Starch and charcoal: useful measures of activity areas in archaeological rockshelters.

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ABSTRACT

Intrasite studies of the spatial arrangements of archaeological materials to interpret structures in activity areas is an important facet of archaeology. As post-depositional processes move these materials from their original position it is imperative that the effect of these processes are evaluated before interpretations about the use of space by humans living at the site are made. In this study we conclude that most of the sediment starch and charcoal from a sandstone rockshelter in New South Wales derives from a cultural source. An evaluation of the effect of seven physical characteristics of the site on the horizontal distribution of the starch and charcoal remains suggests that, at least at this rockshelter, and unlike their effect on stone artefacts, these characteristics have not obscured the general pattern of original distribution at the site. The distribution pattern can, therefore, be interpreted as representative of past human use of space at the rockshelter.

Keywords: spatial analysis, activity area, rockshelter, starch, charcoal

Introduction

Studies of intrasite spatial patterning are important in archaeology because they contribute towards an understanding of spatial behaviour at the finest scale of resolution - activity areas. Many intrasite studies infer that clusters of archaeological material represent foci of human activities (for example, Simek and Larick 1983, 167; Cribb & Minnegal 1989; Fontana 1998; Ranson 1978, Blankholm 1991). This is particularly evident in the archaeological studies of hunter-gatherer groups. The main concern of this paper is to demonstrate that archaeobotanical remains may have a useful role in studies of intrasite spatial patterning.

Interpretations of clusters of archaeological material as activity areas rely on there having been little disturbance of deposits at the sites after initial deposition. However, there are many studies documenting sources of site disturbance which might alter the initial spatial distribution of materials. The focus of this study is on the horizontal distribution of materials rather than vertical displacement. Disturbance forces influencing this distribution include deliberate site maintenance (for example, Binford 1978) and post-depositional processes such as human trampling, animal activity, wind and water movements (Schiffer 1983, Villa and Courtin 1983, Hivernal and Hodder 1984, Nash and Petraglia 1987, Gregg, Kintigh and Whallon 1991). These sources of disturbance are often all present in cave sites. Detailed geomorphological and geochemical work at Palaeolithic caves in the Levant (Goldberg and Bar-Yosef 1998) and South Africa (Goldberg 2000) demonstrate the significance of geogenic, biogenic and anthropogenic factors in the horizontal movement of small archaeological objects. This research also demonstrates that archaeological deposits in caves vary greatly between the edges and the centre.

There is also research which shows that sites' physical characteristics, such as the presence of barriers, the location of driplines, slope and the degree of sediment compaction, influence the extent to which the various disturbance sources affect spatial patterning within the site (for example, Audouze and Enloe, 1997; Carr 1991, 224; Nash and Petraglia 1987: 192; Nielson 1991; Petraglia, Akoshima and Straus 1994; Rigaud and Simek 1991; Thomas 1984; Theunissen et al 1998 and Wandsnider 1987). It is for these

reasons that Stapert and Street (1997) suggest that evaluating the effect of disturbance sources on different kinds of archaeological materials and the effect of the site's physical characteristics is imperative before detailed interpretations about the use of space by humans living at the site can be made.

Although there are several studies that use the spatial distributions of charcoal to contribute to the interpretation of people's use of space at sites (for example, Hayden 1997) we are not aware of any similar studies for sediment starch. This may be because previous studies of the effects of non-cultural factors on the distribution of archaeological material have been on stone artefacts, bone and ceramics and there has been little work on the study of factors causing the movement of plant remains.

Our previous study investigating the influences of physical characteristics on the horizontal distribution of stone artefacts at Petzke's Cave (a large sandstone rockshelter [latitude 28 degrees 56S longitude 150 degrees 48E] near Yetman in northern New South Wales, Australia) found that the stone artefact horizontal distribution is associated with ceiling height (Theunissen, Balme and Beck, 1998). Movement of artefacts is greatest in high ceiling areas of the cave where there is relatively heavy human traffic compared to areas of low ceiling height. The scuffage resulting from this traffic affects large artefacts in particular. The smaller the artefact the more likely that it has retained its original depositional position. These results suggest that the distributions of small, light objects in archaeological sites might reflect human use of space in the past better than large objects.

In this paper we evaluate the effect of seven physical characteristics: sediment pH, sediment moisture, ceiling height, sediment compaction, the location of the dripline and the position of hearths and natural barriers (boulders and walls) of a rockshelter on the horizontal distribution of two small kinds of archaeological evidence - sediment starch and charcoal. We assess whether these two kinds of evidence are useful measures of the spatial patterning of activities at Petzke's Cave a large sandstone rockshelter (20m x 15m) and by implication their application elsewhere.

We have approached this question firstly by assessing the likelihood that sediment starch and charcoal at the site can be linked to human activities. We then consider the other factors that are likely to affect the distribution of sediment starch and charcoal and identify variation in the effect of these factors across the site. This pattern is compared with the distributions of the two kinds of plant remains. If their spatial distributions are strongly affected by post-depositional processes and the shelter's physical characteristics, then the densities of the two plant remains should vary with those physical characteristics.

Sources of Starch and Charcoal in Rockshelter Deposits

There is no clear way of distinguishing between charcoal produced by bushfires and blown onto the site from that produced by cultural activities. However, studies by Murphy (1992, 118) on the sources of plant remains found in a sandstone rockshelter in central New South Wales found that the ratios of carbonised to noncarbonised wood in excavated archaeological deposits at the shelter were up to 600 times those from traps placed outside the shelter (Murphy 1992, 116). At Petzkes Cave the mean density of large charcoal fragments inside the shelter was six times that of the samples from outside the shelter (Martin 1995). These results, together with the presence of hearths and burnt bone and stone, suggest that charcoal within rockshelters is largely the result of burning activities (especially fires for cooking and warmth) within the shelter.

The likely source of starch in shelter deposits is from the in situ decomposition of leaves, seeds, fruits, tubers and bulbs either brought into the sites by humans or growing naturally in the site, or from human and animal faeces. The highest concentrations of starch in plants is in their storage organs such as seeds and underground organs. While it is possible that some of the plant material (especially leaves and seeds) containing starch may have blown into the site, the differences between the macroscopic plant (leaves, sticks and twigs) distribution and the starch grain distribution at Petzkes Cave (Figure 1)

suggests that the primary sources of starch grains at the site are cultural activities such as food plant processing, cooking, consumption and discard.

Factors Affecting the Distribution of Starch and Charcoal Remains

Beck (1989) and Miksicek (1987) have identified many factors that affect the survival and distribution of plant materials in archaeological sites. Variation within sites may be the result of differences in temperature (possibly influenced by proximity to hearths), pH and moisture.

Other processes that affect the distribution of plant remains in sites have rarely been examined but may be divided into those that are the result of shelter topography, those that are the result of human choices in the use of the cave and those that are the result of post-depositional processes associated with human uses of the site especially clearing and trampling (see Thuennissen, Balme and Beck 1998).

Methods

Selection of variables

To assess the effects of these processes on the distribution of plant remains at Petzke's Cave we compared the distribution of starch grains and charcoal to the seven physical characteristics of the shelter (extrinsic variables) listed above - all of which have been shown to affect the distribution of plant remains in archaeological sites.

Figure 1: Comparison of the distribution of (a) macroplant remains and (b) sediment starch in the excavated area of Petzke's Cave.

We did not include floor slope in our list of extrinsic variables because the floor of Petzkes Cave is relatively even. However this factor may be important at sites with an uneven surface topography. Wandsnider (1987) has shown that floor slope may act in concert with other factors such as wind and water to alter the distribution of archaeological remains. The slope may not be sufficiently steep to cause movement by gravity but differences in friction caused by different slopes will affect the extent of horizontal movement caused by other factors. Differences in slope may also reflect human behaviours such as sweeping which itself redistributes different sized material in different ways. Small remains rather than large are more likely to be found in situ after sweeping has occurred (Keeley 1991, 258; Stevenson 1991, 273-276).

Sediment pH and Moisture

Sediment pH and moisture have the ability to remove and alter the distribution of plant remains. Sediment pH affects the rate of decomposition of plant remains because high acidity limits the activity of biological organisms which cause decay. This may not affect

charcoal as much as other plant remains because it has been argued that charcoal is resistant to biological decay since it does not provide adequate sustenance for microorganisms or soil fauna (Beck 1989, 38) and that it is resilient to chemical decay as it is mostly composed of elemental carbon (Ladd 1988, 10).

Moisture has been found to break down organic remains in archaeological sites and it has been suggested (Hughes 1980, 13) that it may be useful as an indicator of the potential for the preservation of organic remains. The effect of moisture on charcoal and starch is a little unclear but Ford (1979, 302) suggests that charcoal exfoliates when it comes into contact with water. In addition Beck (1989, 39) showed that the presence of charcoal in soil may lead to an increase in the moisture retention of soil. According to Banks and Greenwood (1975) starch grains will swell when wet but will return to their former morphology on drying.

Sediment moisture may also indicate areas in the shelter which are subject to water washing. Water washing alters the distribution of materials by carrying lighter materials across the site where they lodge in depressions, against barriers or are deposited outside of the shelter.

Dripline Position

The position of the shelter's dripline has the potential to affect the distribution of material because water drips are concentrated beneath it. This results in fine sediment and small archaeological remains washing away. The sediments in the dripline area are usually hard, compacted, wet and sometimes pitted.

Position of Hearths and Barriers

Hearths were identified at the site as discrete areas that contained burnt sediment, ash and charcoal. The comparison between the position of hearths and the distribution of charcoal was an important control since it is likely that that they were the source of most

of the cultural charcoal in the site. As charcoal from hearths becomes scattered with increasing disturbance (Gregg, Kintigh and Wallon 1991) and Brooks and Yellen (1987, 81) suggest that they are unrecognisable within a few months of disturbance the comparison between hearth position and the distribution of charcoal should give a good indication of the extent of disturbance (Goldberg 2000).

Hearths are also a source of heat and heat can destroy starch (Hather 1991: 671-672). Thus an absence of starch in hearths may simply reflect such destruction.

Material accumulates around barriers through such processes as scuffage and wind and water movement and human behaviours such as sweeping and tossing. The size of remains accumulated is dependent on the processes causing movement.

Ceiling Height

The effect of ceiling height on the movement of humans and other animals in shelter sites was included because of our findings in the study discussed above (Theunissen, Balme and Beck 1998). There have been a number of other studies on the effect of human trampling on the distribution of artefacts (Gifford-Gonzalez et al 1985; Nielson 1991) but none that we could find on the effect on other types of archaeological material. Although the greatest amount of post depositional movement occurs under high ceilings, especially where the ceiling is higher than human standing height (about two metres), these areas are also where most human activities are likely to have taken place and so are probably the places where most material not tossed out of the way would have been originally deposited.

Compaction

Sediment compaction is related to ceiling height in that human and animal traffic compacts sediments. Compaction in sandy sediments is greatest in high traffic areas. The effects of sediment compaction on the horizontal and vertical movement of artefacts has

been the subject of some experimental studies (Gifford-Gonzalez et al. 1985; Nielson 1991; Villa and Courtin 1983). The main conclusion from these studies about horizontal movement is that scuffage causes greater lateral movement on hard surfaces and second, there is greater vertical movement in looser sediments.

Excavation techniques

The top three centimetres of sediment from the site were removed from just under 47 square metres in the southern and middle parts of the shelter. All excavations were carried out using standard archaeological trowelling techniques and all material was sieved at the site using a nest of 5mm and 2mm sieves. One five litre bucket for each one metre square was passed through a 1mm sieve to ensure that very small material was not being missed. Sediment samples of unsieved material were taken from each 25cm excavation square.

Initially we excavated each one metre square separately and attempted to plot all archaeological materials individually as they were found. However variation between the excavators' ability to identify archaeological materials while digging meant that the proportions of material individually plotted and those found in the sieves were uneven between squares. This, in turn, resulted in uneven data on spatial resolution. We therefore changed our practice so that we no longer recorded the location of materials as points but excavated each 25cm square separately. Twenty two of the square metres were excavated in this way.

Field recording of extrinsic variables

The conformation of the shelter's walls, barriers, the positions of hearths, the dripline and three profiles of the ceiling height and floor of Petzke's Cave were recorded using an electronic theodolite.

Moisture was measured as either present or absent (ie wet or dry) by mapping the boundaries of damp areas in the shelter after rain.

The pH was recorded for each square excavated using a standard CSIRO field kit with a disclosing agent (Universal Indicator). The range of pH values obtained in this study measured between 4 and 8.5. However, because pH is measured on a logarithmic scale the difference between these values is substantial.

Sediment compaction was measured for the corners of each one metre square in a trench three metres wide and nine metres long (Trenches 17-22, see Figure 1) with a penetrometer devised by Robert Theunissen (1995). The penetrometer uses a plunger released from a fixed height to measure the depth of penetration on a scale set at 0 as a penetration reading on concrete to 20 as a very deep penetration on loose uncompacted sand. At this site the range of values recorded was between 1 and 13.3.

Charcoal laboratory collection

Charcoal from both coarse (5mm) and fine (2mm) screens were separated from all samples by hand (Martin 1995). The total weight of charcoal recovered from each square was recorded and the average density calculated by dividing the charcoal weights per square by the total weight of sediment recovered from that square. The number of grams of charcoal per kilogram of sediment recovered in each square varied from 1.3g/kg to 51.5 g/kg.

Starch Laboratory Collection

Eighty six sediment samples of two grams each were processed and analysed (Vinton 1995) according to the methods for recovering starch from sandy sediments using caesium chloride (CsCl) separation developed and later published by Atchison and Fullagar (1998).

The caesium chloride extraction method is not without problems, one being the destruction of starch grains during the extraction, the second being that the CsCl tends to re-crystallise during the procedure. However, these are systematic errors and will equally affect each sample. For this study we are concerned with relative rather than the absolute numbers of grains so these effects have little bearing here.

The range of starch densities for each 25cm square varied between 53 and 1107 grains per sample.

Mapping and analysis

The aim of our analysis were to evaluate the influence of the selected variables on the spatial distributions of starch and charcoal. We assessed these influences by comparing maps of the starch and charcoal distributions with distribution maps of the seven extrinsic variables.

The positions of all of the features present on the shelter floor including hearths, dripline and moisture areas were placed onto the plan of the cave using GIS software (ArcView). To this was added the value of extrinsic variables and the density of charcoal and starch by excavated square.

To make these variables easy to interpret visually we used ArcView to create maps with contours which identified 'hot spots' in the distribution patterns. For moisture the Inverse Distance Weighted interpolation (Philip and Watson 1982; Watson and Philip 1985) was used to create the contours shown in Figure 2d. All other contour maps were created using minimum-curvature Spline interpolation (Franke 1982; Mitas and Mitasova 1988). Because the range of pH values was small we divided the contours into three intervals. All the remaining variables measured on a scale were divided into five contour intervals. Thus, for example, ceiling height has been divided into contours of 0-1 m, 1-2 m, 2-3m, 3-4m and 4-5m.

The association between the physical characteristics of the rockshelter and plant distributions was then assessed by searching the maps for any obvious patterns between the plant remains and extrinsic variables. Visual assessment of distribution maps is a common analysis method for archaeological spatial data (for example, Binford, 1987; Enloe et al, 1994; Marean and Bertino, 1994; O'Connell, 1987; Vaquero, 1999) because it is intuitive and allows excavators to use their contextual knowledge in the analysis (Simek and Larick 1983). Visual analysis is especially suitable for our study because the different ways in which our extrinsic variables were recorded rendered them unsuitable for analysis with multivariate statistics. The relationship of the plant remains to the conformation of the shelter's walls could not be measured reliably on a metrical scale and a variety of measurement scales (nominal for moisture content, ordinal for compaction and interval for starch and charcoal density and ceiling height) were used for other variables.

Results

The distributions of sediment starch, charcoal and the position of hearths, the dripline and rocks and boulders are shown in Figures 2a and b and the distributions of extrinsic variables (apart from sediment compaction) are shown in Figures 2c-f. The distributions of sediment starch, charcoal and sediment compaction in trenches 17-22 are shown in Figure 3a-c.

Mal Ridges 2000

Figure 2: Distribution of sediment starch, charcoal and extrinsic variables in the excavated area of Petzkes Cave. (a) sediment starch, cave walls, rock fall and hearths. (b) charcoal, cave walls, rock fall and hearths. (c) pH, cave walls and rock fall. (d) moisture, cave walls and rock fall. (e) ceiling height, cave walls and rock fall.

Figure 3: Distribution of (a) sediment starch, (b) sediment compaction and (c) charcoal in trenches 17-22 at Petzkes Cave.

Starch

Figure 2a shows that there is a low background presence of starch across most of the site. The number of starch grain numbers in each 25cm square varies. There are significantly high numbers (around 1000) in some parts and low numbers (less than 100) in other parts (Figure 2a). The mean number of grains per sample is 244.

Visual comparison of the starch and hearth distribution shown in Figure 2a with the distribution of pH (Fig 2c) shows that relatively high concentrations of starch occurs in all sediment pH classes recorded at the site. Occurrence of starch grains does not seem to be associated with moisture (Fig. 2d). No associations between starch distribution and sediment compaction is evident for trenches 17-22 (Figs 3a and 3b).

The distribution of starch shown in Figure 2a suggests that there is little association between the distribution of starch and the dripline except that the most dense

accumulation of starch is at the southern end of the shelter. This dense accumulation is also in a part of the shelter where the ceiling height is over two metres (Fig. 2e) which is above human standing height. This area is also at the front of the shelter at the major opening to the shelter at the southern (excavated end). It is well lit from the south and east and is on the flat shelter floor above the relatively steep talus slope. Ethnographic observations of the use of rockshelters by people in Papua New Guinea New Guinea (Gorecki 1991), the Australian desert (Nicholson and Cane 1991) and Western Cape San groups (Parkington and Mills 1991) summarised by Walthall (1998) indicate that this front central position beneath the dripline where there is good daylight, is most frequently used for cooking and maintenance activities.

Apart from this dense patch of starch in the southern front of the shelter, the other pattern obvious from Figure 2a is the accumulation of starch around barriers (walls at the rear and front of the shelter) and large boulders in the centre and southern end of the shelter. The ceiling height in these areas is low (Fig 2e) and, while it is conceivable that some physical action such as wind and water flow might cause these accumulations, the fact that they surround the barriers rather than accumulating on either side which might be expected if there was a physical source suggests that the cause might be from human behaviour such as sweeping.

Charcoal

Figure 2b shows that, there is no constant background charcoal present at the site.

Visual comparison of the charcoal and hearth distribution shown in Figure 2b with the distribution of pH (Fig 2c), moisture (Fig. 2d), ceiling height (Fig 2e) and the sediment compaction compared with charcoal distribution for three trenches (Figs 3b and 3c) indicates that charcoal occurs in places where pH, and sediment compaction are both high and low and in wet and dry parts of the shelter. Although there appears to be no associations between charcoal and these variables there do seem to be patterns in the distribution of charcoal and the other extrinsic variables.

Most obviously, the densest patches of charcoal are in places where we have recorded other evidence for the presence of hearths. If hearths are the primary source of charcoal in the shelter, this also explains the apparent association between charcoal and macroplant remains (Figure 1a) which we concluded were probably mainly introduced into the shelter by humans (presumably for fuel). Hearths occur in places of both high and low ceilings but the largest hearth (F220) is in the centre of the shelter, beneath the dripline and where the ceiling is high. This concentration of dense charcoal is surrounded by a wide distribution of scattered charcoal which is probably a result of the central position of the hearth under a high ceiling where the greatest amount of human trampling would have occurred. Hearths B and C are smaller but are also close to the dripline. These are associated with the two densest starch scatters. The remaining two hearths (A and F528) are further towards the rear of the shelter. Hearth A is very close to the rear wall. Hearth F528 is one metre away from the closest shelter wall but in a place with a ceiling height, which while low, is not as low as the ceiling height immediately adjacent to the nearest shelter wall and similar to that at hearth A. The greater density accumulation of charcoal against the very low shelter wall adjacent to Hearth F528 may reflect sweeping and tossing behaviours (Binford 1978).

These patterns match those described in the ethnographic literature summarised by Walthall (1998) for the positions of hearths used for different functions. Hearth F220 fits the pattern for cooking hearths which are at the front of shelters under the dripline and are larger than sleeping hearths. Hearth A and F528 are near the rear of the shelter and fit the pattern of sleeping hearths which ethnographically are found adjacent to sleeping hollows which are against the walls. Hearths B and C also fit position of cooking hearths but C is not particularly large. This position at the front of the shelter near the dripline, as discussed above, is also the ideal position for food processing and maintenance activities. They could be associated with the starch activity or could represent some other activity whose space overlaps that of the starch activity. It is worth noting that although the hearths all date to the last few hundred years, the radiocarbon dates received

so far suggest that the hearths were probably not associated with a single occupation period.

Starch and charcoal

A comparison of the distribution of starch (Figure 2a) and charcoal (Figure 2b) suggests that there may be an inverse relationship between the two types of remains. Areas in which there are high concentrations of charcoal have very little starch present and visa versa. As the charcoal concentrations are associated with hearths, the absence of starch in these areas may well be because any starch that was present has been destroyed by heat. It is possible that any evidence for cultural activities involving starch in these areas has been obliterated.

Discussion and Conclusion

The results described above and summarised in Table 1 suggest that the distributions of both sediment starch and charcoal at Petzkes Cave are a good reflection of the spatial pattern of past human use of the site. Overall the processes affecting the distribution pattern of plant remains at Petzkes Cave seem to be different from those affecting stone artefacts. The distribution of large stone artefacts in rock shelters is greatly affected by trampling (Theunissen , Balme and Beck 1998). In contrast sediment starch and, to a lesser extent charcoal fragments, are more likely to remain in situ in areas where there is trampling (measured here by sediment compaction and ceiling height). Although this and other sources such as water may cause some redistribution of the plant remains (which might contribute towards the background scatter of starch, for example) these movements, at least at Petzkes Cave, have not obscured the general pattern of original distribution at the site.

Variable	Expectation	Observation	Conclusion

Sediment pH	Less starch in area of low pH. Charcoal little affected by pH.	Starch and charcoal accumulations present in low and high pH values recorded at the site.	pH of the values recorded at this site have no effect on spatial distribution of starch or charcoal.
Moisture	No effect on starch preservation. Less charcoal in moist areas.	Starch and charcoal accumulations present in wet and dry areas in the site.	The presence of moisture in the sediments has no effect on spatial distribution of starch or charcoal
Barriers	Accumulation of starch and charcoal around barriers from site maintenance behaviour, or on one side of barriers from wind or water deposition.	Accumulations of low density starch and charcoal around barriers.	Accumulations caused at least in part, by site maintenance behaviour. Wind and water may also have contributed to these accumulations.
Dripline	Less starch and charcoal under dripline.	Starch and charcoal accumulations present under the dripline and away from the dripline.	The presence of a dripline has not altered the spatial pattern of starch and charcoal at this site.
Ceiling height	Little effect on horizontal movement. Human activities are more likely to be concentrated in high ceiling areas which would result in higher densities of starch and charcoal than in low ceiling areas.	Starch and charcoal occur in areas with both high and low ceilings, but densest accumulations are in high ceiling zones.	Concentrations of starch and charcoal in ceiling zones which are higher than human standing height reflect the spatial distribution of past human activities in the site.
Sediment compaction	Little effect on horizontal movement although possibly less charcoal in areas of high compaction caused by scuffage of larger charcoal fragments.	Starch and charcoal occurs on both hard and soft surfaces. Densest accumulation of charcoal is in an area of high compaction.	Compaction has little effect on distribution of starch and charcoal. The dense accumulation of charcoal on a hard surface is more likely a reflection of the area being in a high ceiling zone.
Hearths	Starch may be destroyed by heat resulting in less starch in or near hearths. Strong association between charcoal and hearths.	No association between starch and hearths. Strong association between charcoal and hearths.	Most of the charcoal derives from hearths in the site.

Table 1: Summary of the results of the comparison of the distributions of starch and charcoal with the distributions of extrinsic variables.

Although we have here interpreted dense patches of sediment starch and charcoal as plant processing areas (for starch) and hearths which have been interpreted by other criteria as either sleeping or cooking fires it may be possible to refine these interpretations. Both

starch grains and large charcoal particles may be identifiable to species so particular activities associated with them should be recognisable. For example studies of starch obtained from tuber processing artefacts (Fullagar et al 1998) and charcoal from firewood species have been identified (Donohue 1989). Environmental information may also be interpreted from these plant remains (for example, Smith et al. 1995).

Thus we conclude that these two types of plant remains are useful measures of the spatial patterning of human activities at Petzkes Cave. Both commonly occur in archaeological sites and in large quantities. Both preserve well and do not seem to be significantly affected by factors which affect preservation such as sediment moisture, pH and trampling.

While our data was specific to a single site in northern New South Wales, the general principles and methods used to assess the factors affecting their distribution should apply to any rockshelter site. We have concluded here that starch and charcoal are good indicators of intrasite spatial patterns at Petzkes cave but this needs to be combined with other kinds of similarly assessed archaeological materials to obtain a more complete range of activities represented at the site.

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