different colour and raw material source (*l.l*.0+.0+/−.0+/− if in code).

The results of this work cannot be viewed as an attempt of classification, but instead as a terminological (and labelling) proposal. Conceptually, because the dichotomous key has dimensions (raw material, method of production, resulting shape) and character states for each dimension − each of which can be combined with any other state −, it resembles Dunnell's (1971: 73, 200) 'paradigmatic classification'. However, following his own cautionary arguments, it should in fact rather be considered a non-classificatory arrangement of the type 'identification device' (Dunnell 1971: 102−106).

A different case from the considered here is that of aim-oriented standards for educational and 'experiential' (*sensu* Reynolds 1999) non-original human creations, for

instance the typology for ancient costumes described by Demant (2009). In such standardisation, three levels of complexity were considered:

- ‘C-standard’ was intended for dressing schoolchildren with some ancient costumes. C-standard garments are made of both factory and hand-woven fabric manufactured either by machine or by hand.
- ‘B-standard’ was intended for living (pre-)history theme parks and less accurate museum displays. The elaboration of B-standard garments is based more on archaeological knowledge of the typologies of the time period under consideration than on an original archaeological item. B-standard garments are made of hand-woven fabric and are manufactured less accurately than A-standard garments.
- ‘A-standard’ was intended for research in experimental archaeology and highly accurate museum displays. A-standard garments are elaborated after the original archaeological ones. They are made of hand-woven fabric and are manufactured with the highest degree of accuracy.

Although the scope of C-standard is clearly delimited, the limits between B- and A-standards are unclear because they are based on continuous attributes rather than on discrete ones. Moreover, the terms ‘reconstruction’, ‘replica’ and ‘copy’ are used without having been previously delimited. As a result, the typology and terminology used in this standardisation are not useful for our purposes.

Logically enough, the proposed terminology does not aim to solve all the problems that might exist when research on prehistoric and aboriginal technology use experimental artefacts. However, it represents a more accurate procedure in scientific communication than that which has been made available so far, since this terminology facilitates the description of each type of non-original object via a sole and non-recurring word. It is

appropriate, however, to stress that the terminology presented here is designed for those objects with a fixed final shape and, consequently, objects that do not follow this requirement are beyond its scope. Thus, plastic technologies (e.g. textiles or clay) should be treated separately when they refer to non-fixed forms. However, if they represent fixed forms (e.g. finished costumes or pottery), then they may be treated together with other hard forms.

It is worth emphasizing here that the present paper does not deal with the stylistic analysis of original artefacts nor with the complex cultural/sociological considerations about them. It simply seeks to standardise (via set theory, taxonomy, and etymology) a usable terminology for experimental prehistoric and aboriginal technology, whose present lack of a fixed set of terms is resulting in subjective and potentially confusing meanings.

Finally, it should be pointed out that the terminology presented here does not take into consideration the underlying ethical concerns that copies can entail. Noticeably, from the point of view of research (results dissemination), education (museum exhibition), and commerce (antiquities market), any non-original object is capable of being labelled a ‘forgery’ or ‘fake’ when it is or was involved in some level of intentional fraud (e.g. Alder et al. 2011; Crăciun 2012; Karlgård and Ball 2011; Kersel and Luke 2004; Paulin 2010; Praisler et al. 2013; Shiner 1994; Whittaker and Stafford 1999). By the same token, it is also worth pointing out that this terminology does not profess to place value on some copy types over others, because that would depend on the intended use of the non-original object, rather than on its global accuracy. In other words, the value of the similarities and differences between a copy and an original object vary in significance according to the aims of each concrete experiment.

Concluding remarks

In scientific information, and, by extension, in any field of knowledge, the use of a standard terminology is essential in order to avoid misinterpretations. In research on prehistoric and aboriginal technology, the terminology of non-original objects has not yet been standardised. In this paper, a standard terminology and, additionally, a prospective registry code for experimental artefacts have been presented.

Although the lexicon presented here does not intend to solve all of the problems related to experimental artefacts in research on prehistoric and aboriginal technology, it represents a user-friendly approach to experimental realities, by establishing a shared language – which, to date, has still not been implemented – for experimental items.

While this terminology and code system are primarily addressed to prehistoric and aboriginal technologists concerned with experimental work, they are equally relevant to museum curators, and can also be of value to individuals involved in many other human endeavours, from the contemporary-art trade to the mechanics industry.

Appendices

Appendix A. Procedure applied to develop the terminology for experimental artefacts

All the possible arrangements of the end-points of three 2-*l* couplets in binary code are shown in Table A1. For our purposes here, A is the couplet ‘raw material’, B is ‘method of production’, and C is ‘resulting shape’. The two contrasting leads are ‘same as the

original object' (1) and 'different from the original object' (0). As a binary code system, this table can also be regarded as an information system in which '1' equals to 'presence' and '0' equals to 'absence'. Provided that the number of leads per couplet is constant, the number of possible arrangements is the number of leads raised to the power of the number of couplets, i.e. l^c. Because the number of possible arrangements in a dichotomous key is 2^n (here, n = number of couplets), and in our case $n = 3$, we have $2^3 = 8$ possible copy's terms. From the mathematical 'set theory' point of view, the whole of the eight identification end-points (copy's terms) can be regarded as the product set A·B·C of the three sets A = {p, q}, B = {r, s}, and C = {t, u}, where p, r, and t are the conceptual elements 'same as the original', and q, s, and u are those of 'different from the original'. Geometrically, this dichotomous key is a three-dimensional construct or, in abstract expression, an n-dimensional space (here, n = number of dimensions) in which $n = 3$. Its axes have a discrete, non-continuous value of '0' or '1', and the object's terms will match with the eight vertex of the imaginary cube formed by such three-dimensional construct. Although our key is geometrically three-dimensional, we can add as many contrasting characters as advisable and to build any n-dimensional space in which $n > 3$. In all cases, each object's term will be defined by a sole point in space, which will match with one of the cube vertex.

The expression 'different from the original object', corresponding to a 0 in Table A1, can denote something that is either slightly different (e.g. Moso bamboo instead of Tonkin bamboo as raw material, quartzite hammer instead of quartz hammer as shaping method, incised instead of carved as finished surface) or considerably different (e.g. polyurethane resin instead of Tonkin bamboo as raw material, electric tool instead of quartz hammer as shaping method, plain instead of carved as finished surface). If we take into account these two possible meanings of the word 'different', we have three possible leads: '1' for 'same

as the original object', '0+' for 'slightly different from the original object', and '0−' for 'considerably different from the original object'. The mathematical symbols + and − designate here little or much difference, respectively. As a result, we obtain a multifurcating key of three 3-*l* couplets, which can be represented by the tree diagram displayed in Figure A1. This diagram renders 3·3·3 = 27 possible combinations of non-original objects. For our purposes, all the outcomes whose last couplet ('resulting shape') results in the lead '0−' represent non-sense derived objects, so these must be avoided. Even when they are avoided, we still have 18 different types of copies, an amount that is only feasible if they are not textually termed but referred to as a numeric code.

Appendix B. Definitions of the terms for non-original objects

Duplicate. From Latin *duplic*-, twofold, and *plicare*, to fold. *noun* Non-original object made of the same raw material as the original, produced employing the same method as for the original, and that displays the same shape as the original.

Idealisation. From Latin *idealis*, existing in idea only. *noun* Non-original object made of a raw material different from the original, produced employing a method different from that for the original, and that displays a shape slightly different from the original.

Imitation. From Latin *imago*, image. *noun* Non-original object made of the same raw material as the original, produced employing a method different from that for the original, and that displays the same shape as the original.

Recreation. From Latin *re-*, back or again, and *creare*, to create. *noun* Non-original object made of a raw material different from the original, produced employing the same method as for the original, and that displays the same shape as the original.

Repetition. From Latin *re-*, back or again, and *petere*, to seek. *noun* Non-original object made of the same raw material as the original, produced employing the same method as for the original, and that displays a shape slightly different from the original.

Replica. From Latin *re-*, back or again, and *plicare*, to fold. *noun* Non-original object made of a raw material different from the original, produced employing a method different from that for the original, and that displays the same shape as the original.

Reproduction. From Latin *re-*, back or again, and *producere*, to produce. *noun* Non-original object made of a raw material different from the original, produced employing the same method as for the original, and that displays a shape slightly different from the original.

Simile. From Latin *similis*, similar to. *noun* Non-original object made of the same raw material as the original, produced employing a method different from that for the original, and that displays a shape slightly different from the original.

Appendix C. Case studies

Case study 1. In a study dealing with erythrocyte morphology in bloodstains on stone tools, I carried out a simulation of a prehistoric predation human *chaîne opératoire*, from stone knapping to using the manufactured tools on game mammals (Hortolà 2001). In the corresponding paper, I used the term ’replica‘ to refer to what, according to the standardisation presented here, should be named differently. I described my actualistic

implements as “palaeolithic-like white chert tools”. Although the raw material (chert) was widely used for making Palaeolithic tools, its source was not verified archaeologically. The method of production (direct hard hammer percussion) was the same knapping technique long assumed to be used in the manufacture of many original lithic tools. The resulting shape (knife, projectile point) differed slightly from the original object in the sense that it was not shaped using, as a model, a specific tool found at a concrete Palaeolithic site but rather following an established broad, generic design. In other words, I used actualistic knapped pieces that typologically resembled Palaeolithic tools. Therefore, following the standardisation presented here, rather than replicas they should be in fact regarded as ‘reproductions’.

Case study 2. As a part of a research examining the use of obsidian tools from a Neolithic site and a Bronze Age site located in Sardinia (Italy), a set of experimental tools comparable to the artefacts found at those sites were produced (Setzer and Tykot 2010). Beyond the generalist expression ‘experimental tools’, no concrete term was used in the corresponding paper. The raw material (two types of obsidian from the Monte Arci region in Sardinia) was the same as that of the original objects. The method of production (direct hard hammer percussion) was also the same as that long assumed for many original lithic tools. The resulting shape (flake, flake shatter, non-flake debitage, and blade) was slightly different from the original objects. Therefore, following the standardisation presented here, they should be regarded as ‘repetitions’.

Case study 3. In an experiment on projectile impact fractures and launching mechanisms (Iovita et al. 2014), two kinds of non-original objects were manufactured. According to the

title of the corresponding paper, both kinds of objects were considered as ‘replicas’. On the one hand, a copy of a Palaeolithic projectile point was produced in a museum restoration laboratory. The raw material (plastic) was different from the original object. The method of production (modern techniques) was also different from the original object. The resulting shape (a Levallois point from the Middle Palaeolithic site of Jabrud, Syria) was the same as the original object. Therefore, following the standardisation presented here, it can be regarded as a ’replica‘, as was effectively termed by the authors. On the other hand, copies were made from the plastic object in the same laboratory. The raw material (glass) was different from the original object. The method of production (modern techniques) was different from the original object. The resulting shape was slightly different from the original object. Therefore, following the standardisation presented here, rather than replicas they should be in fact regarded as ‘idealisations’.

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Captions for Figures

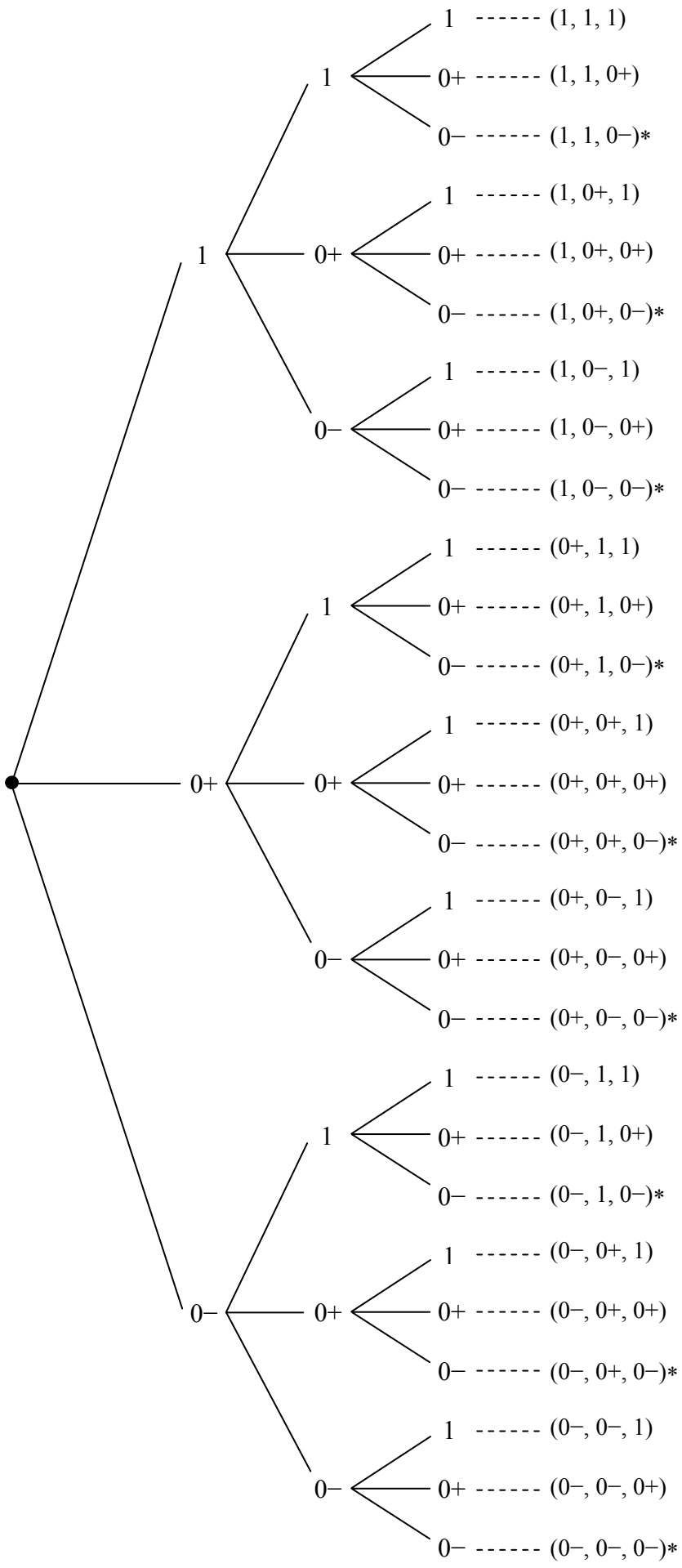
Fig. 1. Dichotomous key for the terminology of non-original objects. The arrow indicates the identification direction, from the pathway-key entry point at left to the identification end-point at right.

Fig. 2. Possible arrangements of the end-points of three 2-*l* couplets in binary code for non-original objects. *Legend:* 0 = ‘different from the original object’, 1 = ‘same as the original object’, A = ‘raw material’, B = ‘method of production’, C = ‘resulting shape’.

Fig. 3. Tree diagram for non-original objects representing a multifurcating key of three 3-*l* couplets, with its 27 outcomes. *Legend:* 0− = ‘considerably different from the original object’, 0+ = ‘slightly different from the original object’, 1 = ‘same as the original object’, ∗ = non-sense derived object.

→	*Chaîne opératoire*			**Non-original object's term**
	Raw material	**Method of production**	**Resulting shape**	
Alpha-taxonomy	Same as the original object	Same as the original object	Same as the original object	Duplicate
			Slightly different from the original object	Repetition
		Different from the original object	Same as the original object	Imitation
			Slightly different from the original object	Simile
	Different from the original object	Same as the original object	Same as the original object	Recreation
			Slightly different from the original object	Reproduction
		Different from the original object	Same as the original object	Replica
			Slightly different from the original object	Idealisation

A	B	C	ABC
1	1	1	1, 1, 1
		0	1, 1, 0
	0	1	1, 0, 1
		0	1, 0, 0
0	1	1	0, 1, 1
		0	0, 1, 0
	0	1	0, 0, 1
		0	0, 0, 0


1
0+
0−
1
0+
0−
1
0+
0−
1 ------ (1, 1, 1)
0+ ------ (1, 1, 0+)
0− ------ (1, 1, 0−)*
1 ------ (1, 0+, 1)
0+ ------ (1, 0+, 0+)
0− ------ (1, 0+, 0−)*
1 ------ (1, 0−, 1)
0+ ------ (1, 0−, 0+)
0− ------ (1, 0−, 0−)*
1 ------ (0+, 1, 1)
0+ ------ (0+, 1, 0+)
0− ------ (0+, 1, 0−)*
1 ------ (0+, 0+, 1)
0+ ------ (0+, 0+, 0+)
0− ------ (0+, 0+, 0−)*
1 ------ (0+, 0−, 1)
0+ ------ (0+, 0−, 0+)
0− ------ (0+, 0−, 0−)*
1 ------ (0−, 1, 1)
0+ ------ (0−, 1, 0+)
0− ------ (0−, 1, 0−)*
1 ------ (0−, 0+, 1)
0+ ------ (0−, 0+, 0+)
0− ------ (0−, 0+, 0−)*
1 ------ (0−, 0−, 1)
0+ ------ (0−, 0−, 0+)
0− ------ (0−, 0−, 0−)*