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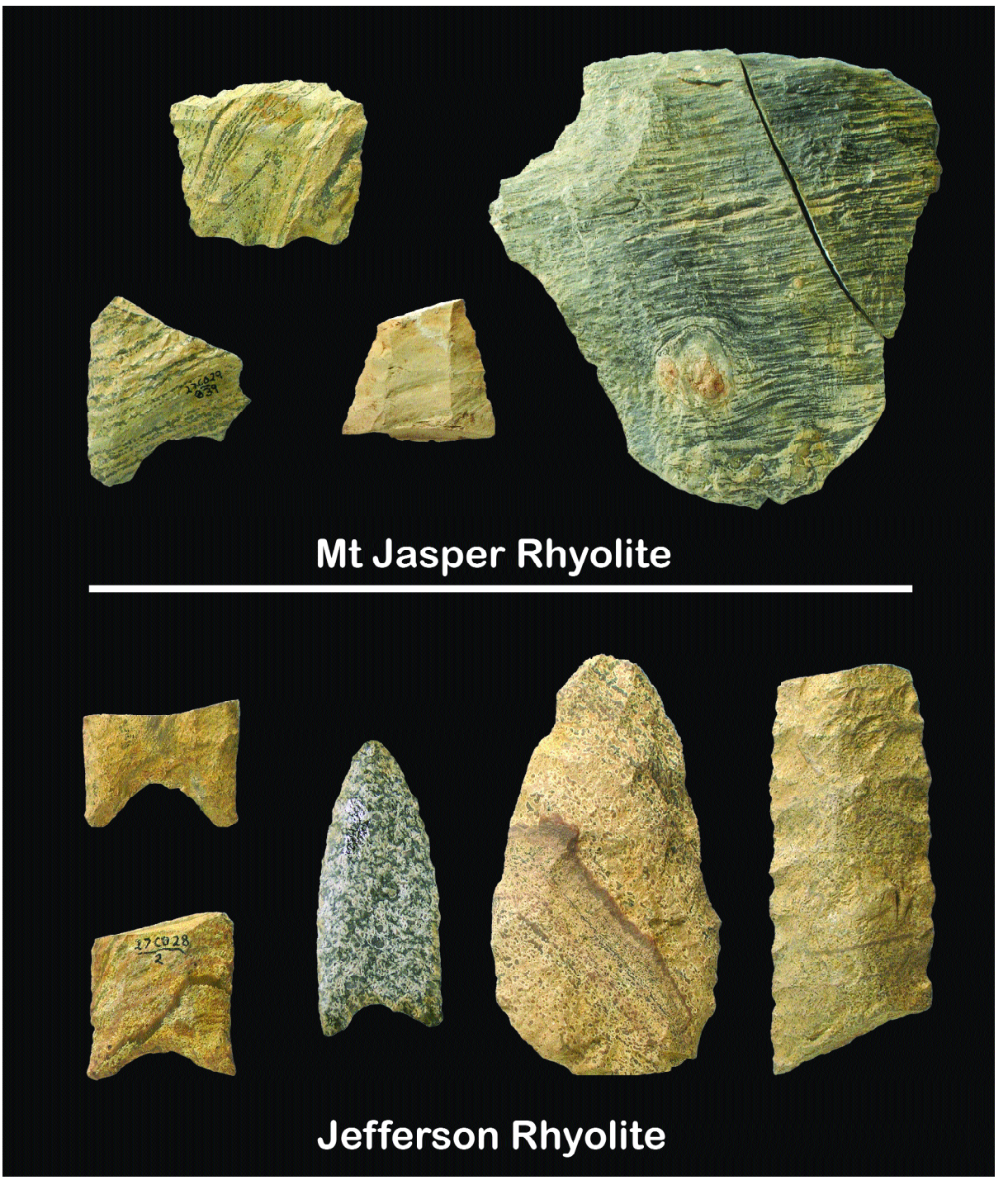

The New Hampshire Archeologist

Volume 49, Number 1, 2009

David R. Starbuck, Editor

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Preface

This volume of *The New Hampshire Archeologist* presents the rich diversity of New Hampshire's past, all the way from the Paleoindian period up until 1942, when a Douglas B-18A Bolo Bomber crashed on a New Hampshire mountain. Archeologists working in New Hampshire do not lack for fascinating research topics, and every site has the potential to challenge, excite and inform.

"The Bomber Crash of 1942" is unlike any other article that has been published within the pages of this journal. Excellent articles by Victoria Bunker have often appeared in *The New Hampshire Archeologist*, but always describing much earlier time periods and New Hampshire's Native peoples. This time Bunker is reporting on one of New Hampshire's most fabled sites of the 20th century, the site of a plane crash on Mount Waternomee in the White Mountain National Forest. The crash debris has been viewed by a great many visitors since 1942, and the National Forest is to be commended for authorizing and funding the research and field documentation conducted by Bunker and her colleagues. World War II archeology is a topic of tremendous importance and interest, and we are extremely fortunate to have the opportunity to present the story of the bomber crash site in our journal. With each passing day, we have fewer and fewer of our heroes who served in World War II, and this article helps to honor and thank the veterans who served our country in that war.

The second article in this bulletin, by Richard A. Boisvert and Stephen G. Pollock, is a study of Mount Jasper rhyolite, an important lithic resource that was quarried for nearly 12,000 years. Other lithic materials were used throughout New Hampshire, but only at Mount Jasper do we have an actual mine shaft (an "adit"). The authors have skillfully covered past archeological work at the site, along with the distribution pattern of Mount Jasper rhyolite, and they show how it may be distinguished from Jefferson rhyolite.

Our final article, by David Starbuck, is a brief discussion of the archeological work that was required by law at Canterbury Shaker Village when an outdoor stone staircase was removed and then restored in 2009. Such compliance work is invariably required whenever cultural resources are threatened within the museum village, and of special interest is a soapstone gravestone ("Betsey Mace") that was discovered buried alongside the staircase.

David R. Starbuck
Plymouth State University

Front Cover Illustration

Flaked tools of Mt. Jasper rhyolite and Jefferson rhyolite recovered from New Hampshire archeological sites. See the article by Richard A. Boisvert and Stephen G. Pollock on page 37.

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Archeology and Geology of the Mount Jasper Lithic Source

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Introduction

Spherulitic rhyolites from both Jefferson and Berlin, NH, have been utilized for stone tools of the Paleoindian period. The nature of the materials from both of these sources has recently been reported upon by Pollock, Hamilton and Boisvert (2008a, 2008b). The purpose of this article is to discuss spherulitic rhyolite at Berlin, New Hampshire. This source is an approximate 0.75 to 1.3 meter-wide dike which crops out on Mount Jasper, near the city of Berlin. We believe the Jefferson source was used during the Paleoindian period and was probably limited to between 11,500 and 9500 BP. Artifacts attributed to having originated in Jefferson are associated with the early Paleoindian period in New England, and are less common or absent in Late Paleoindian sites. The Mount Jasper source is the better known and most historically well documented of these two New Hampshire lithic sources. It is this source which we suggest has had the longest period of usage by Native Americans, spanning a time which probably exceeded 11,500 years. Current evidence suggests that Mount Jasper was predominantly used between 6000 and 7000 BP. One possible reason for the extensive and long-term exploitation of Mount Jasper is that it is situated on a main thoroughfare between the Androscoggin and Connecticut River drainages.

Mount Jasper is located on the northwest edge of the city of Berlin, NH (Plate 1). It is a steep, forested low mountain that reaches 1584 ft in elevation. It is a familiar landmark in the community, and well-traveled trails lead the casual visitor to the prehistoric mine that sits just below the summit, facing southwest over the Dead River 500 ft below. A swarm of approximately 9 rhyolite dikes (Billings and Fowler-Billings 1975) lace the bedrock over most of the mountainside. These dikes consist of vitreous, spherulitic, flow-banded rhyolite whose distinctive red and green colors undoubtedly prompted the local residents to name the mountain Mount Jasper. This material is flint-like in its physical characteristics and was used by Native American tool makers to fashion projectile points, knives, scrapers and other chipped stone implements. Since this stone was not only high quality but also rare, it was a significant source of raw material for tool manufacture over a long span of time.

Interest in Mount Jasper as a lithic source was piqued in 1996 with the recovery of the base of a Paleoindian fluted point at the Jefferson I Site in Jefferson, NH (Boisvert 1998; Bouras and Bock 1997). This specimen was made from an

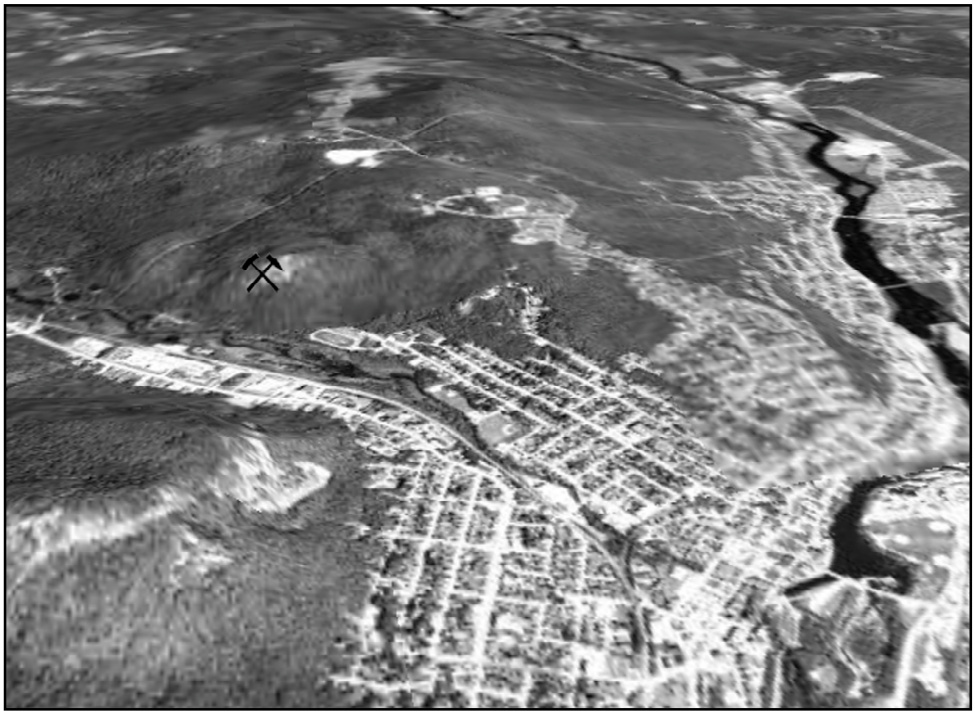

Plate 1. Aerial view of adit on Mount Jasper, Berlin, NH.

unknown chert; however, in test excavations in the spring of 1997 a second point (Plate 2f) was recovered *in situ* and is clearly Paleoindian in age. Initially it was thought to be from Mount Jasper based upon superficial similarities; however, it is now clear that it meets the macroscopic criteria for identification as Mount Jasper rhyolite. Collaboration soon developed among Pollock, Hamilton and Boisvert (1996) on the problem of accurately identifying Mount Jasper rhyolite and distinguishing it from the closely related and visually similar Jefferson rhyolite. This research has culminated in a pair of recent publications (Pollock, Hamilton and Boisvert 2007, 2008) that explore this issue in detail. The summary of the distribution of Mount Jasper rhyolite at sites distant from the source presented below is drawn largely from these studies. Plate 2 presents examples of both Mount Jasper Rhyolite, and Jefferson Rhyolite, which is native to the town of Jefferson, NH, and found on and near sites of the Israel River Complex.

The distribution of the Mount Jasper rhyolite beyond the immediate location itself has been recognized since the 19th century. H.W. Haynes (1888) reported on the sources for stone implements used by "Aboriginal" peoples, and Mount Jasper was on his list of known localities. He gave an accurate description of the adit and its geology and referred to the locality as the "Jasper Cave." Haynes then described an archeological site approximately 11 km north of Berlin along the Androscoggin River where flakes of spherulitic rhyolite were numerous and attributed their origin to Mount Jasper. Despite this early (and likely accurate) recognition of Mount Jasper rhyolite in sites at least somewhat distant from the source, additional such assessments were lacking for a century. Petersen and Bouchehri (1988) noted the abundance of Mount Jasper rhyolite at the Cascade Falls site 4 km away on the Androscoggin River. Reference to the Mount Jasper source developed steadily, with attempts to describe it macroscopically from the source (Boisvert and Dickinson 1992), and in terms of its distribution further down the Androscoggin River at Rumford Falls, Maine (Hamilton and Mosher 1990).

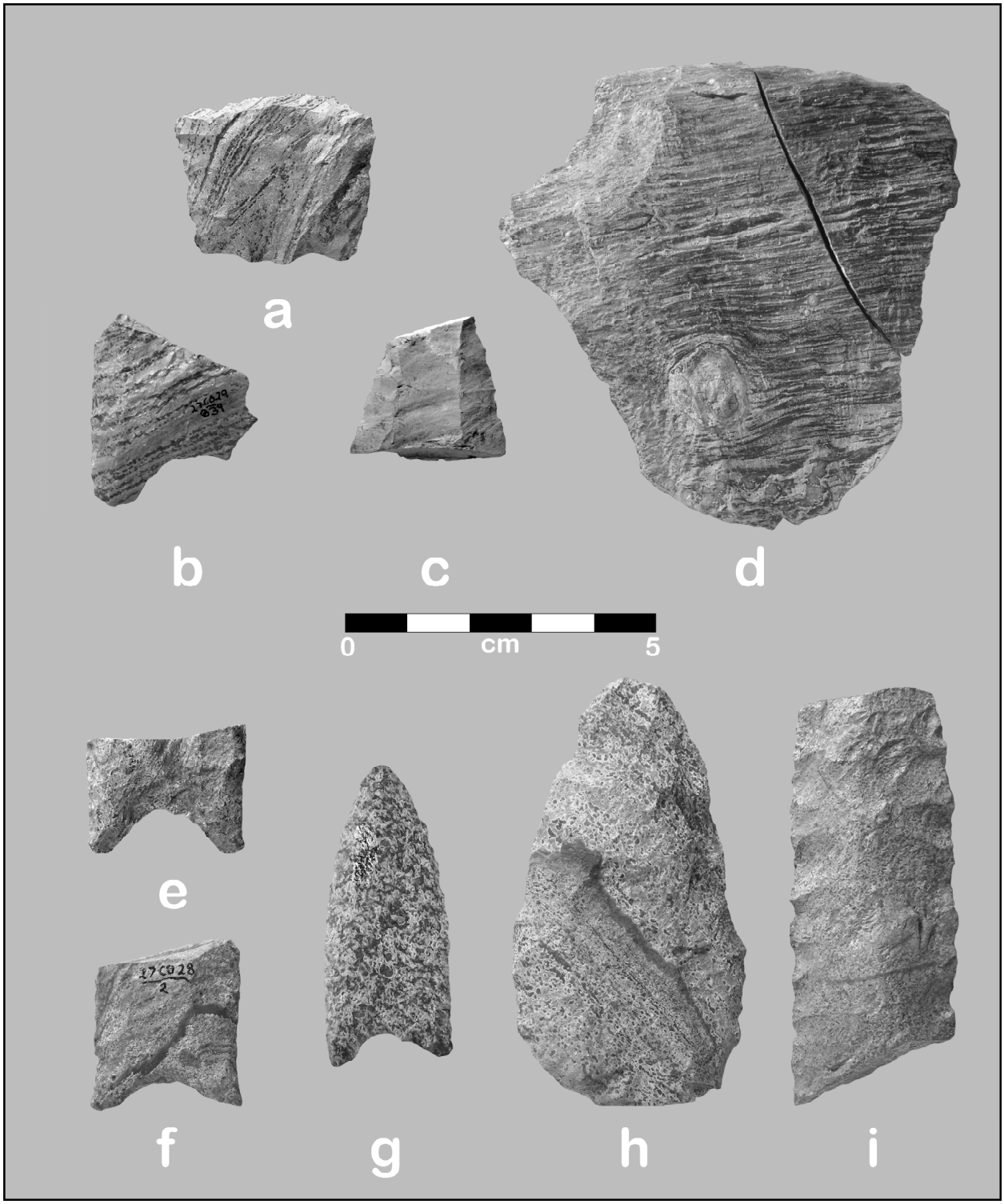

Plate 2. Spherulitic Rhyolites. Mount Jasper Rhyolite: a (Potter Site); b (Jefferson I Site); c (Potter Site); d (Potter Site). Jefferson Rhyolite: e (Jefferson III Site); f (Jefferson I Site); g (Jefferson IV Site); h (Jefferson III Site) and i (Jefferson III Site). Color version without lettering and scale on cover of this volume, printed actual size.

Recognition and Separation of Mount Jasper and Jefferson Source Materials

Pollock *et al.* (2007) discussed in detail the macroscopic criteria for recognizing and separating the Mount Jasper and Jefferson spherulitic rhyolites. Table 1 summarizes these criteria. Pollock *et al.* (2008) concluded that there are sufficient differences in the nature of the spherules between Mount Jasper and Jefferson that artifacts can be attributed, with caution, to one of these two sources. In particular, the density or clustering of spherules, the manner in which the spherules are entrained, and the thickness of the spherule flow band in combination with weathering character are macroscopically important criteria for their recognition and assignment to source. Comparing raw material from Mount Jasper and Jefferson, the Mount Jasper spherules do not weather with a prominent concentric pattern from grayish red interiors to grayish white rims as do the known Jefferson samples. In contrast the spherules from Mount Jasper exhibit uniform reddish brown colorations. The reddish brown coloration intensifies with the degree of weathering. The isolated nature of the spherules in Mount Jasper rhyolite versus the close-pack arrangement of the Jefferson material is also considered a key criterion at this time. The Mount Jasper and Jefferson sources also have areas that are lacking spherules, but exhibit very thin flow bands. In a collection such as that from Bull Brook, which includes both Mount Jasper and Jefferson material (Pollock *et al.* 2007, 2008), the authors have not attributed these more simply flow-banded rhyolite artifacts to a source. Examples of both Mount Jasper Rhyolite artifacts and Jefferson Rhyolite artifacts are illustrated in Plate 2 (a color version is illustrated as the cover of this volume). All are from Paleoindian sites in Jefferson and Randolph, NH.

Table 1. Summary of the major macroscopic criteria for separating artifacts derived from Mount Jasper and Jefferson, New Hampshire.

CHARACTERISTIC	MOUNT JASPER	JEFFERSON
SPHERULE DENSITY	Spherules are isolated or entrained along flow bands, and are commonly coalesced to form "trains" of spherules.	Closely packed but locally isolated
REGION BETWEEN SPHERULES	Fine-grained rhyolite matrix	Commonly filled with smoky quartz
WEATHERED SPHERULES	Color of weathered spherules is uniformly grayish red to brownish red with no, or a very weakly defined, concentric pattern.	Jefferson spherules have sharply defined concentric patterns with whitish rims and grayish interiors.
SPHERULE – BEARING FLOW BANDS	Spherules are concentrated in bands commonly less than 0.5 cm thick.	Spherules are concentrated in 1-4 cm thick bands. These spherule-rich bands alternate with 1-10 cm thick bands where spherules are absent or isolated.
FLOW BANDS WITH NO SPHERULES	The flow banding varies between very and weakly pronounced. The flow bands are characterized by minor textural differences in the fine-grained rhyolite.	The flow banding varies between very and weakly pronounced. The flow bands are characterized by minor textural differences in the fine-grained rhyolite.

Dike Geochemistry

Thirty-seven analyses of the Mount Jasper dike indicate that it is a chemically homogenous rhyolite, with SiO2 values ranging between approximately 71% and 76% (Fig. 1). Rare earth elements (REE) are useful in characterizing the Mount Jasper rhyolite. Figure 2 shows that the Mount Jasper rhyolite is relatively enriched in light rare earth elements (REE), and this pattern shows a gentle decrease to still moderately enriched heavier REE. The pattern exhibits a marked negative Eu anomaly that is due to crystallization and removal of feldspar, probably plagioclase, prior to the intrusion of the dike magma. Figure 2 suggests that the Mount Jasper dike developed from an enriched source, and may be related to the widespread mildly alkalic rocks of the White Mountain magma series of New Hampshire and adjacent Vermont and Maine. Ten artifacts from the Rumford Falls archeological site (Hamilton 1991) show similar REE patterns to the dike at Mount Jasper. Figure 3 compares the average REE pattern of the dike at Berlin with the average of the 10 artifacts from Rumford Falls. The patterns are essentially identical, but the artifacts plot below the pattern of the dike. We attribute this shift to removal of the REE elements through weathering in the near surface as they were buried for the last several thousand years.

Archeological Context of Mount Jasper

Because Mount Jasper is not only an archeological site of considerable extent and antiquity but was also the source of stone used in numerous other archeological sites, it should be evaluated both internally (intra-site) and externally (regionally). Presented below is a brief summary of the archeology at Mount Jasper and at various other sites within the region where rhyolite from Mount Jasper has been found. This summary builds upon a previous compilation of data assembled for the nomination of the site to the National Register of Historic Places (Boisvert 1992) and incor-

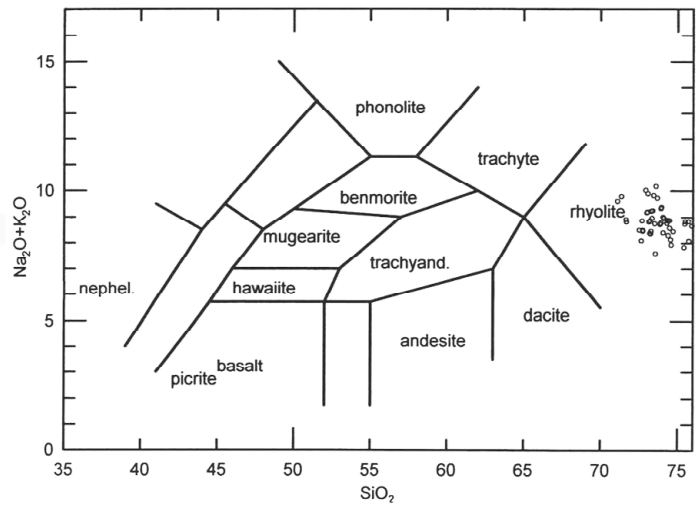

Figure 1. Diagram summarizing the results of 37 whole rock geochemical analyses taken from the dike at Mount Jasper. Samples were collected across the dike and along the length of the dike as it is intermittently exposed on the slopes of the mountain.

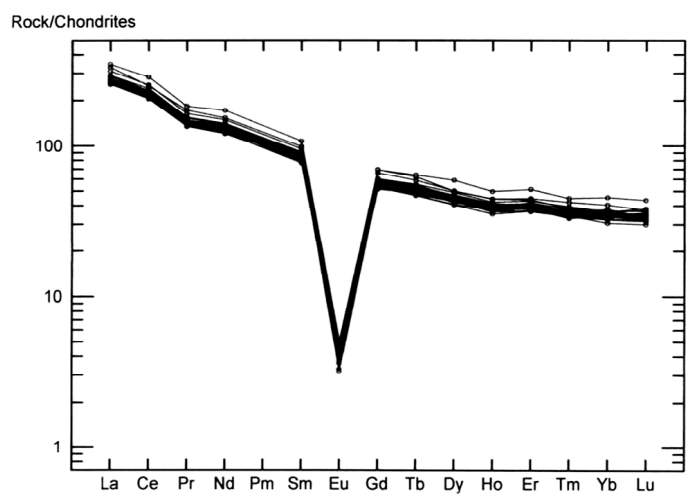

Figure 2. Distribution of 37 REE patterns from the dike at Mount Jasper. The europium anomaly is interpreted such that the dike magma was controlled through the crystallization and fractionation of plagioclase prior to the intrusion of the dike.

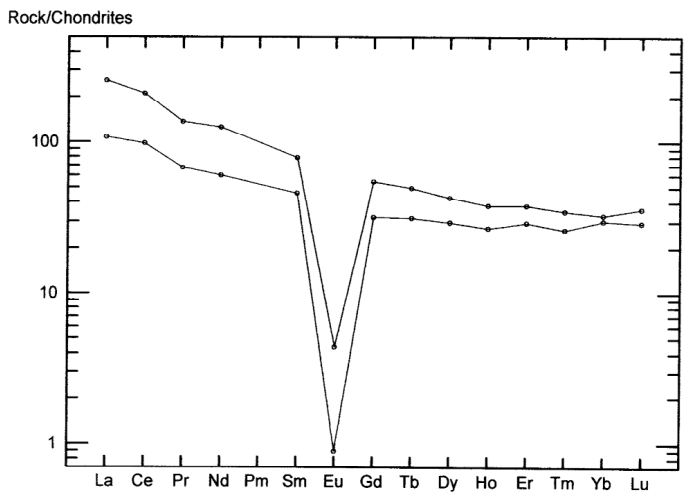

Figure 3. Comparison of average REE patterns from the dike at Mount Jasper (37 analyses) and the average pattern for 10 artifacts recovered during excavation at Rumford Falls. The artifacts analyzed are all from the Archaic period.

porates data accumulated since that time.

The Mount Jasper site has two basic archeological components. This is the dike from which raw stone was extracted (27-CO-1) and the manufacturing areas where the raw stone was reduced into cores, bifaces, or finished products (27-CO-2). The extractive area includes the adit as well as much of the exposed dike from the summit to the lower outcropping.

Gramly (1980) and Gramly and Cox (1976) conducted archeological excavations of the dike at the summit as well as at the adit area, and along the Dead River below. The dike at the main adit is approximately 1.3 m wide and over 10 m deep. Gramly (1980) estimated that approximately 100 m^3 of rock had been removed. This estimate is based upon the current depth of the adit which is approximately 10 m. However, the extent of modern era mining at the adit is not precisely known. It may be significant that in 1947 the depth of the adit was calculated by Elmer Harp, Professor of Anthropology at Dartmouth College, to be 14 feet (4.4 m). Because the dike has been recognized as a lithic source for over a century, not all of the quarrying occurred in prehistoric times. Haynes (1888) stated that he collected material from the dike. Once the dike was recognized as an aboriginal resource, amateur and professional archaeologists, flint knappers, and commercial enterprises procured dike samples (Pollock *et al.* 2008:94). One interesting insight to this modern exploitation is a private enterprise known as Al's Hobby Shop which was located on the Daniel Webster Highway in Twin Mountain, New Hampshire, circa 1950's. It sold labeled samples of the Berlin dike. Surviving labels attached to the dike material state that the hobby shop sold "Indian relics, minerals and curios". Regardless, the adit has been known since at least the 1860s (True 1869) dating well before modern flint knappers and commercial mineral collectors would have been exploiting the site.

Areas of artifact manufacture were primarily situated at the base of the mountain. These are referred to as the Dead River workshops by Gramly (1980). The workshops constitute a nearly continuous string of concentrations of stone debris situated between the lower elevations of the mountain and the broad wetlands that fringe the Dead River. Intermittent usage of these areas for millennia has left archeological deposits at least 600 meters long and 50 to 100 m wide along the base-of-slope. Gramly (1984) identified two specific workshop loci which were separated by approximately 15 to 20 m. The area between the concentrations lacked finished tools. He concluded that these workshops were active during the late prehistoric era on the basis of several diagnostic corner-notched projectile points. In addition, Boisvert (1992) excavated five 1 m^2 test pits to

the north of Gramly's excavations. These test pits recovered an array of manufacturing debris in substantially lower density than found by Gramly.

Additional workshop areas were located on the summit, and on available flat locations on the slopes. The summit workshop area was constrained to a much smaller area and likely did not exceed more than 100 m in diameter. Excavations on the summit of Mount Jasper encompassed 56 m^2 (Gramly 1980, 1984). Manufacturing debris as well as quarried dike waste was mixed together in soil immediately overlying and adjacent to the rhyolite dike, which at this location is currently under soil cover.

Mount Jasper was a special purpose site used over the full length of the prehistoric era ranging from Paleoindian (10,500 - 8,000 BC) through Archaic (8,000 – 1,000 BC) into the Woodland/Ceramic (1,000 BC – AD 1500) periods. Gramly identified both Archaic and Woodland period usage at Mount Jasper. Using the presence of projectile points discarded at the workshops he identified the summit as being associated with the Archaic. Although he did not more specifically categorize the point styles, examination of the sample illustrated (Gramly 1984:20, Fig. 2.15) indicates Susquehanna Tradition points and Middle Archaic Neville points (Boisvert 1992:159). The Woodland period usage was represented by recovery of corner-notched points, including the Jack's Reef variety. The diagnostic points were uniformly made of non-Mount Jasper material and were evidently worn or broken specimens that were presumably replaced by points manufactured on site. Also, it is worth noting that among the artifacts collected by Gramly which are on display at the Berlin Public Library are triangular end scrapers and gravers made of exotic Munsungun Chert. These artifacts are diagnostic Paleoindian tool types and potentially represent domestic activities by Paleoindians at Mount Jasper. A formal assessment of these artifacts, including confirmation of their provenience from Mount Jasper, has not been made, but they strongly suggest direct evidence for Paleoindian occupation of Mount Jasper.

The distribution of Mount Jasper Rhyolite on Paleoindian sites has been of particular interest, especially with the significant increase in investigations at these sites since 1996 (Fig. 4). Considerable research effort has been devoted to identifying lithic sources for materials found on Paleoindian sites continent wide, largely to document the geographic extent of various groups and to reconstruct movements and patterns of acquisition and exchange among them. In the Northeast this topic has been explored by Boisvert (1999, 2000, 2004), Bradley (1998), Burke (2006), Letendre (2007), and Pelletier and Robinson (2005) among others. In fact, virtually every analysis of Paleoindian sites and artifact assemblages in the Northeast has placed significant emphasis on the kinds of raw material used in so far as it is possible to make such identifications accurately.

Distribution of Mount Jasper material has been documented in the Michaud and Lamoreau sites in the Androscoggin drainage near the present cities of Lewiston and Auburn, Maine, as well as the Spiller Farm and Neal Garrison sites in southwestern Maine (Pollock *et al.* 2008:106-107). To the west the rhyolite has been found in the Champlain Valley area at the Mazza and Arbor Garden sites near Burlington, VT, and to the northeast at the Cliche-Rancourt site near Lac Megantic in southeastern Quebec (Pollock *et al.* 2008:103). Interestingly,

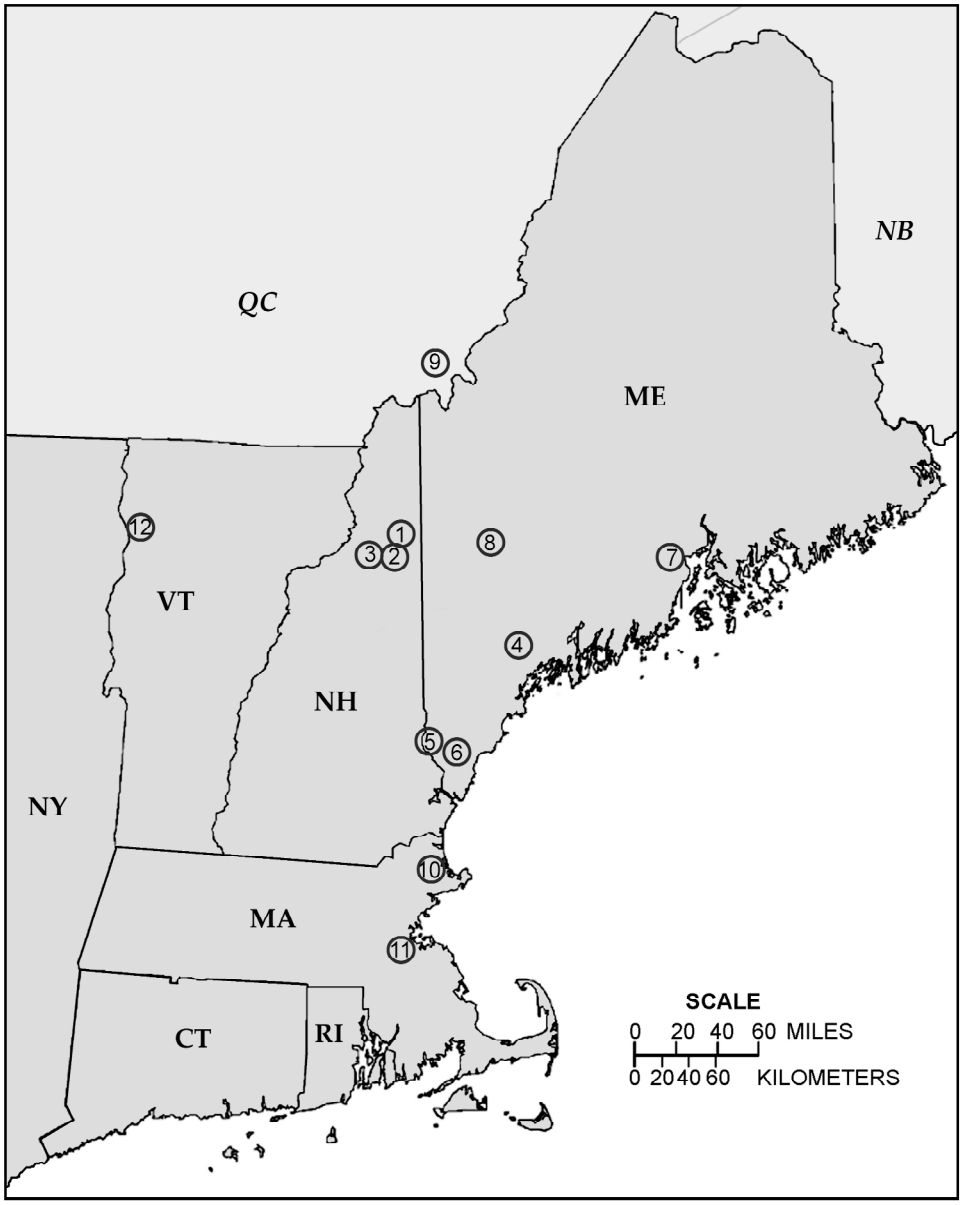

Figure 4. Locations of Sites with Mt. Jasper Rhyolite. **1** Mount Jasper, Head Pond and Cascade Falls Sites, Berlin, NH; **2** Potter Site, Randolph, NH; **3** Israel River Complex, Jefferson, NH; **4** Michaud, Lamoreau, Nicholas and Janet Cormier Sites, Auburn, ME; **5** Neil Garrison Site, Elliott, ME; **6** Spiller Farm Site, Wells, ME; **7** Searsmont Site, Searsmont, ME; **8** Rumford Falls Sites, Rumford, ME; **9** Cliche-Rancourt Site, Megantic, QC; **10** Bull Brook Site, Ipswich, MA; **11** Neponset Site, Canton, MA; **12** Mazza and Arbor Gardens Sites, Burlington, VT.

although the Vail site assemblage was carefully inspected, Mount Jasper rhyolite has not been documented there even though the site is only 55 km northeast of the source. Thus, while the material use was widespread in Paleoindian time, it was not universal. It is known to be dominant at only two sites: Potter, which is nearby in Randolph, NH, and Neponset, the most distantly recorded. Clearly, our understanding of where and why this material was chosen for heavy utilization is woefully limited.

Mount Jasper rhyolite continued to be used after the Paleoindian period, but in a reduced geographic spread. It is abundant at Archaic sites in Berlin, such as the Cascade Falls site and at Head Pond, 4 km northwest of the source. The Androscoggin River Valley exhibits a prolonged period of use. Hamilton *et al.* (1991) executed an exhaustive study of eight sites in and near Rumford, Maine, as part

of a study for the relicensing of a dam for hydropower production. A distinct pattern of usage was identified, applying to both large and small sites. The rhyolite shows a modest abundance in the Early Archaic, rising sharply in the Middle Archaic, then eventually declining through the Late Archaic (Pollock *et al.* 2008:110, Fig. 11) and virtually dropping out of use by the end of the Woodland period. Late Woodland points made from Mount Jasper rhyolite are lacking at the Rumford sites. Elsewhere in New Hampshire, systematic analyses of raw material types from Archaic and Woodland sites have not been conducted, but the use of any spherulitic rhyolite beyond the limited confines of the Androscoggin Valley is rare. There appears to be an overall slow but steady contraction in the range of use for Mount Jasper rhyolite over time. The most likely explanation may be that the accessible higher-quality material was exhausted by millennia of mining and that more abundant alternatives from other sources were relied upon increasingly. Forest cover over the dikes and late 20th century mining by rock collectors and hobbyists further limits our ability to resolve this question. It is apparent that the Mount Jasper source was no longer important, if not altogether abandoned, by the end of the prehistoric era.

Summary

Use of the Mount Jasper rhyolite has a long history extending back at least eleven and a half millennia. It was an important, though not dominant, source of tool stone during the Paleoindian period and was carried at least as far as 250 km. With the onset of the Holocene and shift to the Archaic lifestyles, Mount Jasper rhyolite became the most important material within a smaller geographic area, seemingly focused on the Androscoggin River Valley. Even here, its importance eventually waned over time and sputtered out in the Late Woodland. Still, it must be recognized that this very limited resource as known and used for nearly 12,000 years, and recognition of this lithic, inform our understanding of prehistoric settlement and technological patterns over that span of time. The Mount Jasper site itself is also highly significant as a rare and possibly unique example of mining by Native Americans to acquire material for their chipped stone tools. Stones were quarried at other locations, but only at Mount Jasper do we have an actual mine shaft or adit. Recent investigations into the mineralogical identity of the material has allowed us to distinguish it from seemingly identical rhyolites as well as positively identify it at ever increasing numbers of sites scattered across the Northeast. While the source may have been depleted for use by prehistoric peoples, the information to be gained from its study is by no means exhausted.

Postscript

The summer of 2009 will be remembered by New Englanders as one of the wettest on record. Almost daily rain storms saturated the soil. This weather contributed to a rather dramatic event on the evening of July 9 or early morning of July 10. At approximately 10 AM a party of about 20 participants in the annual NH State Conservation and Rescue Archaeology Program (SCRAP) field school arrived at the adit to view the Mount Jasper rhyolite at the source. Upon arrival they found that an enormous boulder (Plate 3) had slipped free from the top of the mountain and careened down the slope, bouncing off one tree and flattening others, finally coming to rest against a tree immediately in front of the adit. Careful inspection of the path of the boulder indicated that the fall occurred after the most recent rain,

Plate 3. SCRAP field school student on boulder released from the summit of Mount Jasper, July 9 or 10, 2009.

which would have been about 18 hours prior. The point of origin lay astride the dike in which the adit is located and well-weathered examples of the rhyolite were found at this location. Presumably the boulder had separated from the parent formation long ago, and the unseasonable rains lubricated the soils that had migrated under the boulder, allowing it to tumble partway down the mountain. In the course of time the tree will give way and the boulder will resume its journey to the Dead River.

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