

A new look at microburin technology: some implications from experimental procedures

Riccardo MIOLO & Marco PERESANI*

Università di Ferrara, Dipartimento delle Risorse Naturali e Culturali, Corso Ercole I d'Este 32, I-44100 Ferrara

*Corresponding author e-mail: marco.peresani@unife.it

SUMMARY - *A new look at microburin technology: some implications from experimental procedures* - This paper takes into consideration various experimental aspects of microburin technology within the framework of the Mesolithic Sauveterrian assemblages of northern Italy. These are: blank selection criteria, technique variability, the correct utilisation of technical parameters, accidental fracture development and the origin of some artefacts. Other factors, such as correct manipulation and individual learning, have not been taken into consideration. The analysis has been integrated with the experimental manufacture of triangular armatures, leading to the identification of variability in the number, dimension and role of the involved microburins. These elements would suggest that a certain care must be taken in evaluating armature production indexes. Furthermore, they would lead to a re-evaluation of excavation collection techniques. Apart from complementing the analysis of archaeological assemblages, the experiments represent a starting point for cultural parallels in a diachronic perspective.

RIASSUNTO - *Osservazioni sperimentali sulla tecnologia del microbulino e loro implicazioni* - Inserito in una ricerca più ampia attualmente in corso sulle industrie mesolitiche Sauveterriane dell'Italia settentrionale, il presente lavoro esamina, per via sperimentale, vari aspetti della tecnica del microbulino. In particolare analizza i criteri di selezione del supporto, la variabilità delle diverse tecniche, la corretta gestione dei parametri tecnici, lo sviluppo accidentale delle fratture e di alcuni manufatti. Lo studio è accompagnato da un approfondimento sulle armature triangolari, grazie al quale è stata riconosciuta una variabilità nel numero, nelle dimensioni e nel ruolo dei microbulini coinvolti: questi elementi suggeriscono una certa prudenza nella valutazione degli indici di confezione delle armature e invitano a una rivalutazione delle metodologie di raccolta in corso di scavo. Oltre che a supportare l'analisi delle collezioni archeologiche, l'esperimento può costituire un punto di partenza per comparazioni culturali in una prospettiva diacronica.

Key words: microburin technology, experimentation, Mesolithic

Parole chiave: tecnica del microbulino, sperimentazione, Mesolitico

1. PREFACE

Techniques of deliberate fracture for obtaining geometric microliths from blanks began to be employed around the end of the Late Palaeolithic. They reached their maximum diffusion during the Mesolithic and Early Neolithic periods. Even though this subject has been widely treated in the international literature, it is still a theoretical reference to Italian scholars, whose interest in the subject has drastically decreased during the long period between G. Chierici (1875) and others, and the last quarter of the nineteenth century.

If we refer to the Sauveterrian technocomplex, the situation is even more dramatic. In effect, the Italian

Oriental Alps represent one of the most interesting archaeological landscapes of the European highland zone (Tillet 2001; Philibert 2002). The way the last hunter-foragers settled and exploited this territory constitutes a research project that has been under way for many years now (Broglia & Lanzinger 1996; Clark 2000; Dalmeri *et al.* 2001).

Apart from the distribution pattern of archaeological sites, some of these models are confirmed by the typological and litho-technological analysis of the chipped stone assemblages. They would suggest a functional differentiation of temporary camps on the basis of their structure indexes (e.g. ordinary tools/armatures). A few indexes (armatures/ordinary microburins) are of fundamental importance for the

definition of hunting camps (armature export/import: Lanzinger 1985) on the basis of the standardised technology fully described in the available handbooks.

This paper analyses the microburin technique and its variability, which is known as “coup de microburin” (Tixier *et al.* 1980) or “microburin blow” (Crabtree 1982), in order to verify some theoretical approaches and achieve a better knowledge of the Mesolithic Sauveterrian assemblages.

Shape and technological characteristics of the blank, percussion or pressure fracture technique, accidents and working imperfections, possible number and role (removal, ablation and retouch) of the microburins derived from the manufacture of each single microlith are taken into consideration. Thanks to a detailed analysis of the correct manipulation and learning, the results so far obtained represent one of the analytical fundamentals of a research project currently under way on settlement patterns and dynamics in the Central-Eastern Alpine region.

2. MICROBURIN TECHNOLOGY: AN HISTORICAL RETROSPECTIVE

Looking at the literature on the microburin and its related techniques, we have to point out the importance of analyses made by a few nineteenth century forerunners.

The first scholar who observed, described and interpreted microburins was G. Chierici in 1875. This author was able to understand their production technology, which he interpreted to be characteristic of a well-defined cultural aspect. Furthermore, he stimulated the scientific international community with new discoveries and an intensive debate (Nicolucci 1875; Angelucci 1876; Chierici 1876; De Mortillet 1876), which nevertheless decreased in the following years.

It was L. Siret (1893: 78) who renewed the studies on these artefacts, although the following years did not lead to any further methodological improvement. In 1921, H. Breuil introduced the term “microburin”, on the basis of an erroneous interpretation, according to which it was supposed to be a variety of angle burins with a concave retouch, identical to that of plane burins, most probably because this author had been influenced by their similarity with the Sahara quartzite types (Blanc 1938-39). It was only in 1947 that the author accepted the current opinion that the microburin is a production discard of microlithic tools (Breuil & Zbyszewsky 1947; Brézillon 1968). Nevertheless the equivocalness of this term did not interrupt its (sometimes criticised) utilisation by

archaeologists. During those years, S. Krukowski (1914) pointed out that microburins were residuals of triangular microlith production.

Around the end of the First World War, the French researchers were the only ones responsible for methodological studies concerning this specific technology. The paper written by commander E. Octobon (1923) describes “des outils specials” discovered during the excavations carried out in Aisne, which were interpreted as small burins or perforators. It was followed by the important contributions by E. Vignard (1923) on the “coup de trapèze” technique. These papers were followed by a strong debate on the origin and production technique of microburins and microlithic armatures (De Saint Périer 1922; Siret 1928; Octobon 1926; 1930; Vignard 1934; 1935). They reconfirmed the exclusive (and consequently diagnostic) attribution of these artefacts to well-defined cultural horizons, as already supposed by G. Chierici.

3. TECHNOLOGICAL PROCEDURES

Viewed as a logical consequence of the tendency that emerged with abrupt retouch (Camps 1979), which exemplified the detachment of blades and bladelets, the procedures that regulate intentional blank fracture – the obtainment of the *piquant-trièdre* and the consequent origin of the microburin – are also considered as a further development of the retouch technique on anvil.

The above-mentioned conceptual and technological criteria were mainly analysed by the French archaeologists, who made the first experimental tests during the first half of the nineteenth century. L. Siret (1928), who introduced the term “coup de trapèze”, pointed out its employment for the production of all armatures with an oblique point similar to the transverse side of the trapezès, while E. Vignard (1923) described this technique according to the same terminology adopted by the preceding author. Commander E. Octobon (1936) was the first to display experimental results, which had been conducted in order to understand the variables employed in the manufacture of the microliths with the *coup de microburin*.

Nevertheless, it was mainly J. Tixier who diffused the technological knowledge of this method within the scientific community (Tixier 1976; Tixier *et al.* 1980; Inizan *et al.* 1995). According to this author, the procedure implies the use of a blank (flake, blade or bladelet), its positioning at the edge of a quern (stone, wood, flint core, ridge of a thick blade) with

its ventral face upside-down and its axis inclined. The blank is later worked by frequent and perpendicular percussion or pressure¹ strokes, in order to obtain a progressively deep notch leading to the fracture of the blank at the contact point with the quern edge. The break, oblique to the blank axis, follows the anvil ridge position.

This method leads to the production of two distinct pieces: 1) the first, with part of the notch and the *piquant-trièdre*, is of fundamental importance for the shaping of the microlithic armature; another *piquant-trièdre*, opposed to the first, might occur in case the side of the blank is not sufficiently thin; 2) the microburin, which is characterised by part of the notch and the surface of its oblique, adjacent fracture that coincides with the imprint of the *piquant-trièdre*.

This method, which is apparently simple and codified, contrasts with the detailed descriptions of the technical variables verified by other authors (Octobon, Vignard, Rozoy, etc.), but that has not been taken into account in the archaeological record.

From a diachronic point of view, the main interest regards conceptual, more than technological, evolution procedures. For instance, in the case of Final Palaeolithic and Late Mesolithic techno-complexes, the blank (first or second choice bladelet) implies more constraints than for the greater variability in the Early Mesolithic. In the first cases, the intentional fracture is aimed at the discard of unsuitable parts and the elimination of unuseable portions in order to obtain more or less standardised microlithic tools; in the second, some microburins might be interpreted as simple by-products due to retouch procedures. As suggested by Rozoy (1968), the manufacture of a geometric microlith would imply the detachment of one or two microburins. For instance, the two *piquant-trièdres*, necessary for the shaping of the sides of a triangle, undoubtedly derive from the controlled breakage of two distinct points on the blank. In contrast, it is demonstrated that the second microburin is useless, if the natural, morphological characteristics of the blank favour shaping of the armature by ordinary retouch. Other evidence shows that the notch is (rarely) useless, the fractured *piquant-trièdre* reflection frequent, as well as are the notch deepening stages, and that there are various accidental fractures caused by an improper manufacturing technique.

4. MORPHOLOGY, DIAGNOSTIC FEATURES AND VARIABILITY

The morpho-technical characteristics of a microburin are easy to recognise and are diagnostic: the unfailing notch intensively retouched or not on the dorsal face; the *piquant-trièdre* imprinted on the opposite side; the slightly asymmetric angle at the convergence of these two forms. The twisted fracture displays typical conchoidal marks (bulb mark, waves, *lancettes*), whereas its uppermost, central zone has light smoothing. These features are easily observable at low magnifications and visible on the *piquant-trièdre* as a small edge dividing the fracture from the dorsal face of the flake. It has been thought (Tixier *et al.* 1980) that marginal, incidental pseudo-retouches on the dorsal originate from rotational dynamics occurring during the flaking process.

In addition to the consueted proximal, distal and double microburins, other pieces are considered as incidental. Nevertheless, they record distinct steps in the procedure and can be computed within the whole technological assemblage. The hinged microburin described by J. Tixier (1963) and termed *écaille de microburin* (Rozoy 1978) bears a facet different from those described above in ordinary microburins, in that it forms an arch which very prominently folds up on itself until it intercepts the same side on which the notch opens (Tixier 1963; Rozoy 1978). Its origin is attributable to inadequate pressure or to an unexpected fragmentation of the blank in consequence of inadequate morpho-technical parameters. On the contrary, the same pieces might be interpreted as uncalibrated products originating from knocking down the edge when the notch progressively invades the flake/blade. In this case the deliberate fragmentation may proceed.

Another imperfect microburin has been pointed out by F. Bordes (1957) when he described the so-called *pseudo micro-burin*, an artefact not considered to be a proper microburin because it is not contextualized in the corresponding technological assemblages. This artefact associates a notch with an untwisted, almost vertical fracture and a back on the same edge from which the fracture originated during the ordinary flaking (*Ibid.*: tav. 1, n° 10).

5. THE EXPERIMENT: PROCEDURES, RESULTS, IMPLICATIONS

Among the archaeologists that performed deliberate bladelet breaking, we should like to mention E. Octobon and B. Barnes (Octobon 1936) for the detail-

¹ As reported in a revised edition of the handbook (Inizan *et al.* 1995: fig. 33).

led descriptions they made on these procedures. They employed distinct techniques ranging from simple torsion to notched bladelets divided using a deer antler punch and a core-ridge like anvil. From different positions (dorsal or ventral face), inclinations (horizontal, vertical, tilted on the anvil) and impact point targets (at about two third from the notch, in the notch, on the opposite side), experimenters revealed that 40° is the most efficient inclination to obtain an oblique fracture. In contrast, a flat position leads the fracture to be straight and perpendicular to the principal blank axis.

5.1. Our experiment

To explore the microburin technique we used flint bladelets, micro-bladelets, flakes and other types (chips, different fragments, etc.) to be positioned on the anvil on the ground, and divided using the deer antler punch and the pressure technique. Its dorsal side upon the anvil ridge, the piece was gradually shaped towards the central arris and then balanced towards the opposite side in order to achieve the *piquant-trièdre*. The latter more or less follows the bladelet-ridge contact. The notch progressively invades the blank, becomes thin and asymmetric and once it joins the arris or the maximal thickness, the support breaks when its highest resistance threshold is reached. The microburin originates in the portion away from the anvil, whereas the *piquant-trièdre* rests on the part held in the hand. To obtain the best *piquant-trièdre* profile and inclination requires maintaining the blank's orientation (20°-45° inclination, 45° direction) with respect to the anvil ridge.

The notch falls somewhere on the blank depending on shape, thickness and irregularities (hinged or plunged parts, divergent, bent, breached, etc.). Inadequate choices lead the knapper to stop the procedure and open one further notch at a more suitable point, leaving the incomplete manufacture somewhere on the edge (Fig. 2, n. 1). Furthermore, it has been noted that the thickness or the dorsal arris pattern, such as on bladelets with cortical back, may enable one to obtain the *piquant-trièdre* by one single detachment or after brief retouching.

Our experimentation also included the percussion technique. According to E. Octobon and B. Barnes (1936) and more recently N. Finlay (2000), this technique has turned out less precise and less effective especially for very thin bladelets, which irregularly fractured after test. This technique is revealed from semicircular notches larger than usual.

Regarding thickness, it has been verified that the

notch is more easily and effectively produced at ≤ 2 mm. Highest values enhance the technique, and disturbances due to excessive pressure and unexpected irregular fragmentation increase. It has been noted how this threshold indeed exists in the archaeological record² (Miolo 2002-2003).

The most suitable blanks to obtain a regularly patterned *piquant-trièdre* are bladelets and flakes with triangular transverse section; trapezoidal sections meet some constraints when the fracture intercepts the second arris and shifts its direction or turns toward the blank side in consequence of the sudden change in thickness. This shift becomes more evident the more the thickness gradient accentuates behind the arris. In other cases, the fracture hinges upwards between the two arrises, taking on an unsuitable shape for microlith production (Fig. 1, n. 2). Except in a few cases, the Sauveterrian industries in north-eastern Italy reveal that blanks with triangular transverse section were more selected than others (Miolo 2002-2003).

Experimentation also revealed that “hinged microburins” are interpretable as macro-elements coming from the notch chipping which did not affect flake integrity (Fig. 1, n. 1, 2; Fig. 2, n. 5). Deliberate fragmentation may thus be continued until the end. Because the term “hinged microburin” is inadequate to refer to well distinct artefacts which are unequivocally classifiable among microburins, we believe that the term “notch-flake” seems more adequate. Their taxonomic position is coherent in a group of notch shaping pieces and gives more reliability in *piquant-trièdre* index computation.

Experimentation has also shown how some fractures may be imperfect and their irregular outline enhances the achievement of a microlith until failing the procedure. Not surprisingly, such eventuality has minor incidence on the Sauveterrian microliths, assuming that the *piquant-trièdre* can be viewed as a short line-guide driving the retouch, whatever its regularity and degree of edge thinning. Given a certain constraint in interpreting some inappropriate *piquant-trièdre* facets for microlith production (Fig. 1, n. 1, 3, 5), we decided to limit the term “imperfect fractures” or “notch-shaping fractures” to fractures almost orthogonal to the bladelet axis.

Other fractures originating in proximity of the notch or at its extremity are markedly different from the *piquant-trièdre* (Fig. 1, n. 6; Fig. 2, n. 1-3). These

² A case of failure is reported at Colbricon 3 site on a bladelet with one lengthened and asymmetric notch stopping, correspondence to a thick point (3.3 mm).

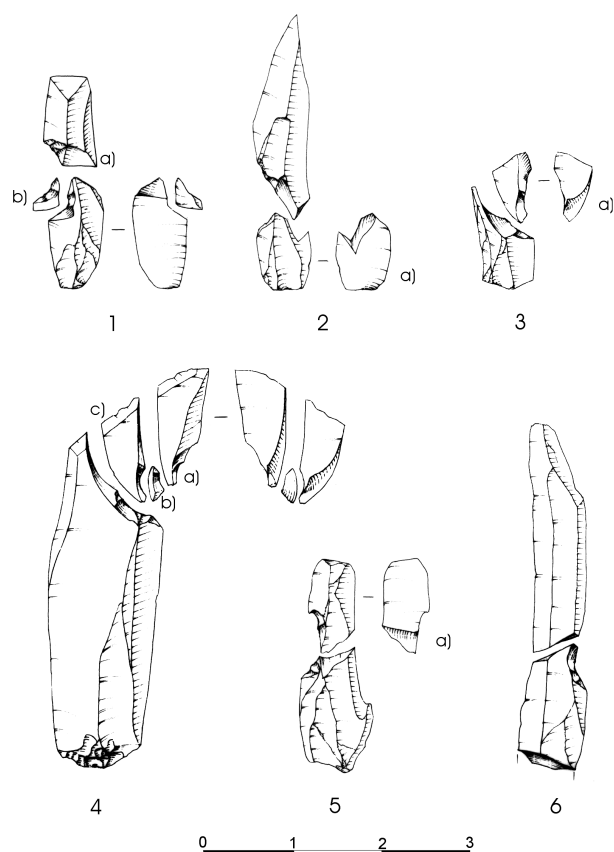


Fig. 1 - Experimental examples of imperfect *piquant-trièdres* and corresponding microburins (1-5), and of unexpected fragmentation that occurred during manufacture (6). 1 - a) distal microburin with transverse fracture, b) notch flake; 2 - a) proximal microburin with hinged fracture; 3 - flake with arched and lengthened *piquant-trièdre*, a) distal microburin with corresponding arched facet; 4 - repeated application of microburin technique, a) first distal microburin, b) notch flake, c) second distal microburin with arched facet; 5 - a) distal microburin with transverse and aberrant conchoidal fracture with defective bulb and impact point; 6 - bladelet with fracture adjacent to the notch (drawings S. Muratori).

Fig. 1 - Esempi sperimentali di *piquant-trièdres* imperfetti (1-5) e di imprevista frammentazione del supporto occorsa durante la lavorazione (6). 1 - a) microbulino distale con frattura trasversale, b) scheggia di incavo; 2 - a) microbulino prossimale con frattura riflessa; 3 - scheggia con *piquant-trièdre* arcuato e allungato, a) microbulino distale e corrispondente faccetta di frattura; 4 - applicazione ripetuta della tecnica del microbulino, a) primo microbulino distale, b) scheggia di incavo, c) secondo microbulino distale con faccetta di frattura arcuata; 5 - a) microbulino distale con frattura trasversale, bulbo non sviluppato, punto di pressione disperso; 6 - lamella con incavo adiacente a frattura (disegni S. Muratori).

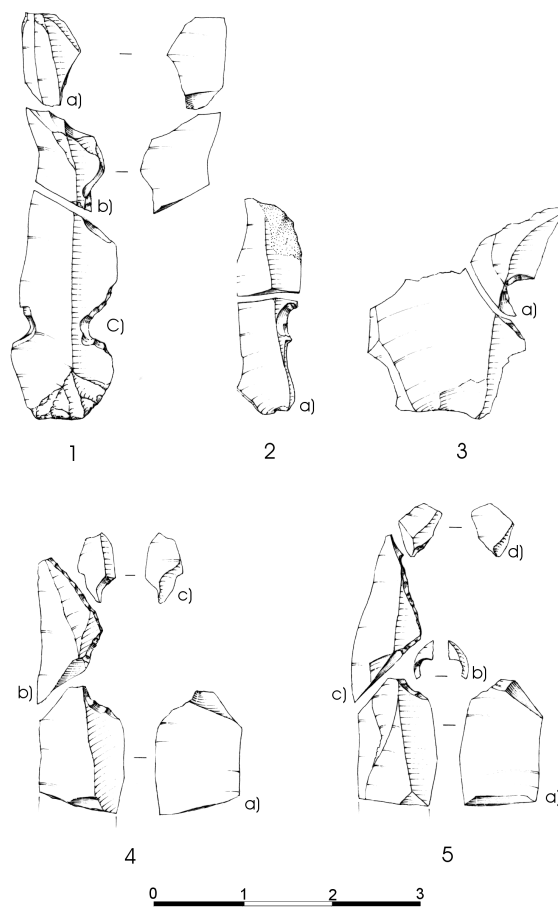


Fig. 2 - Experimental examples of unexpected fragmentation that occurred during manufacture (1-3) and of end-products of triangular microlith making (4, 5). 1 - a) distal microburin, b) fragment originating during notch manufacture, c) unfinished proximal microburin; 2 - a) piece with transverse fracture adjacent to the notch; 3 - a) piece from flake with fracture adjacent to the notch; 4 - a) proximal microburin, b) unfinished triangular microlith, c) small distal microburin originating from the retouch of the second cathetus; 5 - a) proximal microburin, b) notch flake, c) unfinished triangular microlith, d) small distal microburin originating from the retouch of the second cathetus (drawings S. Muratori).

Fig. 2 - Esempi sperimentali di imprevista frammentazione del supporto occorsa durante la lavorazione (1-3) e di scarti di confezione dei microliti triangolari (4, 5). 1 - a) microbulino distale, b) frammento originato durante la realizzazione dell'incavo, c) applicazione abortita della tecnica del microbulino; 2 - a) incavo adiacente a frattura trasversale; 3 - a) scheggia con incavo adiacente a frattura; 4 - a) microbulino prossimale, b) microlite triangolare non finito, c) piccolo microbulino distale originato durante il ritocco del secondo cateto; 5 - a) microbulino prossimale, b) scheggia di incavo, c) microlite triangolare non finito, d) piccolo microbulino distale originato durante il ritocco del secondo cateto (disegni S. Muratori).

irregularities consist in an almost transverse fracture with vertical bending produced when the blank bends or is incorrectly positioned for shaping the notch. If the bladelet rests with its weakest point on the anvil and the punch makes contact at a different point, the combined effect of these two opposing forces would fracture the piece because a contrasting action is generated at the anvil ridge and not at the punch fulcrum. Two fragments originate, sometimes, both bearing remnants of the notch, which is wider in the outermost fragment.

5.2. *Experimental production of triangular microliths*

In order to verify the incidence and the different role played by the microburin technique in microlith production, further experimental tests were carried out in producing triangles. To make this artefact may require two *piquant-trièdres* per single element. Experimentation verified that, while the first *piquant-trièdre* was quick to obtain by adequately manipulating the blank (bladelet, micro-bladelet, flake, sliver, undeterminable fragment), the second was more difficult due to the reduced size of the blank and the increased risk of unexpected fragmentation.

To avoid such risk we selected the more useful edge for shaping the second cathetus and visualized the triangular silhouette at the terminal part of the piece where it progressively thins and thus enables the retouching. Once the proximal portion was removed to eliminate the butt, the bulb or an irregular zone, the first *piquant-trièdre* was shaped. Successively, we retouched the second cathetus following the edge's natural thinning and keeping the piece always pressed against the anvil. A second microburin was therefore unrequested. During this last step it was shown that whereas an arris was intercepted, a second modest *piquant-trièdre* originates giving rise to a respective microburin very reduced in size (Fig. 2, n. 4, 5), the role of which is thus incomparable to the ordinary microburin.

High detail archaeology thus requires sieving with meshes finer than usual (2 mm light) for recovering extremely small microburins. Such evidence reveals how some pieces could be lost due to inadequate methodologies used for collecting artefacts during excavation as well as preliminary classifications (wrong recognition in the field), losing during sieving, or introduction into non-considered or non analysed granulometric fractions.

6. CONSIDERATIONS

In accordance with previous suppositions (Broglia & Kozłowski 1983; Lanzinger 1985), our experimentation has shown that microliths can be produced from a wide range of blanks like bladelets, micro-bladelets, flakes and other pieces regardless of the technological role played by each artefact in the reduction sequence. Procedures lead the knapper to select the more suitable portion on the blank and to depict the geometric outline within its contour.

Furthermore, experimental protocols carried out in this work have provided more detailed information about procedures, selection criteria (dimensional threshold) and technological variability (pressure/percussion) in order to understand the correct management of parameters, to recognize the origin of unexpected fractures and to explain the formation of some discussed elements. Furthermore, our results would serve as a starting point for studies focusing on microburin technology and its evolution from the final Epigravettian to the Early Neolithic.

Concerning triangular microliths, our experimentation confirmed that each single microlith is not associated with two microburins equivalent to one another in their technological role and size. On the contrary, it has been verified that the proximal element is usually more frequent than the distal. Save the cases in which irregular, large, troublesome or unuseable portions are eliminated, the distal microburin usually presents a smaller size and more regular shape than the proximal one. The technological and, above all, size variability encountered in distal microburins proves the existence of distinct roles played by this manufacture in eliminating portions, dividing bladelets, but also retouching edges, that give incertitude to the computation of microlith production indexes.

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