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Ten years in Rouffignac Cave: a collective report on findings from a decade of finger flutings research

Leslie Van GELDER*

Abstract

This year 2010 marks the tenth year of a directed study on Finger Flutings in Rouffignac Cave. This paper chronicles some of the key milestones and findings. Further, it looks to continued research in both Rouffignac Cave and other potential sites to refine methodologies and continue to develop answerable research questions which can be and add to a growing body of knowledge with regard to Upper Paleolithic Cave Art and the individuals who created it.

Before Rouffignac

It is impossible to discuss this research without speaking of Kevin Sharpe's 37 years commitment to the subject of the study of finger flutings. First sparked by the discovery of flutings on the back wall of Koonalda Cave in the Nullabor Region of Australia as part of the Gallus Expeditions of 1971, Sharpe was intrigued by the enigmatic nature of both finger flutings and engraved lines found within the cave. Encouraged by Harvard Professor Hallam Movius Jr. and Alexander Marshack, as well as support from a National Geographic grant, Sharpe returned to Koonalda in 1976 to continue to unravel the questions the flutings produced. Sharpe's goal was to develop a scientific method for studying flutings and engravings, regardless of the geographical location in which they were found.

Finger flutings are found in caves throughout southwestern Europe, southern Australia, and New Guinea and were presumably made over a considerable time span within the Upper Paleolithic. Well-known examples of flutings occur in European caves such as Pech-Merle, Altamira, Gargas and Cosquer, with nearly 120m^2 recorded in Pech-Merle. Plassard (1999: 62) records approximately 500m^2 in Rouffignac Cave, nearly all of which in excellent condition as they do not have calcite covering them as is the case in some other caves.

Given the substantial number of flutings, the variety of their presentation, and their excellent condition (as well as the support of the Plassard family in permitting an extended research project within the cave), Rouffignac became a valuable site for embarking on an indepth investigation into the field of finger flutings.

* Ph.D, Program Director, Richard W. Riley College of Education and Leadership, Walden University, Minneapolis, Minnesota, USA – Leslie.vangelder@waldenu.edu

The development of method for studying finger flutings

In 2000, Sharpe began researching in Rouffignac with a preliminary visit and teamed with the author of this paper in 2001 to start what would become an annual series of field work to the cave followed by laboratory experimentation to follow up on suppositions on the physical manufacture of the flutings which could then be tested against what was investigated in the field. While flutings had been described in the literature by Breuil (1915), Leroi-Gourhan (1958) and others, largely as observers (Nougier & Robert (1958), Barrière (1982), only Bednarik (1986), Lorblanchet (1992) and Marshack (1977) had begun some degree of scientific work into developing methodologies by which to study the flutings.

Sharpe's initial work (initially accompanied by Lacombe and Fawbert, and later with Van Gelder) proposed examining the method and manufacture of flutings and bracketing the question of meaning. Experimental work in the lab was conducted from 2000 to 2003. During that time a number of key conclusions were drawn regarding the manner of fabrication of finger flutings as they related to both the development of a methodology for studying flutings and the conclusions which one could draw about purpose and meaning.

Among the most important elements of method developed in this period was the application of Marshack's (1977) 'internal analysis' method which, though developed primarily to examine portable artefacts, proved equally valuable when applied to fluted lines on cave walls. Internal analysis examines the junctions, cross-sections, depth, width, and shape of lines as they intersect to determine the temporal sequencing of their manufacture, as well as the potential identity of the artist. While Marshack, d'Errico, Bednarik, Lorblanchet and others have largely used this technique for portable items to determine the use of tool and identity of individual artists, within the finger fluting context, this approach has aided in pointing the research increasingly towards the physical evidence produced by a finger or fingers. This has not only led to understanding temporal sequencing, but also has been able to increase the possibility of determining unique individuals.

Laboratory work in this period (Sharpe, Lacombe & Fawbert 2002; Sharpe & Van Gelder 2005, 2006b, 2006c) helped to yield increasingly more reliable methods for determining not only temporal sequencing of fluted lines, but also replicable evidence for determining *in situ* the use of right hand versus left hand (based on the distinctive lines a thumb makes versus the fifth finger); directionality of fluting based on buildup of material and striations within lines; further distinctions between animal made lines, stick lines, and finger fluted lines (Sharpe 2004); and the manner in which the production of certain shapes such as full circles require specific lower body movement which other fluted units do not and might offer explanations as to their prevalence or absence in cave art.

An important methodological outgrowth of the laboratory and field work of this period was the acceptance of the use of the measure of width of three fingers in a fluted unit as a means for beginning to identify and determine individuals. For one or two lines in a unit, there is ambiguity as to the fingers used and which finger's fluted width is being measured. As such, a determination to focus on three fingered widths became central to this work. Further fine tunings were made to this method in terms of developing specific places on a unit to measure, such as measuring at the place where there is the least amount of space and buildup between the fingers, and

consistently measuring at a space a few millimeters below the finger profile. (See Van Gelder 2010b for visual examples, and this CD).

Once the three fingered unit was established as the primary means for establishing unique individuals, two significant areas of deeper research developed as an outgrowth. The first was a series of studies focused on the means to determine the age of fluters and the second focusing on means by which to establish the gender of fluters.

Studies were conducted from 2002 to 2004 in cross-cultural, cross-age groups to determine if there were any significant differences in the three fingered measured width with regard to age of individuals. Results (Sharpe & Van Gelder 2006a, 2006c) showed that though there were no significant differences in measures of adults and adolescents across cultures, there was a significant difference in the measure of a child's hand as opposed to an adult's. No adult/adolescent hands were recorded at a measure of 30mm or smaller and very few were recorded below 34mm. Experiments with young children suggested that children at age 3 were able to have the motor control to do small stream flutings, however by age 5 they were capable of far more significant capacity to create and sustain the drawing of longer and more complex lines. Implications of the scientific determination of children through the examination of flutings is discussed in a further section of this paper with regard to the creation of symbolic images by children and the geographical distribution of fluted lines by particular fluters in Rouffignac.

In the finer tuning of a method to determine individuals through flutings Sharpe and Van Gelder (2009) applied Peters *et al.* (2002a, 2002b), and Manning's (1998, 2001, 2002) research in sexual dimorphism in hands and finger length to the profiles of hands found within the cave. When the fingers are designated as F2 (index), F3 (middle), F4 (fourth), the research points to findings showing that F2/F4 <1 suggests a male and F2/F4 ≥1 suggests a female. This means of discriminating sex provides, at least for the sample tested, 'a significant sex difference ($F_{1.8}$ = 14.78, p <.001, ES =.65, Power =.92)' (Peters *et al*. 2002b: 180). While this approach is not necessarily perfectly accurate in all circumstances, it offered for the first time a means for approaching the question of the determination of gender of an individual from a more scientifically derived basis.

Further work into determining more precisely the individuals within the cave has evolved throughout the decade and has moved from not only the three fingered width but to focusing on other aspects of uniqueness including: relative finger heights within the finger profile; heights and locations of flutings; depth and build-up in fluted units; propensity towards finger splay vs tight fluting; choice of location; idiosyncratic fluting shapes (Van Gelder 2010b and this CD). As technologies such as laser scanning become more readily available this capacity to collect more sensitive data will be available and should continue to aid in determining with greater accuracy the identity of individuals within the cave.

Recent research (Van Gelder 2010b and this CD) has looked to develop method for studying figurative fluted images in the hope of determining more accurately the identities of the artists and also in the hope of learning more with regard to the relationship between fluted panels and figurative images.

Further sections of this paper will discuss at greater length the implications which arise from being able to determine individuals. The following section continues the discussion of the development of method by examining the development of

consistent nomenclature which has also aided in developing a successful framework for studying flutings.

Developing nomenclature based on method

Early references to finger flutings in archaeological literature used often meaning-laden language which the researchers found impeded a clear understanding of the flutings themselves. The literature referred to them as “serpentines”; “meanders;” “macaroni”; “water signs” (Marshack 1977; Barrière 1982). One of the keys to Sharpe and Van Gelder’s research method throughout has been a desire to bracket meaning questions from the primacy of the research agenda. While many have asked the ever-present “what do they mean?” question, or have ascribed meaning based on image such as Nougier and Robert’s (1958) and Barrière’s (1982) assigning of snake and anthropomorphic interpretations, Sharpe and Van Gelder instead focus on posing answerable questions which could be derived from scientific and replicable research in the hope that comprehending manufacture might eventually lead to comprehension of some aspects of the manufacturer’s intention.

By early 2002 it was clear that while the laboratory work had yielded some answers regarding manufacture, lines would need to be studied in other ways. The appearance of flutings, especially in Rouffignac where such a tremendous diversity of flutings exist, posed the next central set of questions along the lines of “how were these created and does the manner of the creation matter in terms of purpose of the flutings?”

A working vocabulary was established and has been used consistently throughout their work in the hope that it would become the standard language for the discussion of flutings. As such, a *fluter* makes a *fluting* by sweeping his or her fingers across a soft surface; a *unit* comprises flutings drawn with one sweep of one hand or finger; the *profile* of a unit or a fluter comprises the silhouette of the finger tops left in the medium from the fluting; a *cluster* comprises an isolatable group of units that exhibit a unity, for instance because they overlay each other; and a *panel* comprises a collection of clusters that appears geographically or otherwise distant from other clusters or on a surface of reasonably uniform orientation

A nomenclature system for studying finger flutings (Sharpe & Van Gelder 2005, 2006b, 2010) was established to create a greater sense of discernment in describing different flutings. This nomenclature system was based on the manner of physical manufacture. Four forms of flutings were named, based on whether or not the fluter used one finger or multiple fingers, and whether or not the fluting was the product of lower body motion or standing still. Names which had no conventional meanings were chosen purposefully to remove the past tradition of using meaning-laden language for description.

Thus, **Kirian** lines (Fig. 1) describe lines made with a single finger and no lower body movement.

Evelynian lines (Fig. 2) describe lines made with a single finger and show lower body movement. These are very often large figurative images such as “Adam” shown here.

Rugolean lines (Fig. 3) describe lines made with multiple fingers and no lower body movement.

Mirian lines (Fig. 4) describe lines made with multiple fingers and show lower body movement.

Fig. 1. Chamber E

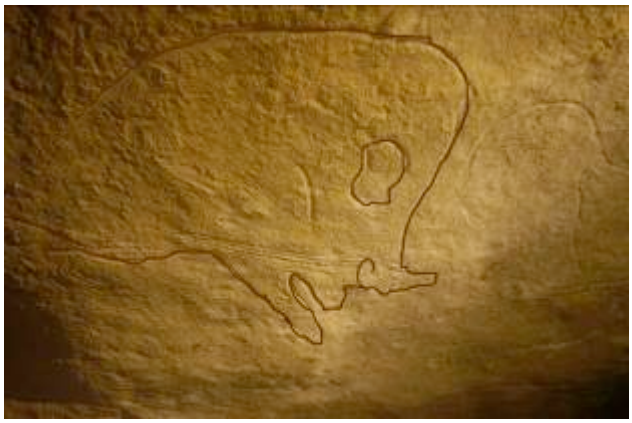

Fig. 2. Chamber H1

All four forms appear in Rouffignac Cave. Identifying the different forms in each chamber has aided in the development of interpretive frameworks. Studies of the Rugolean lines in particular have been instrumental in exploring the question of whether or not some fluted panels may represent a form of proto-writing or deliberate communication (Van Gelder 2010b and this CD; Sharpe & Van Gelder 2009).

Fig. 3. Chamber G

Fig. 4. Ceiling Chamber A1

Identification of individuals

By 2007, Sharpe and Van Gelder had been able to use the results from their forensic hand studies to begin to formally identify individuals in the cave. While this particular project is ongoing and continues to be fine tuned with regard to the application of the variables for determining individuals (see Van Gelder 2010b and

this CD), based on the current understandings and assumptions within Rouffignac, the data suggests that the cave was fluted by at least seven individuals who have been identified. Current work looks not only to identify each of the individuals but to examine the locations in which they occur in the cave, relationships among the fluters in terms of which fluters are found in close proximity to others so as to create a clearer picture of who they are in relation to each other. As challenges exist in the fine tuning of method (such as determining whether or not a person with a 36mm finger width is also the same as one with 38mm in different circumstances), the author assumes that it is likely that in coming years with better technology and technique for data collection a small number of additional individuals may be more clearly identified.

At present, the currently recognized fluters of Rouffignac (Van Gelder & Sharpe 2009) are as follows noted by three-fingered width, gender (when identified), recognized chambers fluted within the cave and a photographic example (Fig. 5-12) of her/his work. The use of the word “child” refers to an individual likely under the age of 7 based on factors discussed above.

1. (Fig. 5) 22mm child (likely younger than 4); Chamber A1

Fig. 5

2. (Fig. 6) 28mm female child; Chambers A1, A2, G, H, I, E

Fig. 6

3. (Fig. 7) 34mm female child; Chambers A1, E, G, H, I, J

Fig. 7

4. (Fig. 8) 38mm male; Chambers H, G, H1, E

Fig. 8

5. (Fig. 9) 41mm female; Chambers A1, G, J, H1, E

Fig. 9

6. (Fig. 10-11) 44mm female; Chambers G, J, (found in conjunction with the Horse, Lion, and Patriarch Panels)

Fig. 10

Fig. 11

7. (Fig. 12) 48mm female; Chambers A, G

Fig. 12

Children, Chamber A1, and evidence of symbolic behavior

Fig. 13. Chamber A1: tectiform.

As a reliable system for determining individuals was developed, questions of meaning and intention could again be brought into the fore of the research agenda. As Rouffignac shows evidence of the engagement of children in fluting most especially in Chamber A1 (Sharpe & Van Gelder 2004, 2006a, 2006c), it also helped to raise the questions of purposeful behavior by children within the cave context. In 2006, the first formal evidence of symbolic behavior by a child was recorded with the Fig. 13 tectiform which was determined as having been created by the 28mm female child. As was later noted, her fluting style in three chambers points to her creating flutings using both hands simultaneously (Chambers A1, H1, J), which implies that she as not holding any light source while fluting. She is the only individual thus far within the cave who shows this fluting style.

Research into Chamber A1's highly fluted ceiling (Sharpe & Van Gelder 2004, 2006a) indicated that children had been heavily involved in the fluting of the ceiling and walls. Current research suggests that a minimum of three children and two adult, clearly identified within the chamber, were present and that the children were likely held aloft in certain sections to flute the higher parts of the ceiling. In lower areas there is evidence of a large number of flutings created by children with finger measures of between 22mm-31mm.

Although previous researchers (Barrière 1982; Nougier & Robert 1958) suggested that the ceiling contained deliberately constructed serpent images and anthropomorphs, internal analysis has disputed this based on closer examination and construction. At present the meaning behind the Mirian style flutings of Chamber A1 remains unknown; however, research continues to determine a more accurate picture of the manner in which the flutings were created.

Questions of writing

The capacity to recognize distinct individuals, their fluting styles, patterns, and choices of location has led to questions related to purpose and meaning. Two long Rugolean panels, one located at the Mammoths of Discovery (Chamber G) and the other near the "Rhinoceros Horn Panel" (Chamber G) have both offered significant questions as to the apparent 'orderliness' of the lines and whether or not they have culturally encoded communication within their form. A key to their interpretation comes from work conducted in the field of communications theory. In 1949, George Zipf proposed a theory of communications which suggested that "a constant and inverse relationship between the order of a word in a frequency list and the frequency with which the text uses it" (Crystal 1997: 87). Zipf's Law, as it is commonly known, is used in a wide variety of contexts to determine what is recognizable communication among members of a group or species and what is "noise".

When Zipf's Law was applied to the two Rugolean panels in Rouffignac where number of fingers and incidence were the variables, the result was a -1 Zipf gradient suggesting a form of recognizable, efficient communication (Sharpe & Van Gelder 2009). While the use of this method is in its infancy, it suggests a potential avenue to fine tune in years to come wherein one might be able to ascertain with greater accuracy specificity within the variables (perhaps length of line, for instance, as many in both panels have a shorter appearance than others). This method can and will be applied in the future to the orderly panels found in Chamber E as well.

While this method and its use do not say that these panels are *writing***,** it recognizes the potential to explore complex questions about writing and meaning in the Upper Paleolithic context (Van Gelder 2010b and this CD).

Future research

The last decade has produced a wealth of information derived from the study of finger flutings which has been applicable not only to a greater understanding of the manufacture of art within Rouffignac Cave but for researchers who are working within other fluted caves. Future research in Rouffignac looks to examine the fluted figurative images in an attempt to determine the identity of the individuals who created them; a continued study mapping the locations of the unique individuals who have been identified and their movements through the cave; and a study of the fluted ceilings in Chamber A1 and G for further development of replicable method in the study of Mirian lines and the new information these chambers can yield.

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