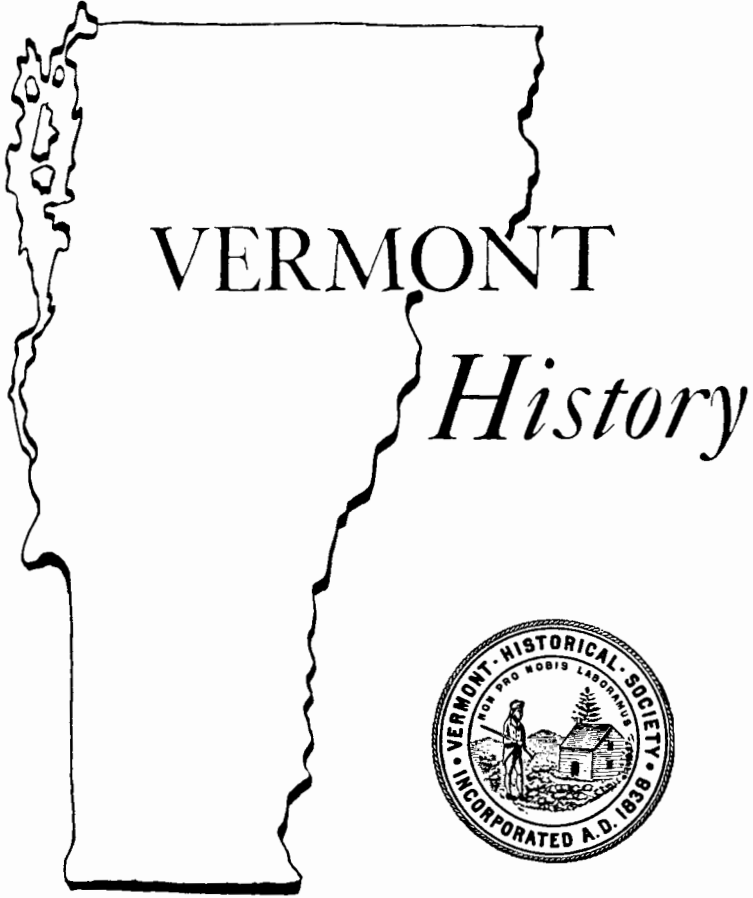


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The PROCEEDINGS of the  
VERMONT HISTORICAL SOCIETY

## EDITOR'S COMMENT:

In recent years Vermonters and others have puzzled over the origins of a number of stone chambers concentrated in the upland areas of Windsor and Orange Counties and sometimes associated with lithic material and alleged inscriptions. The puzzle has attracted the attention of scholars and others who have propounded explanations for the origin of the chambers ranging from pre-Columbian remains of European Neolithic or Bronze Age settlers, early Indians, and the settlers who pioneered the current occupation of Vermont. A conference on "Ancient Vermont" which convened at Castleton State College in 1977 attracted a huge turnout which eloquently testified to the popular enthusiasm for the exotic, ancient origins theory of the chambers.

The growing interest about the chambers prompted the newly appointed Vermont State Archaeologist, Giovanna Neudorfer, to mount a study of their origins. Her investigations first appeared as "Vermont's Stone Chambers: Their Myth and Their History." *Vermont History*, Vol. 47, No. 2 (Spring 1979), 79-147, and later in a slightly revised edition with an introduction in monograph form as *Vermont Stone Chambers: An Inquiry into Their Past* (Montpelier: Vermont Historical Society, 1980).

Not long before the publication of Neudorfer's work, *Ancient Vermont* (Rutland: Academy Books, 1978), the proceedings of the Castleton Conference, edited by the conference chairperson, Warren L. Cook, appeared. This volume provoked a biting review essay by Dean Snow (*Vermont History*, Vol. 48, No. 1, 33-40) and a group of rebuttals and comments on the issue which appeared in the Summer, 1980, (Vol. 48, No. 3) issue of *Vermont History* (Eleanor A. Ott, "'Ancient Vermont' in Perspective," 175-178; Warren L. Cook "A Rebuttal to the Review of 'Ancient Vermont'; Marshall McKusick, "Prehistoric Vermont and the Antiquarian Revolt"; and Richard V. Humphrey, "The Stone Chambers: Interpretive Troubles in Vermont."). Byron Dix, who participated in the Castleton Conference, and his associate James W. Mavor, Jr., have continued the discussion here.

The topic, as Marshall McKusick wrote, remains "a controversial subject which will not soon pass away." In the absence of a shared set of assumptions about the stone chambers, the questions concerning them continue to provoke "a conscious, deliberate look at the nature of history and the historical process."

H.N.M. III

## READERS' COMMENT

### Stone Chambers, Indians and Astronomy: A Critique of Vermont's Stone Chambers

*By Byron E. Dix and James W. Mavor, Jr.*

Giovanna Neudorfer, Vermont State Archaeologist, has assembled much useful, descriptive information about the stone chambers of Vermont in her recent monograph.<sup>1</sup> But, as Fitzhugh notes in his foreword to the volume, it presents only preliminary analysis of the stone chamber problem.<sup>2</sup>

Neudorfer concentrates on the questions surrounding the origins of the chambers. Although she praises James Whittall's advice to study each chamber "on an individual basis and not all lumped together . . . suggestive of one age and origin,"<sup>3</sup> she concludes that most of Vermont's chambers were built as root cellars in the 18th and 19th centuries, and that "While there are still many archaeological puzzles in Vermont, the stone chambers are not among them."<sup>4</sup> We cannot agree that the evidence available at this time supports this conclusion. We believe that answers to the questions about the chambers are likely to be more complicated than any solution yet suggested in the literature, and probably will depend upon facts of history and prehistory not yet known. Whittall's sound advice, which Neudorfer does not appear to take, calls for detailed investigation of each individual chamber and its surroundings.

Neudorfer presents three lines of evidence to support her conclusion of historic origin of the chambers constructed by European settlers—historic documentation, oral tradition and primary data. We have chosen to review her work under the headings: 1) the Indian question, 2) historic vs. prehistoric, 3) astronomical events recorded at chambers, 4) the eighteenth and nineteenth century farm setting, 5) oral tradition, and 6) chamber description.

### *The Indian Question*

Neudorfer states that "no archaeological evidence exists at present which suggests that prehistoric or historical Indian groups undertook the level of construction represented by the stone chamber." She also states that the concentration and distribution of stone chambers precludes construction by Indians because the native groups made only limited use of upland areas.<sup>5</sup> Depending upon how various dry stone structures are compared, one can argue that there are several known Indian groups which built at the chamber level of stone construction. These include the Hopewell phase of the Mississippian culture, about 300 B.C. to A.D. 1,000, which covered a large part of the eastern United States, and the Maritime Archaic in Labrador and other Arctic locations. Neudorfer cites several of the Arctic sources in a footnote.<sup>6</sup> As to distribution and concentration, Indian settlement patterns in Vermont are only now beginning to be described, and there is increasing evidence that Indians used the uplands extensively. In their recent study on the Indian occupation of Vermont, William A. Haviland and Marjory W. Power point out that Paleoindians ranged over large areas of Vermont which included the uplands.<sup>7</sup> Furthermore, stone chambers do not necessarily imply a settlement; they may have served a ritual, astronomical function.

### *Historic vs. Prehistoric*

Neudorfer states that the "stone chambers must be shown to be architecturally and functionally deviant from the 18th and 19th century farm setting which surrounds them before they can be examined within the setting of inscriptions and standing stones," and that "the stone chamber must first be demonstrated not to be historic before it can be demonstrated to be anything else."<sup>8</sup> This dogmatic position stems from the limited view of the possibilities she states: historical root cellars or prehistoric European structures.<sup>9</sup> She has eliminated the possibility that an indigenous, prehistoric people may have built the structures, a context which our work indicates as at least worthy of consideration. Broadening the possibilities leads to the logical inversion of Neudorfer's approach. The historical farm setting can be viewed as deviant from the Indian setting which existed for at least 10,000 years compared with the 200 years of European agricultural experience in Vermont. This approach challenges modern observers to stretch their sights beyond the more obvious and familiar. Over the immense time span from prehistoric to historic period, a stone chamber could have evolved from a place, perhaps sacred, to a temporary structure, to a stone building. Early European settlers could have thought that the cham-

bers were built by settlers who preceded them or by Indians, and that the continuous use of the chambers was not worthy of note.

Neudorfer footnotes the carbon 14 date of A.D. 500 for a charcoal sample associated with chamber No. 3\* in Vermont, a unique structure with access only through a triangular hole in the stone roof. She states that this date may relate to an old forest fire and "in no way proves the antiquity of the chamber."<sup>10</sup> James Whittall's report of this excavation notes that the date 1405 ± 190 B.P. does not necessarily date the construction of the chamber. However, the charcoal was local and therefore unlikely to have come from a forest fire; it does appear to date the period when lower earth fill was placed on the old humus where the charcoal was found, at 69 cm. below present grade. As the fill is retained by dry stone walling, it implies that those persons who moved the fill knew dry-wall construction.<sup>11</sup> It seems odd that Neudorfer relegated this potentially important information to a footnote.

#### *Astronomical Events Recorded at Chambers*

Neudorfer refers briefly to Byron Dix's findings of evidence of astronomical calendars associated with stone chambers in Vermont. She states that Dix has declared his findings tentative and has made no conclusions about the possible age and cultural affiliations of the chambers.<sup>12</sup> The conclusions indeed remain tentative, but our joint efforts since early 1978 have resulted in considerable additional evidence, both astronomical and archaeological, which suggests that the *locations* of some of the stone chambers were determined as part of an elaborate system used for recording astronomical events, partly for calendrical purposes. We have developed a method derived from the hypothesis that astronomical events were recorded in New England during several thousand years past. In addition to traditional treatment of settlement patterns, it includes selection, survey and excavation of sites based on statistical analysis of the locations of stone chambers, standing stones, cairns, marked stones, stone walls, stone rows, historical farmsteads, Indian settlement remains and other manmade lithic material. The results of this approach strongly suggest the purposeful location of stone chambers, standing stones and cairns in places intended for astronomical recording and other ritual functions. These lithic features appear to have a cultural unity and may be the remains of practices which originated in prehistoric times and possibly persisted into the historical period.

\*Neudorfer's study assigned a number to each known chamber in Vermont, and collected and presented data by chamber number.

Neudorfer states that “while descriptive data demonstrates that the chambers exhibit certain common patterns of location and construction and point to distinctive traits of particular structures, these data do not indicate either their date of construction or their purpose.”<sup>13</sup> To the contrary, the locations and geometries of chambers can indeed contribute to indications of both the date of construction and purpose. This is illustrated by two published descriptions of chambers, one in Massachusetts and one in Vermont, which have detailed design features so intimately connected to the astronomical plan that we suggest that parts, at least, of these particular chambers were constructed in a prehistoric era. A stone chamber in Upton, Massachusetts features a long, narrow entrance passage. An observer within the chamber looking out through the passage can see five large cairns on an elevated horizon one mile away. The cairns mark several important astronomical events, probably for calendrical purposes, which can be dated to A.D. 710.<sup>14</sup> They include the summer solstice sunset, and the setting of the Pleiades, Arcturus, Denebola, Alpheratz and El Nath.<sup>15</sup> The probability that a random orientation of the chamber and positioning of the hilltop markers could give this result is less than one part in a million.<sup>16</sup>

Many stone chambers are geometrically complex by design or because they have been modified. In some cases, walls are not straight or parallel, or there are double walls, or there are retaining curbs or internal or external niches. Some have entrance passages, some skewed to the main chamber.<sup>17</sup> James Mavor has suggested procedures for measuring chambers in order to record these complex features.<sup>18</sup> The chamber dimensions and orientations given by Neudorfer are useful only as approximate or mean values. We have measured a Vermont chamber in a 10 cm. cubic grid system which enables a faired drawing to be made with three dimensional resolution of 1-2 cm. We have discovered a complex shape from this, which has details important to the astronomical plan (Figure 1).

From our observation the entrance passage of this chamber (Neudorfer No. 36) is oriented to 104.6 degrees true, in the southeast quadrant, and an observer within the chamber can see the sun rise on the equinox in a notch in the horizon at an elevation of 15 degrees above horizontal precisely in line with the long entrance passage.<sup>19</sup> (See Figure 2). If the horizon were level with the observer, the azimuth of first gleam of sunrise at the equinox would be 89.2 degrees. Thus the elevated horizon causes a displacement to the south of the point of sunrise of 14.4 degrees. The sight line along the passage passes through a hole carved in the bedrock floor of the chamber and to the center of the west or back wall. This wall is inclined 15 degrees to the vertical so that its surface is perpendicular to the equinox sight line in the vertical plane and nearly so in the hori-

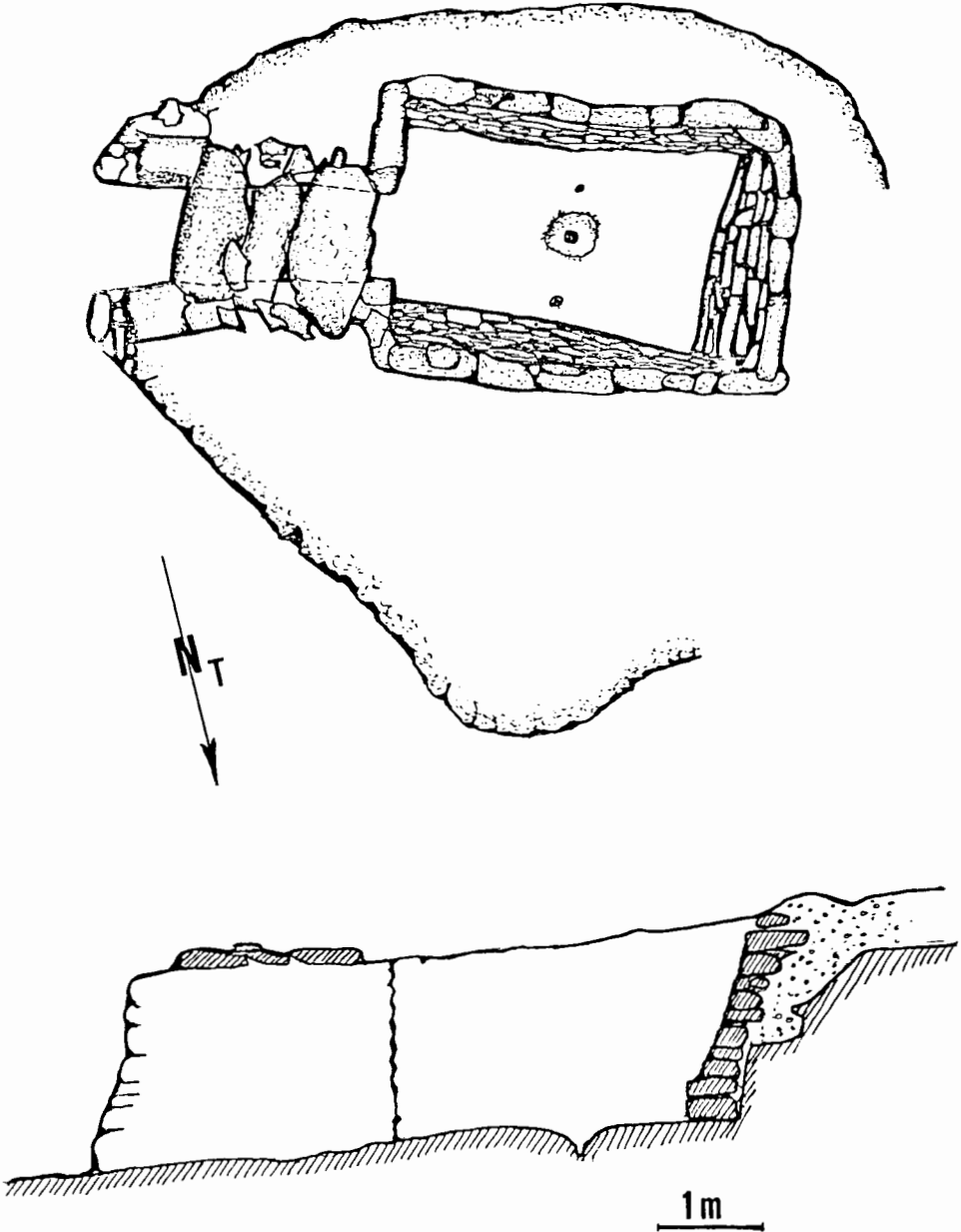


Figure 1  
Calendar I Stone Chamber No. 1  
(Neudorfer No. 36)

zontal plane. (Figure 1). When this chamber was excavated, the only artifacts found in the lowest stratum were possible crude stone tools and Indian magic stones.<sup>20</sup> The chamber is built into a cavity quarried one meter deep into bedrock. Neudorfer claims that this chamber was built by Arunah K. Woodward in the nineteenth century as a root cellar.<sup>21</sup> We question this on the circumstantial grounds discussed above and on the grounds of conflicting oral tradition discussed later.

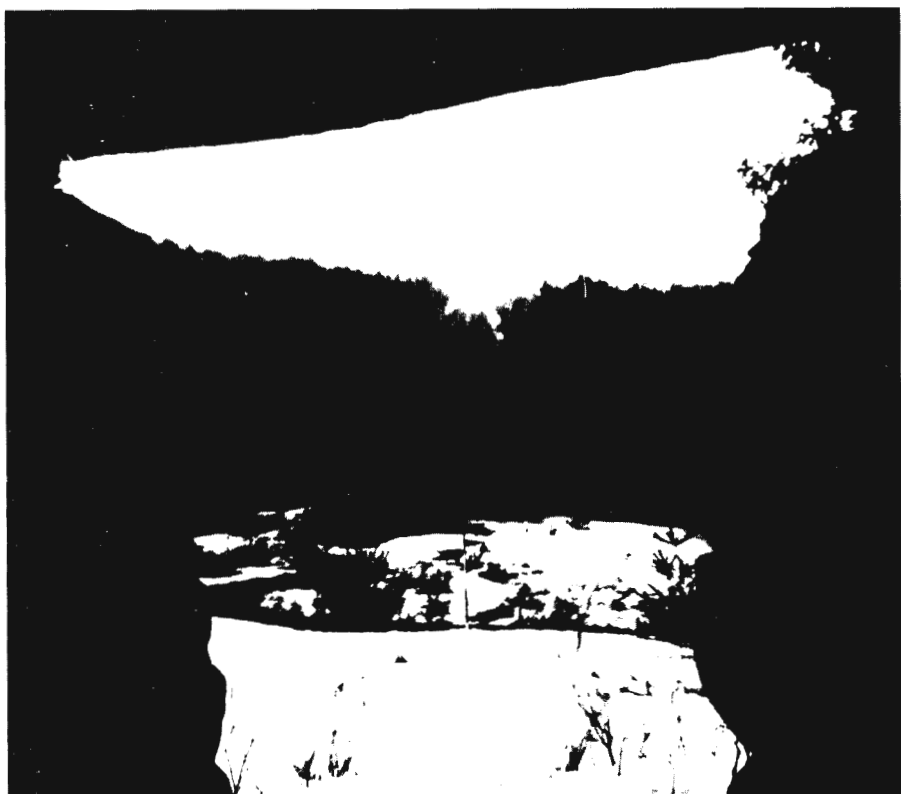
Neudorfer dismisses the issue of orientation of chambers with the statement that the "historic documentation emphasizes that the root cellar and various outbuildings should be oriented to the south or east."<sup>22</sup> There is in fact documentation which recommends orienting them to the north.<sup>23</sup> In any case, the orientation of a stone chamber is by itself an insufficient basis on which to judge either astronomical possibilities or root cellars. An astronomical alignment usually includes two points, an observation point, where the direction of the observation may be indicated by an oriented passage or other structural element, and a foresight, a marker on the horizon, sometimes miles away. The markers usually take the form of natural peaks, notches in rock formations, standing stones, cairns or chambers. Such elevations to the horizon should be included in any catalogue of stone chambers. Only about ten percent of the stone chambers have been studied in this way, because the process is time-consuming and must be done in winter. However, the proportion which exhibit all the requirements for an accurate ( $\pm$  one degree) alignment to an important astronomical event is impressive, about ten of the twenty we have observed.

Substantial evidence exists that Indians were interested in recording astronomical events in North America, including the New England area. Milton A. Travers reports that the Wampanoags "divided the year into spring, autumn and winter, counted the year by lunar months. The ecclesiastical year began at the first appearance of the first new moon after the vernal equinox. The sun was the adored god of great divinity and power."<sup>24</sup> The Portuguese explorers John de Verrazano in 1524 and Esteban Gomez in 1525 both observed agricultural use of a solar calendar and religious association with the bodies in the sky.<sup>25</sup>

### *Eighteenth and Nineteenth Century Farm Setting*

The documentation of root cellar construction reveals nothing about the origins of the stone chambers of Vermont, and could possibly owe more to ancient stone chambers which were adapted to root cellar use than to a specific design for the building of root cellars. There are root cellars lined with wood or stone walls and wooden roofs. There are records of structures which look like stone chambers which have been or are being used as root cellars. In particular, Amos Long's description of Pennsyl-





*Figure 2*  
*Equinox Sunrise From Interior of Calendar I*  
*Stone Chamber No. 1*

vania farm practice describes structures very similar to stone chambers.<sup>26</sup> They were not necessarily built as root cellars; he states only that the farmers used these cellars, not that they built them. In short, some of Neudorfer's documentation of root cellars in areas other than Vermont, used to show similarities to the stone chambers in Vermont, could represent stone chambers themselves, and not necessarily root cellars.

Soil floors are a part of traditional root cellar design and serve to keep crops moist. Neudorfer states that with two exceptions, all the Vermont chambers have earthen floors.<sup>27</sup> In fact, from our observation at least seven chambers, Numbers 1, 3, 6, 9, 26, 29 and 36, were built on bedrock with quarried bedrock floors. (We have collected little information on all the others.)

Most of the stone chambers we have observed were not particularly well suited for food storage, even though they are reported to have been used intermittently for such storage. Only ten of the fifty chambers listed are reported to have vents.<sup>28</sup> A root cellar must have two vents for proper circulation, an inlet and an outlet. They could both be in the door, but this does not serve well because the vent area should be a minimum required for air circulation to prevent temperature change. Vents should be built into different parts of the structure, as in modern practice, but most chambers have no provision for this. Also, since control of respiration as well as temperature is important and different foods require different amounts of respiration, the size of the vent should ideally be related to chamber volume and to the type of food stored. The ratio of chamber volume to vent area for the 8 chambers listed varies from 54 to 3360, a factor of 62.<sup>29</sup> This tremendous variation is not consistent with modern design recommendations for food storage. Chamber No. 29, used to store cabbages,<sup>30</sup> which require a low rate of respiration and therefore a small vent, has by far the largest vent of all in proportion to volume. This vent, however, is known to have been enlarged to make a cabbage chute.

The root cellar documentation mentions a preferred orientation. Neudorfer catalogues seventeen out of fifty chambers as oriented to the eastern sector (45-135 degrees) and thirteen out of fifty oriented to the southern sector (135-225 degrees).<sup>31</sup> These data do not support a dominant southern orientation. She states that field observations demonstrate a strong nineteenth century concern with proper solar orientation of hill-side cellars (known root cellars implied).<sup>32</sup> Neudorfer mentions no field observations except for the stone chambers.

### *Oral Tradition*

In her conclusion, Neudorfer cites oral evidence that seven slab-roofed stone chambers were constructed expressly as root cellars. In Table 20 she lists dates of construction given for fifteen chambers and two labeled as recent.<sup>33</sup> The text reports, chambers 9, 14, 16, 12, 31, 36 and 43 as built for root cellars, no. 8 as a hideout during Indian raids, no. 17 as a dwelling and nos. 15, 34 and 39 as family burial vaults.<sup>34</sup> The oral tradition for the seven chambers designated as root cellars goes back four generations and is cited as an excellent example of "the powers of memory of successive generations."<sup>34</sup> She deplores our short historic memories,<sup>35</sup> yet she gives credence to these oral traditions,<sup>36</sup> since no documentation exists for the origins of most stone chambers.<sup>37</sup>

Chamber no 39, the "burial vault," was used to store apples and cider. Another "burial vault," chamber no. 34, has a vent.<sup>38</sup> Neudorfer states

that the oral tradition concerning Type A chambers, those within foundations, is thinner than that for Type B, other chambers.<sup>39</sup> This is curious because Type A chambers are almost all fireplace platforms, which, architecturally, have a much firmer historical base than Type B. Neudorfer reports the oral tradition that one man helped to build five chambers including nos. 9 and 36.<sup>40</sup> The builder of chamber no. 36 was supposedly one Arunah K. Woodward. Another local source, whose lifetime overlaps that of Woodward, reports that A.K. Woodward never lived in the region of chamber no. 36, though he did own the property. There is also no mention of Woodward building any of the buildings in the area. Land records of Windsor County, the location of chambers nos. 9 and 36, report the first settlers in 1782. However, I. Dunkler writes that chamber no. 9, about a quarter mile from chamber no. 36, was used as a retreat from the Indians during the Royalton raid of 1780.<sup>41</sup> We suggest that inconsistencies, such as given above, are typical of the oral tradition of stone chambers and that the oral tradition of Vermont settlers as evidence of historic construction of stone chambers does not stand up to scrutiny. Without this questionable material, Neudorfer does not present a record of the provenance of more than a few of the chambers.

Neudorfer omits Indian oral traditional accounts of stone chambers, perhaps because there may be few in Vermont. But in Massachusetts, Connecticut and Rhode Island, where remnants of the Indian tribes remain, there are vivid accounts of the Indian's use of the chambers in the seventeenth century. Sarah M.C. Sullivan, a Nipmuck Indian, wrote in 1948 that members of her tribe used the stone chambers in eastern Massachusetts as hideouts during King Phillip's War in 1676. She also reports that her people were great stone builders, but she does not say that they built the chambers.<sup>42</sup>

### *Description of Chambers*

Our field observations have revealed a number of errors in detail presented by Neudorfer.

TABLE 1  
Corrections to Neudorfer Data

<i>Page</i>	<i>Statement</i>	<i>Corrections and Comments</i>
Table 5	#28 chamber is Type A (within a foundation)	Wrong. It is not within a barn foundation.
Table 5	Chambers #9, 12 and 29 are built into hillsides	Wrong. They are freestanding

Table 10	Orientations are compass readings	Wrong. They are true.
	16 ¼ degrees deviation used for all others	Incorrect. Some are 15.
18	Mortar on interior suggests original construction.	Not necessarily, if superficial, which it is in most cases.
22	All chambers built with stone ceiling slabs except 40 & 50	No. 36 unknown, those on passage are recent.
23	No. 36 is a collapsed chamber	No evidence of collapse. Stone roof is either missing or never existed.
Table 17	No. 36 chamber has two slabs	Wrong. There are 3.
Table 20	No. 32 has well and cistern nearby.	Uncertain. It is located near a spring.
32	No. 36 built by A.K. Woodward	Conflicting oral tradition
38	With two exceptions, all chambers have earth floors	Wrong. Nos. 1, 3, 6, 8, 26, 29 and 36 have bedrock floors.
58	Many grooved marks on large lintel or ceiling stones	Few marks on ceilings
58	Dig away soil covering rock anywhere, will find channels	Wrong, only in certain places.

### *Conclusions*

In our view, Neudorfer has not provided sufficient evidence to support her conclusion that Vermont's stone chambers were built within the past two centuries by settlers of European origin. We have established a number of important errors in the chamber descriptions. We have pointed out that some of the documentation of the farm setting, though interesting, is irrelevant to the question and that some structures purported to represent the farm setting may be stone chambers. We have also pointed out inconsistencies and omissions in the oral tradition. We suggest that prehistoric indigenous origins for some of the chambers remains worthy of consideration and, if so, raises questions about the appropriate research philosophy and method. If, as we believe, the chambers have an astronomical aspect, at least two may have been built in part in prehistoric times.

NOTES

- 1 *Vermont's Stone Chambers* (Montpelier: Vermont Historical Society, 1980). Most of the volume first appeared in *Vermont History*, Vol. 47, No. 2.
- 2 Neudorfer, *Stone Chambers*, p. X.
- 3 *Ibid*, p. 6.
- 4 *Ibid*, pp. 57 and 61.
- 5 *Ibid*, p. 2.
- 6 *Ibid*, p. 66.
- 7 *The Original Vermonters* (Hanover, N.H.: University Press of New England, 1981), pp. 34, 39.
- 8 Neudorfer, *Stone Chambers*, p. 7.
- 9 *Ibid*, pp. 2, 4, 5, 7, 57, 58, and 61.
- 10 *Ibid*, p. 71.
- 11 James P. Whittall, II, "Archaeological Survey - Drystone Chamber WD 16," *Early Sites Research Society Bulletin*, Vol. 7, No. 1, (1979), 2.
- 12 Neudorfer, *Stone Chambers*, p. 66.
- 13 *Ibid*, p. 34.
- 14 Byron E. Dix and James W. Mavor, Jr., "Possible Astronomical Alignments, Date and Origins of the Pearson Stone Chamber," *Early Sites Research Society Bulletin*, Vol. 8, No. 1, (1980), 3.
- 15 The star alignments are dated by comparing the observed marker positions with the setting horizon points calculated from the known precession of the equinoxes and stellar proper motion. At the Upton site, the setting point moves along the horizon at the rate of about fifteen meters every century. The solstitial sunset alignment is dated with somewhat less precision from the fact that the setting point moves nearer the equinox setting point at the rate of about 1.5 meters each millenium.
- 16 The possibilities considered in the probability analysis included the past 12,000 years, about 100 stars, all man-made markers in an area of about 50 acres and all possible orientations of the chamber.
- 17 From field observations by Dix and Mavor over the past seven years.
- 18 James W. Mavor, Jr., "Geometry and Metrology in Ancient New England," *Early Sites Research Society Bulletin*, Vol. 7, No. 1, (1979), 17.
- 19 Byron E. Dix and James W. Mavor, Jr., "Two Possible Calendar Sites in Vermont," in Ray A. Williamson, ed., *Archaeoastronomy in the Americas*, (Ballena Press, 1981), Chapter 11.
- 20 William S. Fowler, "Magic Stones and Shamans," *Bulletin of Massachusetts Archaeological Society*, Vol. 36, Nos. 3&4, (1975), 10.
- 21 Neudorfer, *Stone Chambers*, p. 32.
- 22 *Ibid*, p. 48.
- 23 Eric Sloan, *Diary of an Early American Boy - Noah Blake 1805* (New York: Ballantine, 1965), pp. x and 82.
- 24 *The Wampanoag Indian Federation* (Boston: Christopher, 1961), p. 29.
- 25 Amelia F. Emerson, *Early History of Naushon Island* (Privately printed, 1935), pp. 19 and 54.
- 26 Neudorfer, *Stone Chambers*, p. 41.
- 27 *Ibid*, p. 22.
- 28 *Ibid*, pp. 27 and 48.
- 29 *Ibid*, pp. 95 and 98.
- 30 *Ibid*, p. 32.
- 31 *Ibid*, p. 90.
- 32 *Ibid*, p. 56.
- 33 *Ibid*, p. 99.
- 34 *Ibid*, pp. 31-32.
- 35 *Ibid*, p. 63.
- 36 *Ibid*, pp. 30 and 56.
- 37 *Ibid*, p. 33.
- 38 *Ibid*, p. 98.
- 39 *Ibid*, p. 30.
- 40 *Ibid*, pp. 31-32.
- 41 June W. Potts, "Dairy Hill," M.A. Thesis, Goddard College, 1981, pp. 17, 22, 23, 60 and 61.
- 42 Sarah M.C. Sullivan, "Hassanamisco," *Early Sites Research Society Bulletin*, Vol. 9, No. 1, (1981), 10.