PETROGLYPHS IN ITALIAN ALPS DATED

ROBERT G. BEDNARIK

INTRODUCTION

The term 'microerosion' refers to rock weathering processes whose effects can be seen only at the microscopic level, hence for the time spans we are concerned with in rock art dating, only comparatively erosion-resistant mineral components are of interest. This excludes especially sedimentary rocks in most cases. Microerosion analysis is not one specific method, however, but a cluster of potential methods around a basic idea, the concept that these surface changes are a measure of time. They can therefore be used to estimate the ages of certain rock surfaces. Two methods have so far been applied practically: the measurement of micro-wanes along cleavage planes of fractured crystals (Bednarik 1993), and the selective, often alveolar retreat in certain rock types of components that erode at vastly differing rates (Bednarik 1995).

The accuracy of microerosion dating is probably poor at this early stage, because it depends entirely on the number and precision of calibration points, and one has to contend with possible misalignments due to climatic or other environmental factors (for details of the method and its theory, see Bednarik 1992; for results, Bednarik 1993, 2000). The method has been used in seven 'blind tests' now, conducted in Russia, Bolivia and Portugal. In such tests the analyst presents estimates of age *before* being advised of what local archaeologists believe to be the correct age. In five cases independent archaeological predictions were met, and in a sixth its results agreed with those of other scientific methods (arrived at under 'blind test' conditions; Bednarik 1995), but significantly disagreed with archaeological beliefs. The results of the seventh blind test are reported here.

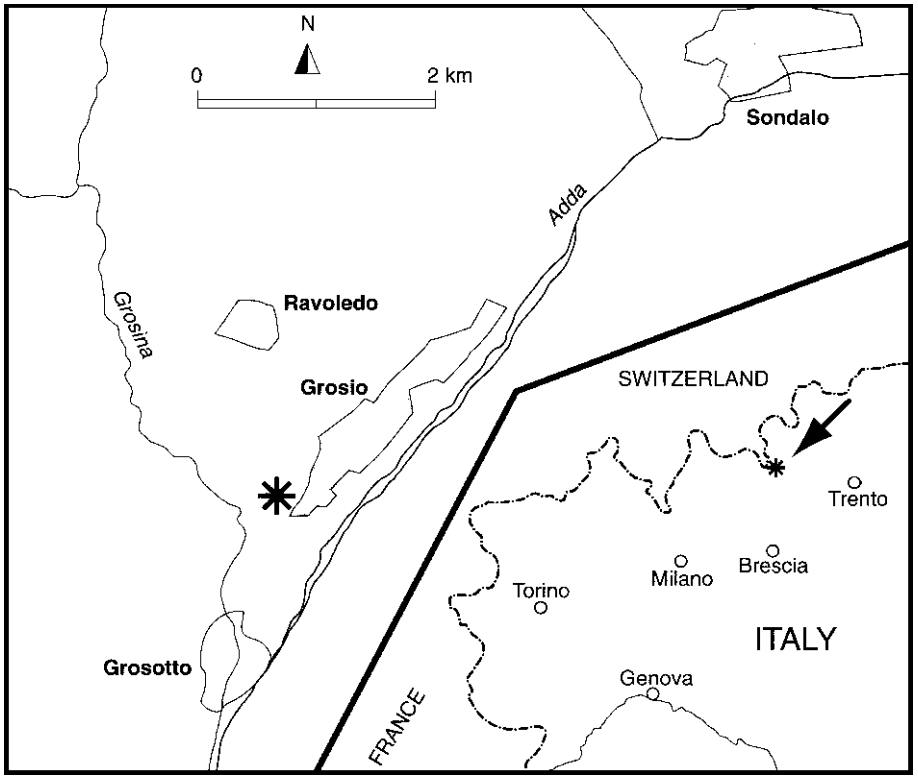

Figure 1. *The location of Rupe Magna near Grosio, Valtellina, northern Italy.*

Valtellina is an alpine valley in the far north of Italy. Among its archaeological features, the valley is noted for its several petroglyph sites, concentrations of which occur at Téglio, Tirano and Grosio (Figure 1). Morphologically, the main valley bears the hallmarks of a glacial trough. Just below Grosio, it is joined by the Grosina valley from the north, formerly a hanging valley that now ends in a narrow gorge. The spur between this gorge and the main valley is located between the towns Grosio and Grosotto. The well-preserved ruins of the Medieval Castello Vecchio di S. Faustino (10th to 11th centuries) are perched on this rock spur, Dosso dei Castelli. Excavations have revealed extensive Iron Age occupation evidence on this hill.

Adjacent to the castle's remains lies a prominent schistose 'whaleback' that is visible for a distance of several kilometres, overlooking the valley. This feature is the appropriately named Rupe Magna. The jagged spur leading up to the west of Grosio, Dosso Giroldo, features a series of rocky outcrops that resisted the former glaciers. They bear scattered petroglyph panels which are poorly preserved, apparently because of encroaching flora. Glacial striae occur well above the present valley floor, suggesting that the Pleistocene Valtellina glacier was at times a few hundred metres thick. Rupe Magna was clearly fashioned by the glacier, acting like a dam and providing an obstruction to the flow of the glacier's lithic debris out of the Grosina valley.

Forming part of a system of contact metamorphism facies, Rupe Magna is characterised by veins of quartz which range in thickness from less than a millimetre to about 40 cm. There are some 5454 petroglyph motifs present on this exposure, distributed over about 342 square metres (Arcà et al. 1995). Only twenty-three of the motifs are said to depict animals, and these have been claimed to resemble horses, goats and wild boars. There are also 871 anthropomorphs, but the numerically dominant form are the cupules, of which 1822 are present. It has been attempted to place the petroglyphs into various periods on the basis of style and superimposition, which led to the following tentative temporal designations: 83.8% are supposed to be of the Iron Age, 8% of the Bronze Age, 0.4% of the Chalcolithic (Eneolithic) period, and 0.9% are of recent age, while a cultural attribution was not considered possible for 6.8% of the motifs (Arcà et al. 1995).

Figure 2. *The anthropomorphous petroglyph at Rupe Magna that was subjected to microerosion analysis.*

METHODS

Without knowing the details of any of these archaeological findings, I examined the Rupe Magna and formed the opinion that some stylised linear anthropomorphs with raised 'arms' were among the earliest components of the site corpus, although not necessarily the oldest actually present. This was arrived at through examining superimpositions and differences in relative weathering apparent at low magnification. I

selected one of these anthropomorphous images for analysis with the specific purpose of estimating its age, intending to then compare my finding with archaeological estimates (Figure 2).

On the rock's uppermost, horizontal surface are numerous glacial striae and examples of fractures caused by the impact of glacial clast movement. On one of these scars an edge of approximately 90º with well-developed micro-wanes was selected as the calibration site. Twenty-five measurements of micro-wane widths produced a mean value of 128 microns (range 90-150 microns; see histogram) (Figure 3).

Figure 3. *Rupe Magna, calibration site at quartz vein damaged by glacial clasts.*

The anthropomorph selected for analysis was then examined microscopically. A linear ridge on a minute quartz vein in the 'head' region of the figure yielded six very consistent measurements of 45-50 microns over a distance of about 1.5 mm. An adjacent tiny clear quartz crystal had also been fractured in the production of the petroglyph. It offered numerous micro-wanes of various angles, and again the widths were consistently up to 50 microns on those of right angle. The mean value of fourteen determinations was 48 microns. Finally, one of the numerous recent cupules present at this site was briefly examined as it was found to be crossed by several quartz veins of 1-2 mm width. Very little micro-wane development was apparent, and the few areas on the micro-topography that offered suitable conditions indicated that the wane widths varied somewhat, but were generally in the range of 10-12 microns at 90º.

These data are not adequate to secure a reliable dating for the rock art in question, but they certainly suffice to provide rough age estimates. For this purpose a simple calibration curve is constructed, with one end formed by the present time, the other end by the micro-wane of the edges produced by the glacier 'shortly' before its final retreat. Other micro-wane widths on quartz from the same site and from similar edge angles can then be plotted on this curve. If a chronological value is inserted for any of the plotted values, it provides a rough age estimate for any point on the curve.

Subsequent to obtaining these microerosion data I pursued two questions with colleagues: (1) when is the last glacier supposed to have withdrawn from this part of Valtellina; and (2) what is the age local archaeologists have traditionally attributed to the kind of anthropomorphous figure I examined?

The most recent glacial activity probably occurred around 12 000 BP. Responses to the second question differed considerably, but the two principal models would favour ages of 5200-6000 years (late Neolithic) and c. 3000-3600 years (middle to late Bronze Age) respectively for the analysed anthropomorph (Anati 1994; Fossati 1995). The first of these alternatives seems to be opposed by several leading authorities. Graziosi (1973) considers the chronology dubious, an opinion shared by de Marinis (1994) and Schumacher (1983), partly because stylistically similar anthropomorphs have been found on portable items attributable to middle/late Bronze and Iron Age occupations. Arcà and colleagues favour that age, but they still do consider the possibility that anthropomorphs with raised arms may first appear in the Neolithic (Arcà et al. 1995). Such figures, called 'orants' (because their 'raised' arms are considered to indicate the act of worship or offering oblation, a baseless projection of modern concepts into the distant past: we have no idea in what attitude Neolithic people 'worshipped'), are found in the metal ages of the region, but also on a decorated

bone from the Neolithic of Riparo Gaban at Trentino.

Using the tentative 12 000-year minimum date for the calibration value, the resulting curve gives the age of the analysed Rupe Magna anthropomorph as most likely between 5000 and 6000 years BP, which confirms the archaeological, stylistic estimate as included in Anati's chronology (1994) but squarely rejects the alternative speculations (Figures 4 and 5). Even with this imprecise, tentative estimate, a Bronze Age or Iron Age antiquity can be ruled out safely.

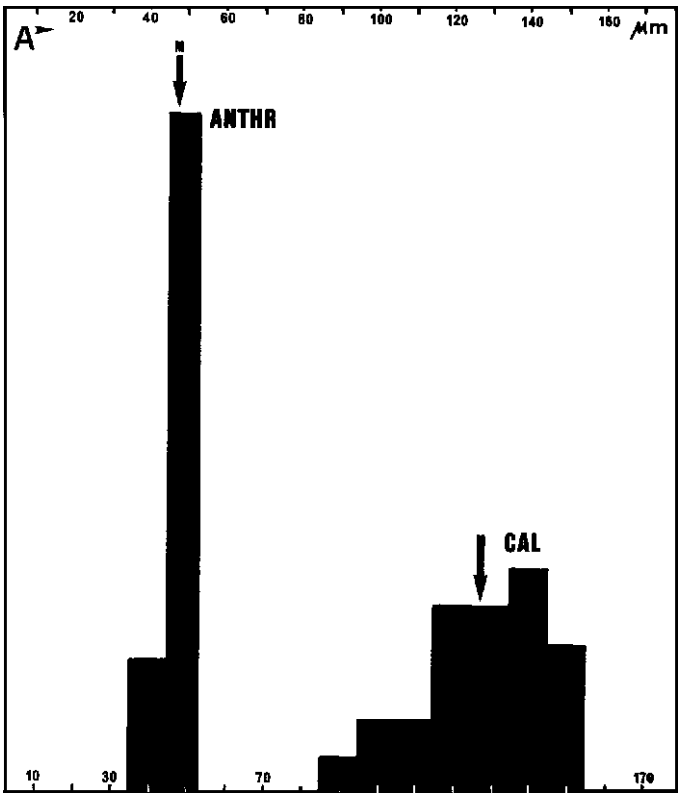

Figure 4. *Microerosion analysis of calibration site and anthropomorph, Rupe Magna. The histogram shows wane width measurements (A) of quartz fracture edges in microns (1000th of a mm).*

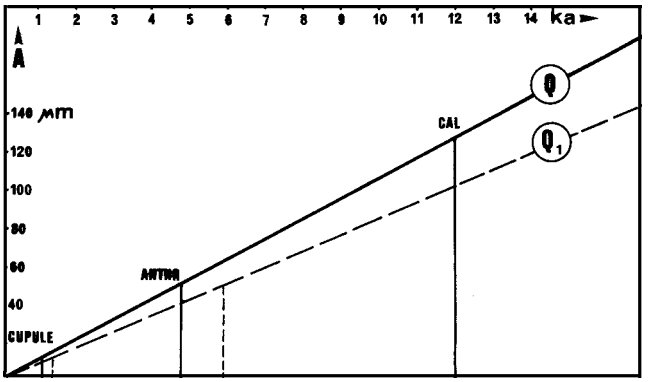

Figure 5. *Microerosion curve for crystalline quartz at Rupe Magna, based on a single calibration value and only one mineral. This provides preliminary age estimates (in ka, 1000 years) for two petroglyphs, a very early anthropomorph and a relatively recent cupule.*

DISCUSSION

It is to be emphasised that the anthropomorph I selected was one of the earliest figures I examined at the site, just as the cupule analysed was one of the most recent, in order to obtain an idea of the time depth represented in this corpus. It is thus highly possible that most other anthropomorphs at the site are younger than the sampled figure. This, and the existence of anthropomorphs with raised arms on portable and dated Bronze Age finds prompts me to suggest that perhaps, once again, a stylistic marker is unreliable and such

figures were made in different periods, from the Neolithic to the early Iron Age. This is consistent with stylistic trends in long rock art sequences in other continents, especially Australia, or with the continuation of Palaeolithic style long into the Holocene in many parts of Eurasia (Bednarik 1997). It is also relevant that reuse or modification of older petroglyphs is a frequent feature in rock art world-wide, as is the practice of copying existing and often much earlier motifs. Significant stylistic differences in the work of artists of the same generation, tribe and even family clan are well known in Australian ethnography (Mulvaney 1996), which is particularly relevant in illuminating these chronocentric constructs in stylistic European rock art studies.

The cupule I obtained some microerosion information from is certainly very much younger than the anthropomorph. For all practical purposes, it is under a quarter of the age of the apparently late Neolithic figure. This shows once again that cupules are a ubiquitous form of rock art and were still produced in the Historical periods. There is ample evidence of this from various regions of the European Alps. It must be cautioned, however, that a cupule (or any other petroglyph) could easily be re-worked or enlarged much later than the time of its initial production, and we know of many examples of 'reused' cupules. Microerosion dating relates of course always to the time a rock surface was last impacted upon. So what is being determined with this method is the approximate time a surface was last pounded or engraved.

The Grosio project described here represents the first attempt in central Europe to apply one of the suite of 'direct dating methods' of rock art now available to us. It indicates the utility of direct dating to test established petroglyph chronologies or, as in the case of the Italian Alps, to test competing archaeological hypotheses, provided that conditions are favourable for specific methods. Microerosion analysis can provide convincing age estimates for petroglyphs on all rocks that comprise crystalline quartz as a component, such as granite, provided the surface in question was not concealed by sediment, mineral accretion or a lake since the petroglyph was executed. These conditions apply at thousands of petroglyph sites across Europe, notably in Scandinavia. The method effectively covers a time range of about 50 000 years, and on the basis of current calibration curves yields dates with tolerances of in the order of ten percent. It thus offers only modest precision, but compensates for this with its excellent reliability, and as a non-interfering technique is to be preferred to dating methods involving destructive sampling of rock art.

REFERENCES

Anati, E. 1994. *Valcamonica rock art: a new history for Europe*. Centro Camuno di Studi Preistorici, Studi Camuni 13, Capo di Ponte.

Arcà, A., Fossati, A., Marchi, E. & Tognoni, E. 1995. *Rupe Magna. La roccia incisa più grande delle Alpi (Parts 1* and 1**: Tavole)*. Consorzio per il Parco delle Incisioni Rupestri di Grosio, Ministero per I Beni Culturali e Ambientali, Soprintendenza Archeologica della Lombardia, Sondrio.

Bednarik, R.G. 1992. A new method to date petroglyphs. *Archaeometry* 34, 279-291

- 1993. Geoarchaeological dating of petroglyphs at Lake Onega, Russia. *Geoarchaeology* 8, 443-463.

- 1995. The age of the Côa valley petroglyphs in Portugal. *Rock Art Research* 12, 86-103.

- 1997. Rock art as reflection of conditional visual perception. *Cambridge Archaeological Journal* 7, 255-259.

- 2000. Age estimates for the petroglyph sequence of Inca Huasi, Mizque, Bolivia. *Andean Past* 6 (in press).

Fossati, A. 1995. Cronologia ed interpretazione. In Arcà et al. 1995, pp. 99-109.

Graziosi, P. 1973. *L'arte preistorica in Italia*. Sansoni editore.

Marinis, R.C. de 1994. Problèmes de chronologie de l'art rupestre du Valcamonica. *Notizie Archeologiche Bergomensi* 2, 99-120.

Mulvaney, K. 1996. What to do on a rainy day. Reminiscences of Mirriuwung and Gadjerong artists. *Rock Art Research* 13, 3-20.

Schumacher, E. 1983. Zur Datierung, Einordnung und Gliederung der Felsbilder des Valcamonica. *Prähistorische Zeitschrift* 58(1), 61-88.

International Federation of Rock Art Organisations (IFRAO), P.O. Box 216, Caulfield South, Vic. 3162, Australia.
E-mail: robertbednarik@hotmail.com