Temporal Hygiene: Problems in Fort Ancient Cultural Chronology

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“...no systematic procedure has been adopted by the archaeological community. As a result, our databases may be significantly weakened by questionable dates and/or questionable associations between dated samples and the archaeological phenomena they are intended to represent. As the use of chronometric data in general becomes more ambitious, we must pause and assess how reliable these data are.”

Pettitt et al. 2003:1685

Introduction

Radiocarbon dating is an invaluable tool for measuring absolute time in many disciplines. However, like any tool this technology must be used appropriately to yield valid results. The proliferation of “scientific” dates in the literature lulls one into a sense of security in knowledge. Not all dates are equal and not all dates bear the same relation to the events of interest. The above quote is applicable in almost any region and multiple disciplines (Blockley and Pinhasi, 2011; David, 2008; Grimm et al., 2009; Hart et al., 2002). Recently many scholars have begun the processes of sifting through the massive databases compiled since the advent of radiocarbon dating to effectively winnow the chaff from the seed and place our temporal reconstructions on more objective footing. This body of work has resulted in a set of objective criteria (e.g., Blockley and Pinhasi, 2011; Collett and Robertshaw, 1983; Pettitt et al., 2003; Telford et al., 2004). Some criteria are more important in some regions and contexts, and not all investigators apply the most astringent hygiene procedures. One common result from these efforts is the realization that most dates are invalid or at least irrelevant for the stated analytical aims (i.e., for reconstructing occupation timing), and many “well-known” sites and sequences are essentially undated (see Blockley and Pinhasi 2011: Table 1).

The Middle Ohio River Valley (hereafter MORV) is no exception to these issues. Like many regions (e.g., David, 2008), many of the dates and subjective preconceptions used to evaluate chronology are derived from the early days of the development of the procedure. There has been a tendency in MORV to reject the more recent tail of the date distributions. There is no objective reason to prefer older ages to younger ages (Collett and Robertshaw, 1983). Further, most MORV dates are derived from wood samples or unidentified samples. Most of the wood samples are not identified to species, and sample size and composition are rarely reported. Thus, we have very good reason to view the older age estimates with
suspicion (old-wood bias). Large chunks of wood will include several rings, and, especially when used in mixed samples, will be averages of multiple growth periods. Further, the inert inner-layers, advanced in loss of $^{14}$C, are more likely to be left after a fire. The younger layers on the exterior – having the most proximate relationship to cut date – have little chance of surviving intense burning (Puseman et al., 2009).

The practice of picking the “best” date out of a range based on preconceived notions of phase ages permeates many of the established spatio-temporal classificatory constructs in wide use in the MORV and beyond (Blockley and Pinhasi, 2011; Brady-Rawlins, 2007; Carr and Haas, 1996; Collett and Robertshaw, 1983; David, 2008; Means, 2005; Pettitt et al., 2003; Schambach, 1971; Truncer, 2006). It must be remembered that many of these units are inherited culture-historical constructs that pre-date radiocarbon dating (e.g., Griffin 1966). Recent analyses have critically assessed the timing of various significant events in eastern North American (ENA) Late Prehistory (LP) and have revealed spurious patterns derived from casual interpretation of radiocarbon dates (Carr and Haas, 1996; Cook, 2007; Greenlee, 2002; Hart et al., 2002; Hart et al., 2005; Means, 2005, 2006, 2007). This is a welcomed advance; however, none of these prior efforts in ENA or MORV have applied a rigorous “cleaning process” to the regional date database. Procedures based on objective standards of quality control (in line with international efforts) are required to begin to reconstruct more accurate and precise MORV chronologies. My efforts are just the first in this vein, and illustrate both the problems in the extant records and the promise of such reevaluations. I hope to start an open dialogue to develop more rigorous and appropriate criteria for the interpretation of radiocarbon dates in the literature. My criteria provide an illustrative case study but are not intended to be final and absolute (for a similar sentiment see Pettitt et al., 2003).

**Reliably Tracking Absolute Time**

Many investigators have noted that uncritical promulgation of dates and their subjective interpretation, coupled with a lack of rigor in the way they are reported and published leads to many errors in temporal interpretation (Blockley and Pinhasi, 2011; Carr and Haas, 1996; Collett and Robertshaw, 1983; Pettitt et al., 2003; Power et al., 2010; Telford et al., 2004). Major problems in many cases are the dating method (conventional beta count or AMS), lab procedures (sufficient pretreatment, modern reporting standards and measurement protocol), material dated (bone, burnt bone, humus, long-lived wood, mixed samples, short-lived wood, annual seeds and nuts), and any relevant carbon reservoir (Blockley and Pinhasi, 2011; David, 2008; Grimm et al., 2009; Peacock and Feathers, 2009; Pettitt et al., 2003).

“Radiocarbon dating is essential [in constructing cross-correlated sequences] because it is an independent technique for chronological ordering” (Collett and Robertshaw, 1983: 59; emphasis added). “It is important that we do not unwittingly place greater emphasis upon our relative archaeological chronologies (derived from typological and technological variability) than on absolute dated ones: we may be discarding methodologically valid dates simply because they disagree with our preconceptions about the development of cultural sequences” (Pettitt et al., 2003:1687). Cross-dating is wide spread in MOVR, as is the practice of rejecting dates that don’t fit the current phase chronology. “Before the advent of accelerator mass spectrometry (AMS) radiocarbon dating, investigators typically obtained conventional
decay count (radiometric) radiocarbon dates from samples of bulk sediment or occasionally from large wood fragments” (Grimm et al., 2009:301). The bulk sediment and wood samples bear an unknown relationship to the time of deposition. The issues of association alluded to by Grimm et al. (and others) has been known for some time; however, Grimm and colleagues note that even after AMS largely replaced conventional dates in recent years (for paleoecology at least), there remains a “great legacy of conventional bulk sediment ¹⁴C dates … in the literature and in paleo databases, which are widely used for synoptic … studies” (Grimm et al., 2009:301). While bulk sediment dates are less of an issue in archaeology, the “great legacy” of older conventional dates is very relevant. In fact, Blockley and Pinhasi (2011:102) note that dates on unidentified and long-lived species were all “several hundred years older than dates on charcoal identified to shorter lived tree species” (emphasis added). This created significant resolution issues in deciphering the timing and context of the origin of the first agricultural societies in the world and has a largely unrealized impact on many other important regional chronologies.

With the above issues in mind, I now review criteria previously used in “cleansing” radiocarbon databases. My discussion is derived primarily from Pettitt et al.’s (2003) and Blockley and Pinhasi’s (2011) discussions and the criteria they employed in improving the hygiene of their databases. These criteria inform my scoring procedure employed below for the MORV LP site analysis.

**Pettit et al. 2003**

1. The certainty of association between a dated sample and the archaeology/event that it is intended to date.
2. The difference in age between the sample and the date of its deposition, e.g. ‘old wood’ effects.
3. The contamination of samples with younger or older carbon bearing materials such as humic acids and carbonates.
4. The differential effects of contamination depending on sample age (i.e. the older a sample the greater the potential effect).
5. Potential problems with certain chemical fractions, e.g. the relatively open system of bone being more susceptible to contamination and the question of burnt bone.
6. Inter laboratory pretreatment and measurement error.
7. The question of ‘averaging’ dates from large data sets.
8. The interpretation of large data sets.
9. The issue of calibration, which at the time (1971) was applicable back to c. 5000 BC.

**Blockley and Pinhasi 2011**

Key criteria are as follows:

1) Good security of association between sample and the archaeological event...
2) The depositional context is understood and any localised problems such as 14C reservoirs are corrected for...
3) Sufficient radiocarbon laboratory protocols are undertaken to remove contamination...This can be a particular problem with older samples and ...bone collagen...
4) An internationally agreed calibration curve...
5) Any statistical manipulation of the radiocarbon data...is appropriate, and accounts for the nonnormal probability densities of calibrated radiocarbon data, and reports defined uncertainty ranges...

Figure 1: Previous cleansing criteria used in other regions.
Pettitt et al. derive a very detailed scoring system with values ranging from 0-4 for each of nine problem areas: contamination by older/younger carbon and measurement of irrelevant carbon fractions; 
$^{14}$C dating of different chemical fractions; accuracy; sample materials and $^{14}$C measurement; sample measurement and reporting; certainty of association of dated sample with human activity; relevance of dated sample to specific archaeological entity of concern; quantity and nature of dates for archaeological horizon; sample materials and stratigraphic issues (pp. 1687-1690). This very detailed structure is necessary for several reasons concerning their context of investigation. Many Paleolithic sites are stratified multicomponent rock shelters which date beyond two $^{14}$C half-lives before present. This makes contamination by bedrock and water a very significant issue. Further, mobility of objects among strata can significantly affect the relationship between the organic dated and the associated artifactual material. This requires hypersensitivity to detailed contextual analysis and agreement among dates within layers. Many of the dates from Paleolithic sites are derived from bone, which Pettitt et al. (2003:1688) note is an open system, more liable to contamination; this heavily influences their evaluative criteria. Pettitt et al. must also deal with exceedingly old dates at the edge of the calibration dataset. Many of their criteria are dependent upon multiple dates in agreement within and among strata. In more recent, single period, open sites (like many of the MORV LP sites) many of these criteria are irrelevant. Pettitt et al. (2003:1687) “evaluate each sample in terms of our criteria on a point basis, beginning from 0 (reflecting very poor confidence in the aspect of concern) to 4 (very high confidence). The resulting ‘scores’ provide a reflection of the reliability of the date and its relevance to archaeological issues. We realize the arbitrary nature of such a procedure. Given this, it seemed logical to arbitrarily chose [sic] 40% (i.e. scores of 0 and 1) as a cutoff point below which were have little or no confidence in the attribute of concern, 40–60% (score of 2) as falling into a category of questionable confidence and 60% or above (scores of 3 or 4) as reflecting confidence. We combine individual scores into an overall evaluation score which uses the same cut-off points.”

Blockley and Pinhasi likewise repeatedly emphasize the value of stable isotope data in evaluation of dates. Pettitt et al. explicitly recognize the effect of outdated laboratory pretreatment and measurement techniques; automatically discounting all mixed samples and any sample run prior to 1970. Blockley and Pinhasi go further and discount any dates run prior to the “late 1980s” (p. 101). Both groups of scholars also regarded age estimates with very large uncertainties as suspect. They also both note the importance of employing updated calibration curves before embarking on any interpretive studies. While some synthetic studies from MORV and adjacent areas have done this (Brady-Rawlins, 2007; Carr and Haas, 1996; Cook, 2007; Drooker, 2000; Greenlee, 2002; Means, 2005), not all synthetic work has.

While I have not listed all of the evaluation and scoring criteria (especially Pettitt et al.’s), this review serves to illustrate the important considerations that are necessary when conducting a regional temporal hygiene exercise. One final distinction between the two systems of evaluation is worth pointing out. Blockley and Pinhasi apply four binary criteria by which samples are rejected for violating any one of the criteria. Pettitt et al. construct a scoring system where each of the nine considerations contributes to a composite score. Here, I prefer the scoring system approach employing a largely arbitrary cut off point similar to Pettitt et al. Due to the inconsistencies of reporting, many of the quality control and contextual information required by Pettitt et al. and Blockley and Pinhasi are not possible with the extant literature for MORV. The scoring system that I use employs information about material dated, method used, and
whether or not the assay was run before 1970 (mirroring Pettitt et al.). Finally, measurements with a
standard deviation \( \geq 100 \) are viewed as less reliable for occupation history estimates.

These minimal hygienic criteria reduce the sample of dates by 80%. This is even greater than the
degree of cleaning achieved by Blockley and Pinhasi’s more rigorous criteria; they retained “~86” out of
an initial 228 dates for a reduction of just over 60%. Blockley and Pinhasi likewise lament their inability
to apply a more astringent cleaner to their database due to the vagaries of the published database.

Criteria Used

I employ three categories of information: type of material dated (“Sample” column in Table 1),
method of measurement (“Method” column in Table 1), and age of measurement (i.e., pre- or post-1970;
the ‘Y’ variable in the scoring formula, see Table 1, note d). The score calculations are as follows:

Sample (S):

(-1) No information is provided in the literature regarding the material dated.

(0) Sample is composed of mixed wood from throughout the sampling unit. This is prevalent in older
samples where the need for large samples required aggregation, but has persisted until even the most
recent investigations (see e.g., Nolan, 2009, 2010).

(1) Single species of wood is reported or inferred from textual descriptions. These are either large
chunks/logs, or no information on sample size is provided. Some samples may have been unduly
promoted to this category where sample contents were not explicitly discussed; however, this should have
no impact on quantity of retained dates due to subsequent ranking criteria.

(1.5) Small wood samples either identified as “twigs”, or other information indicates that a small
sample was submitted. This limits the possibility of older layers and multi-growth period averaging;
however, this does not ensure proximity to event of interest.

(2) Samples of mixed plant material and/or mixed nuts. Given that these samples are aggregated from
the whole level and not explicitly selected for dating with secure descriptions of their context, we cannot
be sure that they are all related to the event of interest, or to the same event.

(2.5) This score is assigned for “plant” material. This is a vague category only used by Lee (2010).
Precisely what she means is unknown, but it is contrasted with “mixed plant” and wood samples.
Therefore I infer this to be a single non-wood specimen. Thus it should bare a more solid relation to the
event of interest, though the uncertainty of identity warrants caution.

(3) Bone is assigned to this category. Perhaps, this is an overestimation of the reliability of some of
the bone dates in the sample given the notes of caution previous authors have enumerated (Blockley and
Pinhasi, 2011; Collett and Robertshaw, 1983; Pettitt et al., 2003); however, several of these bone dates are
very recent. Older dates will be discounted by other criteria so the net effect of false promotion here
should be negligible. To my knowledge, no burnt bone samples are included.
Nuts and nut shells constitute this category. The single year nature of these specimens provides a high probability of unity with the event of interest.

Cultigens and seeds constitute this highest ranked category. These are given slightly more credibility than nuts because nuts may become incorporated into a depositional context from natural and/or preceding events. Cultigens and seeds are much more likely to date at least some level of human activity, very likely the precise event of interest.

Measurement Method (M):

(0) Conventional beta count dates
(2) AMS dates

This adds weight to the higher precision method that can be used on smaller samples. Well chosen samples with higher precision measurements will produce age estimates more proximate to the event of interest, giving these dates greater priority in determining age of occupation.

Age of measurement and precision (Y):

(-2) If date was processed prior to 1970 or had a 1 σ range ≥ 100. Note that in practice these two criteria overlap significantly.

Otherwise, no change is made to the final score (i.e., Y = 0).

Composite scores are the result of this simple formula: S + M + Y. Scores range from -3 to 6.5. I chose to a partially arbitrary cutoff of scores > 3. Scores exceeding the cutoff point are acceptable dates to use in estimating age of occupation directly. Scores below the cutoff have a tenuous connection to the event of interest, and, especially in the case of wood dates, are only maximum estimates of the age of occupation. These “unacceptable” dates may be useful for other research aims, however. The selected cutoff value precludes any wood date from being used in a straightforward manner to represent the age of the occupation. This alone is the primary reason for choosing this cutoff value. A benefit of this approach over the Blockley and Pinhasi reject/accept protocol is that sites without “reliable” dates can still be cautiously analyzed realizing that the best they can be is a maximum age estimate. Further, this provides a tool for deciding among acceptable dates if there is stark disagreement. Though other factors should be considered in any evaluation (e.g., context, likelihood of multiple components), all other things being equal, a date score of 4.5 should be regarded as having a higher probability of representing the “true” age of the occupation than a 3.5.

The Sites

Eleven sites were selected for this analysis. Sites were chosen that had multiple dates, covered a wide geographic range within the Fort Ancient territory, and (where possible) had played a large role in constructing regional chronologies and narratives of cultural change. The sites chosen are given in Figure 2.
Sites

- Muir (E, Osborne)
- SunWatch (M, Anderson)
- Wegerzyn (M, Anderson)
- 33DL2228 (Non-Fort Ancient)
- Knowlton (Non-Fort Ancient)
- Blain (E, Baum)
- Reinhardt (M)
- Voss (E/M, Bm/And/Osb)
- Baldwin (E, Baum)
- Philo II (M, Philo)
- Richards (M, Philo)

Figure 2: List of sites and previous interpretations of time period and cultural affiliation.

Results

Figure 3 provides the initial sample of all dates and Figure 4 illustrates the changes in chronology apparent after cleaning the database by the above enumerated criteria. The full database and the results of cleansing are presented in Table 1.

Muir

Muir was initially interpreted as occupation(s) occurring between AD 991 and AD 1239 (Turnbow and Sharp, 1988: Chapter 11). None of the six Muir dates are acceptable. All dates score a 1, leaving each as a maximum age. If there truly is a single age or age range to estimate then the event must have taken place sometime more recent than ca. AD 1200 and perhaps significantly so. That is, the type site for the Early period, Osborne Phase (AD 950 – 1200) was not occupied during the Early period (Turnbow and Sharp, 1988: Chapter 12).
Figure 3: Pre-cleansing date sample spanning the entire range of the Late Prehistoric period.
Figure 4: The cleansed database showing a distinct narrowing of the time range of occupations and a significant reduction in the number of dates available.

SunWatch

The original interpretation of SunWatch placed the occupation in the Early period (ca AD 1100 – 1200). More recently, Cook has revised the estimate of occupation timing into the late Middle period (ca. AD 1350). Of the 21 dates from SunWatch, only two are acceptable (A 0175 and I 7087). This indicates an occupation after AD 1300. The two acceptable dates have mutually exclusive 2 σ ranges. However, there is only a 5 year gap and I 7087 has a very large uncertainty and is an older measurement. There is a string of wood dates between the acceptable dates that could be maximum ages on a 16th century component. Most of the wood dates are within the 1 σ range of A 0175, and there is a > 100 year gap
between the youngest wood date and the corn dated as I 7087. While it is possible that there are two discrete time ranges represented, more dates are needed.

Wegerzyn

Wegerzyn is a small, possibly circular village located just north of SunWatch (Cook, 2008; Simonelli and Kennedy 2003). Initial impressions led to the expectation of an Early period occupation, primarily by cross-dating with the initial interpretation of SunWatch. More recent interpretations place the occupation in the Middle period, derived primarily from interpretation of a tight cluster of AMS dates. Wegerzyn sheds light on some of the synchronic variability in settlement and lifestyle during the Middle period. Krieg (2009) has argued that Wegerzyn may be closer to a “normal” Fort Ancient village than SunWatch.

The 12 wood dates exhibit a 300 year range. The ages cluster according to method of measurement, with the more recent (AMS) dates falling in the late 14th century, contemporary to or even post-dating the more elaborate SunWatch. Further, this is a maximum age estimate, and the true age may be more recent. The scoring system reveals a single acceptable date (Beta 68664). This is a beta-count date on a very small sample of nutshell which required extended counting (four times normal; Kennedy personal communication 2011) resulting in a large σ range. This date is in statistical agreement with the AMS wood dates, but caution is advised in interpreting the mean/median as directly related to occupation time.

33DL2228

33DL2228 is north of the traditional Fort Ancient territory in the upper reaches of the Scioto drainage. The site was investigated under a CRM mitigation project and yielded typical LP artifacts from a small scatter of features and a smaller Middle Woodland component (Beta 259209 and 259207). Typical Fort Ancient ceramic designs were absent (Lee, 2010). All of the “plant” dates were AMS measurements and qualify as acceptable dates. All of the 1 σ ranges for acceptable dates overlap yielding a likely approximate date range of AD 1100-1300. Even the conventional wood date fits with the likely range, a contrast with most of the other sites.

Knowlton

Knowlton is also a CRM investigated site in the upper reaches of the Scioto drainage classified by Weller (2005) as Cole. The inventory of the site is similar to that noted for 33DL2228 (i.e., LP lacking FA ceramic designs). None of the dates are acceptable. Four of the AMS dates register a 3 score, constituting two clusters. Being wood samples these must each be treated as maximum estimates. The most recent cluster of AMS dates indicates an occupation after AD 1300, possibly as late as the 16th century (though the youngest date has a large standard deviation). Thus, LP sites lacking decorated ceramics extend well into the Middle period, at least at these latitudes.
Table 1. Radiocarbon Dates from Selected Late Prehistoric Sites

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a: 1 = Central Ohio; 2 = South Central Ohio; 3 = Southwestern Ohio; 4 = Southeastern Ohio; 5 = Southwest Ohio.
b: 1 = no information; 0 = mixed wood; 1 = wood; 1.5 = small wood; 2 = mixed plants and nuts; 2.5 = plant; 3 = bone; 4 = nut or nutshell; 4.5 = nutshell (e.g., bean, corn).
c: 0 = standard error; 2 = AMS.
d: Total score = Sample * Method - Y, if date submitted before 1970 and/or sigma = 0. Then Y = 2; otherwise Y = 0. Note that sigma 100+ and date prior to 1970 are nearly synonymous.
e: The method of measurement was not specified and could not be determined based on typology (i.e., pre-1984 must be standard) assumed standard.

Blain

The original Blain dates spanned several centuries. Prufer and Shane (1970) preferred the earliest dates. However, the sample material, age of measurement, the large error ranges, and the subjective rejection of the more recent age estimates all count against the interpretation of Blain as an Early period site. More recently Carr and Haas (1996) and Hart et al. (2002) have obtained more robust dates from curated materials. All of the newer measurements, and only the newer measurements, are acceptable and place the occupation within the Late period.

Reinhardt

A total of eleven AMS assays were run on material from the Reinhardt site (Nolan, 2009, 2010, 2011). Using only the acceptable nutshell dates, an occupation between AD 1300/1350 and 1430 is most likely. A smaller, earlier occupation cannot be ruled out. This earlier occupation is represented by a bone collagen AMS measurement and 2 (of 3) TL dates on ceramics (Nolan, 2010: Table 6.1).

Voss

Voss has been variously interpreted as a late Cole site, and Early period Baum phase site, a Transitional period (AD 1000 – 1200) site, and a multicomponent site with activity into the 16th century (Baby, Potter, and Mays 1966; Brady-Rawlins 2007; Prufer and Shane 1970). The dating issues for Voss
are numerous (Carr and Haas 1996). Only four of 28 assays are acceptable. Like Reinhardt, the earliest acceptable date is an AMS measurement on bone collagen. This date does not overlap any other acceptable date at 2 σ. The second oldest acceptable date likewise does not overlap any others at 2 σ. The remaining two dates are indistinguishable from each other, and fall at the Middle/Late period boundary. Finally, one recent measurement by Carr and Haas on wood falls very late in the sequence, but overlaps the last two acceptable dates at 2 σ. This winnowing simplifies the picture somewhat, but we are still left with a 300 year range of dates, with as many as three discrete ranges. There is, however, no Early period component (cf. Prufer and Shane [1970] and Church [Church 1987; Church and Nass 2002]).

Baldwin

The Baldwin site was the basis for the eponymous phase of Prufer and Shane’s Early period, though without the benefit of direct radiocarbon dates. There are now three dates from Baldwin, all of which are acceptable, and all of which overlap at 1 σ. These dates are all recent measurements and two are AMS dates. The middle of the fourteenth century is the earliest likely date of occupation. Clearly this occupation does not fall within the Early period.

Philo Phase

The last two sites are the type sites for Carskadden and Morton’s (2000) Philo phase, assigned to a post AD 1250 time span. None of the Philo phase dates are acceptable (scores from -1 – 1.5). The entire assemblage is derived from wood, many of which are large logs. After some dates were deemed too early, Morton decided to focus on only the outer layers of large logs (James Morton, personal communication 2009). This produced a more consistent range of dates in the late thirteenth to early fourteenth century. These should still be considered maximum age estimates (see discussion above and Puseman et al. 2009). Further, recalibrating the dates with the modern curves pushes all of the Richards dates after AD 1300. Philo II was occupied no earlier than AD 1250 and probably more recently.

Conclusions

There is an imminent and pressing need to rigorously clean and recalibrate our radiocarbon databases. The current proliferation of dates provides a false sense of security of knowledge. The inconsistent and casual method of reporting of dates seems to be evidence of that confidence and certainly complicates interpretation. This review of a small sample of dates for the MORV has undermined the logical inferential structure of key aspects of the predominant narrative of Fort Ancient prehistory. The past practices of subjectively rejecting dates that did not fit with preconceived notions of time and change along with a heavy reliance on wood charcoal means that as much as 80% of the radiocarbon database may not be measuring the events in which we are interested. This undermines any efforts at cross-dating in absolute time, and makes any claims about timing and tempo of change spurious.

While only taking into account type of material dated, method of measurement, and age of measurement dramatically reduced the number of usable dates, these are only minimal hygienic criteria. In fact, these are the most lenient criteria I have encountered. The realization that, with these minimal criteria, approximately 80% of the MORV LP dates are not reflective of occupation history provides a
sharp contrast to the approximately 60% reduction in available dates for the Southern Levant applying more stringent criteria (Blockley and Pinhasi, 2011).

Greater detail about multiple occupations, and contamination (to name just two very important issues) could be derived from more thorough treatment of context and association, sample size, and stable isotope data (Blockley and Pinhasi 2011; Pettitt, et al. 2003). I will conclude by mirroring the sentiment of Pettitt and colleagues. The criteria and the ranking system employed here should be viewed as only a first step towards recalibrating our MORV LP chronological reconstructions. I hope my initial effort will contribute to a productive and frank consideration of how to evaluate our dates leading to a more objective and sound system of ranking that meets the needs of practitioners. We need to adopt a systematic procedure to assess the reliability of our dates and to strengthen our databases; otherwise even the least ambitious endeavors will be spurious.

Epilogue: Anthracology and Wood Dates

The question remains as to what value, if any, wood charcoal dates can have in an investigation of prehistory. Anthracology is a relatively new field in paleoecological studies that investigates the interaction among prehistoric human behavior and the ecological system they inhabited (e.g., Asouti 2003; Marconetto 2010; Marston 2009; Rubiales, et al. 2011; Théry-Parisot, et al. 2010). One of the major findings of multiple studies is that there is apparently little if any selection for functional criteria in wood species. In general, anthracological studies have concluded that people usually exploit wood resources in proportion to their inferred abundance in the local environment. The close correlation between paleoecological abundance and frequency in anthropogenic deposits, if found to hold in a particular case, raises the possibility of using dates on wood charcoal to investigate other aspects of human decision making, resource use, and landscape management practice.

If frequency of availability was the most important factor (Marston 2009:141-142; Rubiales, et al. 2011; Théry-Parisot, et al. 2010:145), then we can use collected wood samples to detect anthropogenically fragmented ecologies (Power, et al. 2010; Rubiales, et al. 2011:2). The extant anthracological literature attests to the ability to reconstruct species abundance from deposits that meet certain criteria (Théry-Parisot, et al. 2010:143). Detection of anthropogenic impacts is particularly important for investigating swidden agricultural societies such as the LP MORV inhabitants.

If it is possible to obtain representative dates for the wood charcoal from long-term, non-specialized deposits (Théry-Parisot, et al. 2010:143) then we may be able to infer the approximate age of the surrounding forest. There is a likely ceiling on the age of trees that are selected for everyday tasks (old trees require more energy expenditure to harvest), but patterned inter-site variability in the difference between mean/max wood ages and approximate occupation date (derived from acceptable assays) could reveal cycles of settlement relocation, resource depression, population packing, and relative sustainability of agricultural systems through time. The major issue that seems to be left over in order to empirically investigate swidden cycle is the relationship between the dated sample’s age and the ages of the remainder of the undated samples. This is likely irresolvable with current samples, but a program of controlled random sampling from appropriate contexts could yield promising results.
It is possible to use the extant wood dates to constrain the estimate of the forest age for each site in the sample. However, in this case, the constraint works in the opposite direction. All we know about the wood samples already dated is that there is wood that is at least that old at the site, and therefore from the surrounding forest at the time of occupation. It is not likely that the oldest specimens at the site were dated (especially given the aims of the investigators), and further, it is not likely that the oldest trees in the area were brought home. While we are interested in the oldest sample from the occupation, we are not interested in the oldest trees in the forest. Swidden agriculturalists are more likely to reuse old garden plots than virgin forest (e.g., Pollack and Henderson 1992:284), thus the oldest sample in the site should reveal something about the age of those fallow plots and therefore the frequency of reoccupation. The current samples can be treated as minimum estimates of the age of the re-used fields. Plots reused more frequently may not be fully rejuvenated and would indicate resource stress.

Most sites have wood at least 200 years older than the occupation age. SunWatch, Wegerzyn, Philo II, and possibly Blain have wood more than 300 years older than the occupation. There is no evidence of very young forests in this sample that would indicate resource stress. Voss, with only a 150 year lag, comes the closest; however, the probability of multiple occupations here complicates the inference, and this is more than enough time for soil nutrient replenishment. One intriguing pattern is that the southwestern and southeastern Ohio forests, despite sustaining large villages (SunWatch and Philo II), appear to have had a greater land and time buffer than the central Ohio populations.

Absolutely no generalizations or conclusions can be drawn from this brief discussion of estimated forest age and swidden cycle length for the analyzed sample. The current sample is incapable of concluding that Voss has a younger forest than Philo II (or any difference in between). I intend this discussion simply as an illustration of the analytical potential of radiocarbon dates on wood charcoal. Whether we intend to estimate the age of the occupation or the age of the surrounding forest canopy, more rigorous and systematic use of dates is required.

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