A REVIEW OF THE CUMBERLAND FLUTED POINT TRADITION IN RELATION TO THE DUTCHESS QUARRY CAVES (NY) AND THE PHIL STRATTON SITE (KY)

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ABSTRACT

A review of 80 years of research and thinking about the archaeological phenomenon known as Cumberland reveals misunderstanding of its age and cultural position. The culturally stratified and very well-dated Dutchess Quarry Caves site, in conjunction with the pioneering investigation of the extensive Phil Stratton site, suggest that early manifestations of Cumberland are older than Clovis. The origin of fluted point technology lies with the long-lived Cumberland Tradition, which began to develop in southeastern North America.

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The purpose of this paper is to review and critique thinking about Cumberland and the Cumberland fluted point – ideas about age, longevity, and cultural position with respect to Clovis and other Palaeo-American manifestations. Investigations of Cumberland habitation sites and artifact caches (Roosa 1977; Deller and Ellis 1992; Funk and Steadman 1994; Ellis and Deller 2000; Gramly et al. 1999; Gramly and Vesper 2005) allow us to move beyond perfunctory analyses of isolated projectile points (e.g. VanBuren 1974) and to apply, at last, standard archaeological concepts (e.g., phase, stage, culture, horizon, tradition).

A working framework for the organization and evolution of Cumberland (Gramly 2009 and 2012), helps us to understand absolute dating evidence from the Phil Stratton Cumberland encampment, Logan County, SW Kentucky and Dutchess Quarry Caves, Orange County, New York. Recognition of a common tradition uniting Palaeo-American groups continent-wide who made varieties of Cumberland points as they settled early post-glacial landscapes (Ellerbusch and Yerka 2005) has been long overdue.

I. Overview of Cumberland

Beginnings (until 1954)

Among the earliest illustrations of Cumberland points in 20th century archaeological literature is Plate V of Figgins’ 1935 publication about “Folsom and Yuma artifacts” for the Colorado Museum of Natural History. Two indubitable Cumberland points from Ohio are pictured, which are classed as Folsom. A colleague of Figgins, the Easterner, Edgar B. Howard, preferred the designations “Folsom-like” and “generalized Folsom points” (1934).

No distinction was made between Clovis and Cumberland points by Wormington in the first edition of her Ancient Man in North America. Taking cues from Howard, she termed both styles “generalized Folsom points” (1939:10). However, in the second (1944) and third (1949) editions of her popular work she segregated Clovis points from Cumberland points, which were called by her “Ohio fluted.” Some fellow workers were not so quick to follow her lead and separate them; for example, a chart prepared by Krieger (1950) for the Proceedings of the Sixth Plains Conference held in 1948 has Clovis and Cumberland points sharing the designation “Clovis
Fluted.” He believed that this broad category of projectile points post-dated “Sandia” but pre-dated “Folsom Fluted.”

Lewis and Kneburg writing in 1950 about early projectile points of Tennessee, likewise, lumped together Clovis and Cumberland points, noting that Cumberland points resembled the Clovis type far more than they did “classic” Folsom specimens.

Some writers remained silent about this typology issue, abstaining from judgement or allowing Figgins’ initial view of the matter to stand (Sellards 1952).

**The Concept is Introduced** (1954-1960)

Credit goes to T. M. N. Lewis for defining the Cumberland point and setting it well apart from Clovis points (1954: 7-8). Lewis felt that for Cumberland points “fluting in general is longer and better executed than in the Clovis type...” but that thinner examples might lack fluting altogether.

His belief that longer channel flake scars constituted evidence of better fluting technique became entrenched within the archaeological literature and minds of North American prehistorians. The idea that Cumberland fluting is a “most sophisticated” technique (see Peck and Painter 1985), we now realize, is mistaken. Studies of modern flintknappers’ work demonstrate that Cumberland fluting is technologically simple and easily executed (Gramly 2012) – in opposition to Lewis’ view. Also, by regarding longer channel flakes as a refinement or advance upon Clovis fluting, Lewis implied that Cumberland points evolved from Clovis points and were later in age. His assumption was later echoed by Robert Bell who felt that “full-length” channel flakes, which in his opinion were characteristic of both Folsom and Cumberland points, indicated equal antiquity (1960: 22) and a post-Clovis age.

Inevitably the term “Ohio fluted” was set aside in favor of “Cumberland fluted” as Cumberland points are much more numerous in the Cumberland River valley region of Tennessee and Kentucky than they are in Ohio – a fact that was reiterated by Madeline Kneburg (1956) who was a close colleague of Lewis. Still, use of the term “Ohio fluted” persisted as late as 1960 (see Hyde 1960), but after that date it disappeared from archaeologists’ vocabulary.

Lewis’ suggestion that there are both fluted and unfluted Cumberland points harmonized with Wormington’s position (1957: 41). She recognized that Folsom points were fluted on both sides, some on one side only, and a few showed no fluting at all. The problem with Lewis’ observation is that he did not distinguish between thick and thin unfluted points with a “Cumberland shape.” From a perspective of 60 years we recognize that thin unfluted points with a Cumberland shape are nearly always classifiable as the Beaver Lake and Quad types; while, thick unfluted points with a Cumberland shape are, indeed, a rare variety of Cumberland point.

Other workers were quick to adopt Lewis’ position about the contemporaneity of all unfluted points having a “Cumberland shape” and ordinary fluted Cumberland points (see, for example, Rolingson 1964). By pooling what is now understood to be Archaic Beaver Lake and Quad types with more ancient Cumberland points, the temporal record was foreshortened. Linked to Beaver Lake and Quad on typological grounds, Cumberland’s chronological position was assumed to be later than Clovis despite the lack of any compelling stratigraphic evidence.

**Searches for Stratigraphic Evidence and Associations** (1960-1980)

During the 1960s and 1970s the developing story about North American projectile point succession was reported regularly; most of the data about Cumberland was generated by researchers working in northern Alabama. At the end of two decades of intensive research the
cultural and temporal position of Cumberland still had not been fixed. Radiocarbon dates were few, and those that had been reported were questioned or doubted (see Funk et al. 1969). The basis for understanding remained “typological considerations and a limited amount of stratigraphic data,...” (Walthall 1980: 30-31).

In his 1980 review Walthall also noted that the distribution of Cumberland points in the Southeast seemed more restricted than Clovis. He took this fact to mean that Cumberland was localized or regional in outlook and late in the Palaeo-American projectile point sequence when “free-ranging” lifestyles of earliest Palaeo-Americans were no longer practiced. Essentially the same interpretation of Southeastern data was given by Anderson and Faught 20 years later when they argued that makers of Cumberland and Suwannee/Simpson points – compared to “older” Clovis – procured food “in smaller packages.” They also felt that Cumberland hunters ranged over shorter distances than Clovis and exploited a wider variety of smaller animals (2000: 512). This interpretation was mirrored by Kenneth Tankersley in his review of Cumberland and Clovis of the mid-West and mid-South (1989: 168). Tankersley’s arguments, like Walthall’s and Anderson and Faught’s, were reasonable; however, by themselves they cannot be construed as proof of Cumberland’s lesser antiquity. An equally attractive counter-argument has tightly circumscribed projectile point distributions and “regionalized” food-getting being outcomes of small or founder populations. In theory, Cumberland could be older than Clovis.

Useful stratigraphic data bearing upon the antiquity of Cumberland were gathered during the 1960s and 1970s within rockshelters and caves. Open sites on floodplains and uplands having Cumberland points that were explored during this period, on the other hand, all have proved to be deflated, unstratified, and multi-component (Hubbert 1989; see Cole n.d. for a thorough review of the Quad Locality). Examples of such sites abound along the watercourses of Alabama, Mississippi, and Tennessee. A typical example is Sugar Creek, northern Alabama where bunching of fluted Cumberland, Quad, Lerma, and Big Sandy projectile tips was observed. Co-occurring types were regarded as a “significant” indicator of close cultural relationship (Travis et al. 1960). Likewise, the Sims site in the Tennessee River valley near Camden, Tennessee, yielded Clovis, Cumberland, and Archaic types (Dalton, Beaver Lake, Quad, etc.) from an eroded surface. The 18 Beaver Lake points at Sims were considered to be “unfluted Cumberlands.” In an astonishing act of faith by a professional archaeologist, this group of points was relegated to a period between Clovis and Dalton (Adair 1976: 326) using Mason’s (1962) generalized arguments as justification.

Primary data about Cumberland from rockshelters and caves were presented by a cadre of dedicated archaeologists, most of whom were amateurs when their research was performed. Foremost among them was Margaret V. Clayton, who generated reports about Boydston Creek Bluff Shelter (1967) and several localities on Sand Mountain, northern Alabama (1965).

The Rock House on Sand Mountain produced four Cumberland point fragments within or near a lower cultural zone having many Dalton points. Clayton felt that the discovery was important “...because it represents the first recorded occurrence in the area of classic fluted material in an early context at a stratified site” (1965: 94). Wisely, Clayton did not argue that the Cumberland fragments were made by Dalton knappers, although she felt the four point fragments were at least as old as Dalton but could represent an earlier component (Ibid.: 7).

In my opinion two of the four point fragments (Clayton’s Figure 9a and b) are bona-fide Cumberland points, although from her descriptions it is impossible to decide to what stage of the Cumberland Tradition they belong. The other two specimens (Figure 9c and d) appear to be fluted Dalton points. As we understand today, the technique of fluting was widely practiced at the end of Dalton and carried over to a succeeding early phase of Hardin (Gramly 2002, 2008).
At the Boydston Creek Bluff Shelter Margaret Clayton recovered another indisputable Cumberland point – this time a medial fragment (1967: Figure 15). Unfortunately its exact position within the shelter deposits was unknown. Clayton’s careful discussion of this artifact is worth quoting in full:

“Possibly the earliest point recovered from the site was the fluted fragment, probably a Cumberland, illustrated in Fig. 15. Although stratigraphic evidence is lacking, the antiquity of this point in the Southeast is usually inferred on typological and technological grounds. Neither the Cumberland, nor any other fluted point, has ever been found in the Southeast in stratigraphic isolation. However, at the Quad site (Cambron and Hulse 1960) and Rock House (Clayton 1965), it was found in association with mixed Dalton and Early Archaic material. This, apparently, is the situation at Dk 57. As Table 2 indicates, the fluted point seems to be associated with Dalton and Early Archaic materials, but stratigraphic separation from these later types is lacking.”

Extensive controlled excavations at the Stanfield-Worley Bluff Shelter, also in northern Alabama, failed to yield any fluted Cumberland and Clovis points (Dejarnette et al. 1962). This site did produce a profusion of Early Archaic projectiles including the Beaver Lake type, which was defined based upon specimens within the neighborhood. The authors cautioned that although Beaver Lake points were shaped like Cumberlands, nonetheless they were thinner and broader. This observation and the suggestion that the Beaver Lake type might be later in age than Cumberland were duly noted by some typologists (for example, Perino 1968, 1985) but ignored by others. Amazingly, a belief in the contemporaneity of Cumberland and Beaver Lake persisted in some academic circles until recently (see Hollenbach 2009: Table 3.3).

At the time when stratified shelters in Alabama were being explored, another group of amateur archaeologists was investigating an important cave complex with Cumberland points in southern New York State. This work at the Dutchess Quarry Caves was well underway by 1966 and was directed part of the time by State Archaeologist, Robert E. Funk. A Cumberland fluted point (now classified as a Terminal Cumberland Stage Barnes point), which was recovered from a basal deposit within Dutchess Quarry Cave 1 (Funk et al. 1965), stirred the imagination of the archaeological community across the Northeast. The association of this point with fragmentary bones of caribou was radiocarbon-dated (Funk et al. 1969). The result – 12,530+/-370 radiocarbon years – was generally regarded as too early for Cumberland fluted points; however, the result was not easily dismissed as the bones used for dating were sound and appeared to have been broken open by human beings for extraction of marrow.

Some scholars, however, weighed the dating results from Dutchess Quarry Cave 1 and advised against their dismissal. George F. MacDonald in his review of research on Palaeo-American sites in eastern North America, expressed a minority position when he said: “The date is as early as any that have been run on Clovis sites in the Southwest and if it is accurate, runs contrary to the view that Cumberlands are considerably later than Clovis in the East” (1971: 34). Marie Wormington, however, in a companion piece for the same volume advised against placing too much dependance upon the single radiocarbon date from Dutchess Quarry Cave 1 (1971: 88).
Archaeologist Robert Funk took this comment to heart but years later (Funk and Steadman 1994) would report other radiocarbon dates from the Dutchess Quarry Caves supporting a considerable antiquity for Cumberland.

The growing faith during the 1960s and 1970s in the idea that Cumberland was a late fluted point manifestation – one likely “transitional” in time between the Archaic and Clovis – favored lithic analyses bolstering this belief. Stone tool technologists regarded Clovis fluting as “less efficient,” befitting a typologically earlier position (Jolly 1972: 76). Jolly, like most analysts, was impressed by the length of Cumberland channel flakes. Both Gustafson (1972) and Jolly accepted Cambron and Hulse’s view, expressed as early as 1961, that median ridges on Cumberland point preforms enabled long flutes to be struck and their use was, therefore, a definite refinement.

Lost in the discussions of stone tool typologists, however, was Cambron and Hulse’s caution that refined fluting technique does not necessarily imply a greater age for Clovis and lesser antiquity for Cumberland (1961: 90). Notwithstanding matters of age, there are some clear differences in knapping technique between Cumberland and Clovis (McNutt 1972). However, explaining these differences using reworked, fragmentary, fluted points can be difficult. Also, accounting for variations in size and form is challenging for analysts who have only selected artifacts to study. For example, working only with specimens from surficial contexts, ancient Cumberland knappers’ predilection for making small fluted points from prismatic blades is easily overlooked.

Finally, we should not fail to acknowledge an expansion of knowledge about late manifestations of the Cumberland Tradition in northeastern North America during the 1960s and 1970s. I refer to Roosa’s recognition of a Parkhill Complex in the Great Lakes (1977), which is characterized by fluted Barnes points (Wright and Roosa 1965). Although Parkhill Complex sites have proved to be surficial, deflated and impossible to date absolutely, they have furnished large artifact samples. Clearly, Parkhill Complex artifacts cannot be construed as Clovis, and in fact, they resemble Folsom materials farther west – suggesting a post-Clovis age for many of them. At the time of its definition by Roosa and colleagues, Parkhill’s cultural and temporal position was unclear. They appear to have been unaware of the Barnes points that were brought to light at Dutchess Quarry Caves, New York State (Funk et al. 1965; Funk et al. 1969; Kopper et al. 1980).

**Clovis Dominance (1980-2000)**

Clovis and the “Clovis First” hypothesis dominated Palaeo-American studies during the 1980s and 1990s primarily because reports about discoveries and site investigations were quickly and efficiently disseminated. New fieldwork was well-grounded temporally, stratigraphically, and geologically (Haynes 1980). Further, at regular intervals accumulating evidence about Clovis lifestyle was reviewed by communities of researchers (for example, Shutler 1983). These overviews were aimed at academicians, amateur archaeologists, and artifact collectors; their collective impact was impressive. Alternate hypotheses about Palaeo-American origins were almost ignored.

During this period of advancing understanding, data from archaeological sites that had been investigated decades ago were re-visited and freshly formatted – as for example, Boldurian and Cotter’s treatment (1999) of the Clovis type site at Blackwater Draw. Re-analysis of Clovis projectile points, prismatic blades (Collins 1999), and entire tool assemblages, in conjunction with recent finds, helped clarify regional sequences (Tankersley 1996). As well, re-analysis fostered new typologies, generalized in nature, that were widely applicable (Justice 1987, 2002a, 2002b; Gramly 1992, 2000).
These typologies had a welcome side-effect of dispelling misconceptions about Palaeo-American projectile point distribution. Justice (1987), for example, noted the wide distribution of Cumberland projectile point varieties. His perspective helped correct Walthall’s notion that Cumberland was “regionalized” and necessarily younger than Clovis.

The idea that Cumberland was little more than a local development in the aftermath of a Clovis population “crash” had gained ground during the 1980s and 1990s. One of its most articulate spokesmen was Fred H. West who wrote (1983: 377):

“The short period of time which this remarkable expansion [of Clovis] was accomplished, followed discontinuously by different and more local cultures, suggests the rapid depletion of the resources on which Clovis grew and a resultant crash of the Clovis population. From this greatly reduced base of discontinuously distributed populations, there developed variant hunting cultures more particularly adapted to game species with more restricted ranges.”

The general favor that the “Clovis model” for peopling the New World enjoyed during the 1980s and 1990s resulted in attention being directed away from Cumberland. This distancing was easy as few open-air Cumberland Tradition sites had been reported until that time. The handful of data sets available to culture historians was easily ignored in Volume 3 (Environment, Origins and Population) of the Handbook of North American Indians (Ubelaker 2006). Nowhere within this landmark study of human origins in the New World, which had been in the hands of editors since the 1970s, is the problem of Cumberland addressed. In fact, the word Cumberland is not even mentioned! Likewise, the Dutchess Quarry Caves – among the oldest absolutely-dated sites in the North America – received scant attention despite the availability of Funk and Steadman’s 1994 report with its long list of AMS dates for extinct or extirpated fauna at Dutchess Quarry Caves.

A Shifting Perspective (after 2000)

Test-excavations were begun at the Phil Stratton site, Logan County, southwestern Kentucky in 2000. Work would continue at the Cumberland encampment – the first open-air site of its kind to undergo excavation – for another 11 years. The search for a Cumberland site with cultural integrity was inspired by Funk and Steadman’s report about the Dutchess Quarry Caves with their varieties of Cumberland points, associated Pleistocene fauna, and early radiocarbon dates. Altogether 11 radiocarbon dates had been obtained by Funk on bones of caribou, flat-headed peccary, and giant beaver. These determinations either pre-date Clovis or are equal in age (see 1994: Table 9 and Table 1 here). The association of Cumberland point varieties with extinct or extirpated species is unique; within the greater Tennessee Valley region, on the other hand, Cumberland remains from caves or rockshelters occur with modern fauna and Early Archaic artifacts – as, for example, the basal zone of Dust Cave, northern Alabama (Goldman-Finn et al. 1994).

The hypothesis that some Cumberland artifacts might be older than the oldest Clovis remains seemed a good one to test archaeologically, but finding a single-component Cumberland site required years of persistent, usually fruitless, enquiry.

The moribund state of research into Cumberland and the lack of secure dating evidence in the Southeast – the very region where Cumberland remains abound – began to draw attention (Peck
2003). Despite its poor foundation in knowledge, scholars were adamant that Cumberland’s place within temporal sequences lay with “Late Paleoindian” (Anderson 2004), a “Middle Palaeoindian Stage” (Haynes 2002: 45), “the millenium after Clovis” (Meltzer 2009: 285), or a “Middle Period” (Broster et al. 2013: 201 and Table 12.1).

A shortcoming of all these attributions is the assumption, never questioned, that Cumberland lasted for only a short period – at most 300-400 years. The considerable variation in shape and execution of Cumberland projectile points could not have taken place during such a brief interval (Gramly 2009, 2012); rather, the varieties of Cumberland fluted points and associated stone tools likely represent two or three thousand years of a technological tradition that originated in northern Alabama and southern Tennessee and afterwards spread northward (Ellerbusch and Yerka 2005). Ultimately, bearers of this tradition reached New England and the Canadian Maritimes in the East (Barnes points) and the Rocky Mountains in the West (Folsom points).

As the investigation of the Phil Stratton site progressed, questions about the presumed antiquity of Cumberland and its place within the scheme of prehistory were raised. Some writers even suggested that its age might be greater than Clovis (Hranicky 2007: 124-125). More to the point, there was growing realization that basic assumptions about Cumberland needed rethinking. The recovery of a rich prismatic blade industry at the Phil Stratton site (Gramly 2013a) showed that classes of stone artifacts, heretofore thought to be exclusive to Clovis, were in fact more widespread among Palaeo-American technologies. A shift in perception among some prehistorians about Cumberland is expressed clearly by Anthony Boldurian and Justin D. McKeel (2011: 101): “Traditionally, ‘standard’ Clovis points of this region are thought to antedate those attributable to Cumberland, though neither stratigraphy, nor geochronology, nor radiocarbon dates firmly document the supposition.”

A temporal and technological sequence for Cumberland is presented within Section II. The Phil Stratton site, it will be argued, belongs to a Middle Stage and is earlier than Clovis; while, the artifacts from Dutchess Quarry Caves represent both a Middle/Late Stage and Terminal Stage of a Cumberland Tradition. The first of these stages (“Middle”) antedates Clovis. The second (“Late”) may be coeval with Clovis and continued after its decline. Evidence for dating these stages will be discussed along with explanations of dating methods.

II. Dating the Dutchess Quarry Caves and the Phil Stratton site

*Dutchess Quarry Caves*

The only series of radiocarbon dates with a direct bearing upon the problem of Cumberland’s age and cultural position comes from Dutchess Quarry Caves, Orange County, southeastern New York State (Figure 1). Archaeological investigations by various workers at Dutchess Quarry Cave No. 1 (Figure 2) and No. 8 (Figure 3) from 1965 to 1989 resulted in the discovery of five projectile points of the Cumberland Tradition, bones of large Pleistocene mammals, and some stratigraphy.

Although it is impossible to demonstrate an unequivocal association of fluted points and Pleistocene fauna within just one stratum at either cave, radiocarbon dates on bones of Pleistocene species at Dutchess Quarry Caves – no matter from what stratum they were recovered – are older or as old as the oldest calendar age for Clovis, that is to say, 13,460 to 13,520 years BP. This earliest date for Clovis within the United States is reported from the Aubrey site (Ferring 2001: Table 3.2). A list of the Dutchess Quarry Caves (DQC) radiocarbon determinations that were obtained on refined collagen is presented in Table 1. Recently the pre-Clovis age of the DQC
large Pleistocene mammal remains was confirmed by fresh radiocarbon determinations on caribou tibias from DQC No. 1, Stratum 2. These results, which are reported by Feranec and Kozlowski (2010: 205), were 12,900+/−70 radiocarbon years BP and 12,900+/−50 radiocarbon years BP. They closely agree with dates presented in Table 1 and Funk’s 1969 determination for DQC No. 1.

Since many of the dated caribou bones from DQC had been cracked open, ostensibly for their marrow (Guilday 1969), an association of human beings and Pleistocene large mammals at this locality is difficult to deny. Numerous remains of smaller animals, on the other hand, either were brought to the caves by animal predators, or these species lived and died there.

Some time after 15,000 years ago (Connally 1969) large animals such as caribou and mastodon (Feranec and Kozlowski 2012: 277) may have been seasonal visitants to the Walkill River valley – which at last was free of pro-glacial lake waters. At the same time farther north, part of the Hudson River valley was inundated by pro-glacial Lake Albany; the ice front lay near present-day Albany, New York (see Lothrop and Bradley 2012 for a review). It is possible that when DQC was occupied initially, the former Walkill lake-bed and its open shoreline were an ideal setting for caribou calving. Cumberland hunters arriving from the south with projectile points of Pennsylvania jasper could have resided temporarily within the caves and enjoyed a superb view of these calving grounds.

The discovery of a Middle or Late Stage Cumberland fluted point fragment sealed by a fallen rock within Stratum 4 at Dutchess Quarry Cave No. 8 (Funk and Steadman 1994: 50) is proof that this variety of Cumberland point was deposited at an early period during the accumulation of sediment there; therefore, it could be as old as any of the large mammal bones associated with it.

Important to note, the five “Cumberland points” reported by Funk from DQC can be subdivided into two varieties, and these varieties are not the same age. The older variety is represented by two tip-sections of moderately thick (7.7 mm, 7.8 mm) Cumberland points with flaring sides – both fashioned of yellow-brown jasper showing an heavy patina (see Figure 4 and also Funk and Steadman 1994: Plate 13). These specimens, which were unearthed within Stratum 4 at Dutchess Quarry Cave No. 8, belong to either the Middle or Late Stage of the Cumberland Tradition. Their fragmentary condition precludes a more exact attribution. They resemble, but are slightly thinner than, the larger class of fluted projectile points from the Phil Stratton site. As we shall argue, the age of the Cumberland occupation at Phil Stratton’s falls within the the 15th millenium before present. It is remarkable, and surely no coincidence, that the range of calibrated mean ages for AMS-dated caribou, peccary, and giant beaver bones at Dutchess Quarry Caves, which spans 14,476-15,299 calendar years (modal point 14,888 years), is close in time to the estimated age of the Phil Stratton encampment.

The more recent variety of Cumberland Tradition fluted point at Dutchess Quarry Caves is represented by two examples from Feature 1, Stratum 3, DQC No. 8 (Funk and Steadman 1994: Figure 13) and a complete point from Stratum 2 at DQC No. 1 (see Figure 5). According to Funk and Steadman, all three specimens may have been manufactured from raw materials of the immediate region; however, this identification has yet to be confirmed chemically. The relative thinness of these points in relation to their width, together with secondary fluting on top of the primary channel flake scar, mark them as Barnes points. Barnes points belong to the Terminal Stage of the Cumberland Tradition. The calendar age of the Terminal Stage is estimated at 12,500 years BP (Gramly 2012). West of the Mississippi the Terminal Stage is represented by the Folsom archaeological culture.

What faunal remains, if any, from Dutchess Quarry Cave No. 1 and No. 8 are associable with
these Barnes points has yet to be established. Obviously, the dated caribou, peccary, and giant beaver bones are too old to be good candidates. Some of the skeletal remains of Virginia deer that were recovered in large number from both caves, as yet undated, might prove to be coeval with the Barnes points.

In 1994, when Funk and Steadman’s monograph about the Dutchess Quarry Caves appeared, archaeologists habitually lumped together all the varieties of Cumberland point that had developed during 3,000-3,500 years. By not distinguishing between the two varieties of Cumberland Tradition projectile points, interpreting the cultural stratigraphy of the lower zone of Dutchess Quarry Cave No. 8 became difficult.

Even more problematic was Funk and Steadman’s reluctance to apply the absolute age of the Pleistocene fauna to the human beings who left behind the Cumberland points at DQC. The list of AMS dates (Table 1), they felt, was too old to pertain to fluted points; instead, they asserted that animal scavengers must have introduced all the caribou, peccary, and giant beaver remains to the caves (1994: 73). This belief, more than any other factor, contributed to our misunderstanding of Cumberland’s true antiquity and evolution of fluted point Palaeo-American technology.

**Phil Stratton Site** (Figure 1)

It is fortunate, indeed, that the search for an absolutely datable Cumberland site occurred when new methods of determining archaeological age were being applied, as no hearth with charcoal for radiocarbon-dating was ever discovered at the Phil Stratton encampment.

Nearly 22 weeks of archaeological investigations over 11 years at the Phil Stratton site netted nearly 1,800 weathered chert tools, including many prismatic blades, prismatic blade cores, Cumberland point fragments and channel flakes resulting from their manufacture. Figure 6 is a plot of fluted point fragments and channel flakes. Most of the weathered tools, as well as thousands of chert debitage flakes, can be relegated to the Cumberland occupation.

Not unexpectedly, a small number (N = 22) of Neo-Indian bifaces also was encountered here and there across the site. These specimens range in age from Early Archaic to Mississippian and most appear to be hunting losses. A cluster of a few anciently damaged Cypress Creek points (Ellis Durham, personal communication) in the SW quarter of the site suggests a brief occupation during the Late Middle Archaic. However, in general, the vestiges of Neo-Indian presence at Phil Stratton’s are minimal, and for all practical purposes the site is a closed component of the Palaeo-American era.

During our decade of excavating, close watch was kept for concentrations of heat-spalled chert flakes and tools that might indicate a hearth whose charcoal had been washed away. No such anomalies were observed within our excavation, which covered 770 square meters – equivalent to 192 ½ two-meter squares. In every unit of excavation, however, a few burned specimens, were recovered; on the average they comprise at most 1-2% of the tally of artifacts from an unit. The uniform, low-frequency distribution of fire-damaged objects across the site suggests that periodic brush fires during the ancient occupation (and perhaps afterward) were responsible for some destruction.

A slow rate of sedimentation would have exposed artifacts lying upon ancient land surfaces to heat damage and scattering. The net result was that boundaries of artifact concentrations became difficult to perceive.

1. Burial by Loess

Located at the brow of a low hill bordering the Red River, the Phil Stratton site was buried
neither by alluvium nor colluvium; rather, sedimentation resulted from a slow accumulation of wind-borne particles (loess) during the glacial epoch when the Mississippi River flooded its broad valley regularly. Deposition of the Peoria Loess within the central Mississippi valley occurred during the Wisconsin glacial era (Rodbell et al. 1997; Forman and Pierson 2002), but had ceased by 10,900-10,700 radiocarbon years BP when the Brady soil began to develop (Steve Holen, personal communication, 2008).

Prevailing winds sweeping across the Mississippi Valley from west to east picked up floodplain silt and deposited it in beds many meters thick immediately east of the River (Muhs et al. 2005: Figure 1). Across western Kentucky’s Pennyroyal region farther eastward, Mississippi valley loess, together with contributions blown in from the Cumberland and Tennessee River valleys, capped pre-existing soils. This blanket of loess has managed to survive on broad-lands that have not been disturbed by farming (US Department of Agriculture 1981: 88). At the Phil Stratton site, approximately 200 km east of the Mississippi River, the thickness of the Peorian loess diminishes to one meter; while, nearer Nashville, loess units are scarcely 20 cm thick and challenging to recognize (DuVall & Associates, 1990).

Loess at the Phil Stratton site rests upon a cherty, iron-stained regolith overlying St. Louis Formation limestone of Mississippian Age (Shawe and Rainey 1965). The slope of the regolith steepens immediately north of the N0E0 – N0E40 transect across the site, and the blanket of loess has slumped there (Figure 7) with resulting disturbance to the zone of archaeological remains.

2. Absolute Dating of Loess

Two areas of the site were completely free of modern digging, tree-clearing, and road-grading. One area lay in the neighborhood of the N0E0 point, and the other was 42.4 m to the east and south of grid point S5.2 E42.4. At these places the loess appeared compact, although during excavation we noted that tree roots had penetrated to a depth of 40-50 cm. We trenched both areas as deep as the regolith and then collected soil samples from top to bottom of our trench faces with the intention of applying optically stimulated luminescence (OSL) – one of three widely used methods of dosimetric dating (Feathers 1997; Wagner 1998). Loess is a superior material for OSL, as the formerly airborne, silt-sized particles that comprise it were thoroughly exposed to sunlight and all light energy stored within them was released.

OSL samples were collected at five and ten cm intervals within both trenched areas. A series of 18 samples from the eastern trench was processed with standard mesh (sizes #5 through #230) and weight percentages were calculated (Table 2). The results show a smooth gradation from the base of the loess upward to 35 cm below surface with a slight coarsening of particle size as the regolith is approached. No break or unconformity in the sedimentary record is evident, indicating that the Peorian loess at the Phil Stratton site accumulated steadily.

Eight of the 18 samples from the grid eastern trench were submitted to the Luminescence Dating Research Laboratory at the University of Illinois at Chicago along with eight samples from the grid western trench. A summary of dating results for these 16 units of loess is given in Table 3 (see also Gramly n.d.-a) and is represented graphically by Figure 8.

The data show that loess began to accumulate upon the regolith 30-32,000 years ago and had attained a thickness of only 40 cm by 16-18,000 years ago. The rate of accumulation until the Wisconsin glacial maximum (approximately 17-18,000 years ago) was very slow – hardly 3 cm per millennium. Between the glacial maximum and the end of loess deposition, when the Brady soil began to develop, 60 cm of loess was deposited at the Phil Stratton site. The rate of accumulation had quickened to 12 cm per millennium – roughly four times the rate of the early
glacial epoch. For mathematical purposes the increasing rate of accumulation is logarithmic. It was during the period of rapidly accumulating loess that the Cumberland occupation took place.

Within the eastern trench we observed large Cumberland stone artifacts to be numerous approximately 25 cm below surface; while, for the western trenched area, large flakes and sizeable tools occurred, at a slightly greater depth – 30-35 cm below surface (Figure 9). Therefore, for the Phil Stratton site, in general, the Cumberland occupation layer lies 25-30 cm below surface and is just above an iron-enriched soil horizon (a B-zone). Fine debitage flakes and tool fragments above and below the Cumberland occupation (Figure 10) are likely a result of disturbances by plants and animals over many thousands of years.

Plots of OSL dates obtained in both the eastern and western trenches at 55 cm below surface and deeper, when made to share an endpoint at ground surface of 12,800 calendar years (age of the Brady soil), are resolvable as overlapping curves (Figure 8). The curves are smooth and fit comfortably within the standard deviations of the OSL dates with only a single outlying OSL result. The intercept of the curve pertaining to the western trench with its peak artifact density at 30 cm below surface is approx. 14,750 calendar years; while, the intercept of the curve for the eastern trench at 25 cm is approx. 14,500 calendar years. The antiquity of the Cumberland occupation must be very close to these values.

The graphed estimates of age are confirmed by computer-generated plots of OSL-determinations from both trenched areas that were provided by Charles McNutt (Gramly 2009: 15). Logarithmic plots of determinations (Figure 11) gave solutions of 14,795 calendar years (east trench, 25 cm below surface) and 15,342 calendar years (west trench, 30 cm below surface). When combined mathematically, the joint estimate of age at 27.5 cm below surface is 14,487 calendar years – remarkably close to the graphed estimates of 14,500 and 14,750 years. This finding is in harmony with the modal age of radiocarbon-dated large mammal remains from the Dutchess Quarry Caves, namely 14,888 calendar years.

Further mathematical manipulation of the Phil Stratton OSL data by Charles McNutt yielded a new joint age estimate of 14,637 calendar years (2014 personal communication); another result of mathematical experimenting by him falls within the first half of the fifteenth millennium before present (2014 personal communication). In all cases these estimates are several hundred years older than the early Clovis manifestations at the Aubrey site, Texas, and El Fin del Mundo, Sonora (Sanchez et al. 2014).

The Cumberland occupations at both DQC and the Phil Stratton encampment appear to pre-date any known archaeological manifestations in North America with the possible exception of discoveries of Solutrean-like remains in the Delmarva Peninsula (Stanford and Bradley 2012: 98-102).

3. Direct Dating of Cumberland Artifacts within the Loess

Just as light energy accumulated within a loess particle is expelled by strong sunlight resetting its “time-clock” for archaeological dating, a freshly-flaked chert tool buried in the ground is ready to register decay particles of gaseous element Radon-222. Within a few thousand years a zone of radon damage is formed that is sufficiently thick for measurement by an infrared laser (Walley 2013; Gramly 2013b). The thickness of this zone and thus the amount of light energy stored within it depends upon 1) the length of exposure to radon, 2) the amount of radon in the soil surrounding it, and finally 3) the chemical and mineralogical composition of the chert itself. The makeup of chert affects the nutrition and growth of biogenic organisms within the surface of an artifact. These organisms and their decay products, in turn, provide places for radon-induced
light energy to be stored (Gramly n.d.-b).

Knowing something about the environment of deposition of flaked stone tools and holding constant the type of chert being analyzed, it is possible to date artifacts relatively. Going a step farther, chert artifacts of known age whose radon-induced light values have been measured, can be used to assign actual calendar ages to artifacts of similar raw material. In short, infrared laser spectrometer (ILS) is potentially of great value to archaeologists who must cope with archaeological assemblages that cannot be dated by any other means.

Experimental application of the beam of a one-watt, infrared laser to Palaeo-American fluted points of Ft. Payne chert and Ste. Genevieve chert – common raw materials in the archaeological record – has shown that these artifacts emit light, which can be measured and displayed graphically. Further, series of Cumberland points and Clovis points of identical raw material from similar soils give significantly different light values (David H. Walley, personal communication) – suggesting a relatively greater age for Cumberland points.

With these results in mind, 14 Cumberland artifacts of presumed Ste. Genevieve chert from the Phil Stratton site were analyzed with an infrared laser. The light outputs of these specimens (Table 4) were then compared to values from a series of 14 Clovis points, preforms and bifaces made of presumed Ste. Genevieve chert from the Blue Hole Clovis site. The distance between these localities is approximately four kilometers (see Figure 12). Since both sites are essentially surficial, likely their artifacts were exposed to the same factors that introduce error to the ILS method of relative dating – such as brush fires during land clearance. In selecting artifacts for measurement, any obviously burned objects were eliminated.

Since Palaeo-American artifacts at both the Phil Stratton and Blue Hole Clovis sites lie within Peorian loess, one would expect them to have been exposed to equivalent dosages of Radon-222; however, we thought it necessary to verify this assumption, Accordingly, on April 27, 2013, David H. Walley and the author visited the sites and measured radon abundance with a gamma-ray detector coupled with an URSA-II analyzer set to recognize the energy spectrum of Radon-222. The value for Blue Hole Clovis site (3,950 units) was nearly identical to the value for the Phil Stratton site (4,000 units). Despite this equivalency, the ILS readings of presumed Ste. Genevieve chert artifacts from these sites were divergent – a clear indicator of a difference in calendar age.

Assuming that the calendar age of the Blue Hole Clovis site lies at the middle of the range of most radiocarbon-dated, North American Clovis sites (Waters and Stafford, 2007) – that is to say, 12,950 calendar years – then the calendar age of the Phil Stratton site is 9-10% greater or 14,269 years. Of course, the small size of measured samples and operator error due to difficulty in positioning a laser stylus upon the non-planar surface of an artifact, together generated high standard deviations. Therefore, the experimental results for ILS in this case are statistically insignificant. Nonetheless, the outcome is close to the age of the Phil Stratton site as determined by OSL and not far off the mark of radiocarbon determinations for the lower cultural zone of Dutchess Quarry Caves.

Upon considering the divergent ILS values of artifacts from the Blue Hole Clovis and Phil Stratton sites, archaeologist Charles McNutt, who in recent years has become interested in the problem of “pre-Clovis,” agreed that the difference was statistically insignificant; however, he also felt that it would be difficult to argue that the Phil Stratton Cumberland material was younger than measured artifacts from the Blue Hole Clovis site (McNutt 2013; Gramly 2013a: 145).
III. The Cumberland Tradition and its stages

The evidence for the antiquity of Cumberland set forth in Section II applies only to its hypothesized Middle and Late Stages, which are preceded by an Early Stage and followed by a Terminal Stage. The trend from Early to Terminal Stages, spanning perhaps 3,000-3,500 years, is characterized by a change from thick, narrow lanceolate points (accommodated within sockets or unwieldy split-hafts) to very thin cutting instruments (mounted within sleek split-hafts). Beginning as unfluted, lanceolate forms resembling El Joboid points of the Las Lagunas Phase in the Pedregal Valley, Falcon State, Venezuela, projectile points of the Cumberland Tradition eventually were transformed into the Folsom and Barnes fluted types. Along the way, perhaps during the Late or Middle Stages or roughly 13,500-14,500 calendar years ago, Clovis fluted bifaces may have developed from the Cumberland bifacial industry. Although Clovis appears to have vanished from most of North America at the beginning of the 13th millenium BP, it persisted in Alaska and New England as late as 12,350 years ago (Gramly 2013c) and overlapped temporally and spatially with manifestations of the Cumberland Tradition’s Terminal Stage.

Both the general configuration and specific attributes of Cumberland Tradition points define stages allowing us to mark time (Figure 13). When more full tool assemblages, such as the one unearthed at the Phil Stratton site, are described for Cumberland, it will be possible to refine chronologies and recognize horizon styles. Basic research needs to be done—especially for hypothesized earlier stages of the Cumberland Tradition. For example, one wonders if the rich prismatic blade industry on record at the Phil Stratton encampment (Gramly 2013a) originated during the Early Stage of Cumberland when projectile points began to be fluted to their tip (?), and was this practice linked to the making of prismatic blades?

If it can be shown that North America west of the Appalachians and east of the Mississippi River valley during the 15th and 16th millennia before present was occupied exclusively by bearers of the Cumberland Tradition, then sites dated to this period, but lacking distinctive projectile points, rightfully will be recognized as Cumberland manifestations. Thus, the cultural placement of the Coats-Hines mastodon butchering site and bone bed (Deter-Wolf et al. 2011) – one of the few 15th millennium BP archaeological sites with faunal remains south of Dutchess Quarry Caves – will be understood. That “pre-Clovis” Cumberland culture was responsible for the genesis of Clovis is an hypothesis worth serious consideration. As I have attempted to argue here, cultural historians can no longer afford to regard Cumberland as an expected outgrowth of Clovis; typology and dating tell us otherwise.

Acknowledgments

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The genius of innovator David Walley enabled the antiquity of the Phil Stratton site to be argued. I thank him for his role in our research.
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Table 1. AMS Radiocarbon Dates on Large Mammal Bone from Dutchess Quarry Caves No. 1 and 8 (after Funk and Steadman 1994).

<table>
<thead>
<tr>
<th>Lab. No.</th>
<th>Species</th>
<th>Skeletal Element</th>
<th>Cave</th>
<th>C-14 Age</th>
<th>Calibrated Age (2-sigma)*</th>
</tr>
</thead>
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<tr>
<td>CAMS-13298</td>
<td>Caribou</td>
<td>Phalanx</td>
<td>No. 1</td>
<td>12,920+/70</td>
<td>14,530-15,870 yrs. BP</td>
</tr>
<tr>
<td>CAMS-13296</td>
<td>Caribou</td>
<td>Calcaneus</td>
<td>No. 1</td>
<td>13,180+/-80</td>
<td>15,350-16,310 yrs. BP</td>
</tr>
<tr>
<td>CAMS-12586</td>
<td>Caribou</td>
<td>Femur</td>
<td>No. 1</td>
<td>12,720+/-70</td>
<td>14,350-16,310 yrs. BP</td>
</tr>
<tr>
<td>CAMS-13305</td>
<td>Caribou</td>
<td>Tibia</td>
<td>No. 1</td>
<td>13,150+/-90</td>
<td>15,240-16,300 yrs. BP</td>
</tr>
<tr>
<td>CAMS-13304</td>
<td>Caribou</td>
<td>Metatarsal</td>
<td>No. 1</td>
<td>13,840+/-80</td>
<td>16,180-17,030 yrs. BP</td>
</tr>
<tr>
<td>CAMS-12589</td>
<td>Caribou</td>
<td>Radius</td>
<td>No. 8</td>
<td>12,750+/-70</td>
<td>14,370-15,660 yrs. BP</td>
</tr>
<tr>
<td>CAMS-10357</td>
<td>Flat-headed peccary</td>
<td>Canine tooth</td>
<td>No. 8</td>
<td>12,160+/-80</td>
<td>13,840-13,950 yrs. BP</td>
</tr>
<tr>
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<td>14,030-14,360 yrs. BP</td>
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<td></td>
<td>14,650-15,300 yrs. BP</td>
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<tr>
<td>CAMS-13027</td>
<td>Flat-headed peccary</td>
<td>Canine tooth</td>
<td>No. 8</td>
<td>12,220+/-60</td>
<td>13,860-13,910 yrs. BP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14,070-14,370 yrs. BP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14,640-15,310 yrs. BP</td>
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<tr>
<td>CAMS-12592</td>
<td>Flat-headed peccary</td>
<td>Canine tooth</td>
<td>No. 8</td>
<td>12,430+/-70</td>
<td>14,130-15,640 yrs. BP</td>
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<tr>
<td>CAMS-12587</td>
<td>Giant beaver</td>
<td>Molar</td>
<td>No. 8</td>
<td>11,670+/-70</td>
<td>13,430-13,870 yrs. BP</td>
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</tbody>
</table>

Mean radiocarbon age (all samples) = 12,704+/- 74 (N = 10 dates).
Mean calendric age range (all samples & solutions) = 14,476-15,299 years BP (N = 14 solutions).
*Calibrations courtesy of Beta Analytic Inc., Coral Gables, FL.
Table 2. Breakdown by Fraction of Sieved Samples from Eastern OSL Site (S5.2 E42.4), Phil Stratton Site

<table>
<thead>
<tr>
<th>SAMPLE LEVEL</th>
<th>%#5 Mesh</th>
<th>%#10 Mesh</th>
<th>%#35 Mesh</th>
<th>%#60 Mesh</th>
<th>%#120 Mesh</th>
<th>%#230 Mesh</th>
<th>Pass %#230 Mesh</th>
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<tr>
<td>35 cm*</td>
<td>ZERO</td>
<td>ZERO</td>
<td>0.26</td>
<td>0.26</td>
<td>1.0</td>
<td>0.50</td>
<td>98.0</td>
</tr>
<tr>
<td>40 cm*</td>
<td>ZERO</td>
<td>ZERO</td>
<td>0.50</td>
<td>0.50</td>
<td>1.0</td>
<td>0.50</td>
<td>97.5</td>
</tr>
<tr>
<td>40 cm (B)</td>
<td>ZERO</td>
<td>0.10</td>
<td>0.46^</td>
<td>0.23</td>
<td>1.4</td>
<td>0.7</td>
<td>97.1</td>
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<tr>
<td>45 cm</td>
<td>ZERO</td>
<td>0.10</td>
<td>0.10</td>
<td>1.3</td>
<td>0.50</td>
<td>98.0</td>
<td></td>
</tr>
<tr>
<td>50 cm*</td>
<td>ZERO</td>
<td>0.34</td>
<td>0.34</td>
<td>0.70</td>
<td>0.34</td>
<td>98.3</td>
<td></td>
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<tr>
<td>55 cm</td>
<td>0.26</td>
<td>0.26</td>
<td>0.26</td>
<td>0.56</td>
<td>1.1</td>
<td>0.53</td>
<td>97.4</td>
</tr>
<tr>
<td>60 cm*</td>
<td>ZERO</td>
<td>0.56</td>
<td>0.28</td>
<td>0.56</td>
<td>0.28</td>
<td>98.3</td>
<td></td>
</tr>
<tr>
<td>65 cm</td>
<td>ZERO</td>
<td>0.20</td>
<td>0.41</td>
<td>0.41</td>
<td>1.25</td>
<td>0.41</td>
<td>97.3</td>
</tr>
<tr>
<td>70 cm*</td>
<td>ZERO</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>1.46</td>
<td>0.48</td>
<td>96.5</td>
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<tr>
<td>75 cm</td>
<td>ZERO</td>
<td>0.17</td>
<td>0.69</td>
<td>0.35</td>
<td>1.40</td>
<td>0.69</td>
<td>96.7</td>
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<tr>
<td>80 cm*</td>
<td>ZERO</td>
<td>0.31</td>
<td>0.62</td>
<td>0.31</td>
<td>1.25</td>
<td>0.62</td>
<td>96.8</td>
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<tr>
<td>85 cm</td>
<td>ZERO</td>
<td>0.43</td>
<td>1.51</td>
<td>0.64</td>
<td>1.94</td>
<td>1.30</td>
<td>94.2</td>
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<tr>
<td>90 cm*</td>
<td>ZERO</td>
<td>0.17</td>
<td>0.70</td>
<td>0.35</td>
<td>1.40</td>
<td>0.70</td>
<td>96.7</td>
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<tr>
<td>95 cm</td>
<td>ZERO</td>
<td>0.20</td>
<td>2.64</td>
<td>0.61</td>
<td>2.44</td>
<td>1.62</td>
<td>92.5</td>
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<tr>
<td>100 cm*</td>
<td>ZERO</td>
<td>0.14</td>
<td>1.49</td>
<td>0.29</td>
<td>2.10</td>
<td>1.49</td>
<td>94.5</td>
</tr>
</tbody>
</table>

*Part of this soil sample was dated by OSL.
^Chert flake was recovered from this fraction.
(B) This sample is the second of two collected at this depth.
Table 3. OSL Age Determinations of Loess Samples for Grid Eastern and Western Trenches, Phil Stratton Site. Analysis Performed by Luminescence Dating Research Laboratory, University of Illinois, Chicago.

**Western Unit (2-m square S2E5 and west wall of unit S3E5)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Laboratory Number</th>
<th>Determination (calendar years BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 90 cm below surface</td>
<td>UIC1800</td>
<td>29,980 +/- 2,320</td>
</tr>
<tr>
<td>2. 75 cm below surface</td>
<td>UIC1799</td>
<td>16,720 +/- 1,300</td>
</tr>
<tr>
<td>3. 65 cm below surface</td>
<td>UIC1874</td>
<td>19,320 +/- 1,380</td>
</tr>
<tr>
<td>4. 55 cm below surface</td>
<td>UIC1872</td>
<td>17,020 +/- 1,210</td>
</tr>
<tr>
<td>5. 45 cm below surface</td>
<td>UIC1873</td>
<td>8,090 +/- 590</td>
</tr>
<tr>
<td>6. 40 cm below surface</td>
<td>UIC1728</td>
<td>3,500 +/- 320</td>
</tr>
<tr>
<td>7. 30 cm below surface</td>
<td>UIC1727</td>
<td>1,150 +/- 100</td>
</tr>
<tr>
<td>8. 30 cm below surface</td>
<td>UIC1726</td>
<td>950 +/- 90</td>
</tr>
</tbody>
</table>

**Eastern Unit (at grid point S5.2 E42.4)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Laboratory Number</th>
<th>Determination (calendar years BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 100 cm below surface</td>
<td>UIC2033</td>
<td>31,890 +/- 2,260</td>
</tr>
<tr>
<td>2. 90 cm below surface</td>
<td>UIC2034</td>
<td>26,580 +/- 1,870</td>
</tr>
<tr>
<td>3. 80 cm below surface</td>
<td>UIC2035</td>
<td>23,480 +/- 1,670</td>
</tr>
<tr>
<td>4. 70 cm below surface</td>
<td>UIC2036</td>
<td>21,400 +/- 1,520</td>
</tr>
<tr>
<td>5. 60 cm below surface</td>
<td>UIC2171</td>
<td>17,170 +/- 1,230</td>
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<tr>
<td>6. 50 cm below surface</td>
<td>UIC2172</td>
<td>11,210 +/- 810</td>
</tr>
<tr>
<td>7. 40 cm below surface</td>
<td>UIC2173</td>
<td>6,175 +/- 485</td>
</tr>
<tr>
<td>8. 35 cm below surface</td>
<td>UIC2174</td>
<td>4,880 +/- 350</td>
</tr>
</tbody>
</table>
Table 4. Light Values for Ste. Genevieve Chert Artifacts from the Blue Hole Clovis Site (BHC) and Phil Stratton Site (PS).

<table>
<thead>
<tr>
<th>Catalogue #</th>
<th>Artifact</th>
<th>Light Units (average both sides)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHC-13</td>
<td>Fluted point pref.</td>
<td>20,577/20,967 (20,773)</td>
<td>(+/- 1,485)</td>
</tr>
<tr>
<td>BHC-16</td>
<td>Fluted point pref.</td>
<td>24,235/16,845 (20,540)</td>
<td>(+/- 4,561)</td>
</tr>
<tr>
<td>BHC-8</td>
<td>Fluted point pref.</td>
<td>19,133/21,520 (20,327)</td>
<td>(+/- 2,152)</td>
</tr>
<tr>
<td>BHC-10</td>
<td>Fluted point pref.</td>
<td>19,974/17,113 (18,544)</td>
<td>(+/- 1,871)</td>
</tr>
<tr>
<td>BHC-5</td>
<td>Fluted point pref.</td>
<td>16,341/18,419 (17,380)</td>
<td>(+/- 1,965)</td>
</tr>
<tr>
<td>BHC-7</td>
<td>Fluted point pref.</td>
<td>16,499/17,528 (17,014)</td>
<td>(+/- 1,965)</td>
</tr>
<tr>
<td>BHC-15</td>
<td>Biface</td>
<td>18,219/15,098 (16,659)</td>
<td>(+/- 4,059)</td>
</tr>
<tr>
<td>BHC-3</td>
<td>Fluted point</td>
<td>15,526/16,049 (15,788)</td>
<td>(+/- 1,710)</td>
</tr>
<tr>
<td>BHC-1</td>
<td>Fluted point</td>
<td>14,310/17,090 (15,700)</td>
<td>(+/- 2,569)</td>
</tr>
<tr>
<td>BHC-12</td>
<td>Fluted point pref.</td>
<td>16,199/15,130 (15,665)</td>
<td>(+/- 2,754)</td>
</tr>
<tr>
<td>BHC-2</td>
<td>Fluted point pref.</td>
<td>15,378/15,811 (15,595)</td>
<td>(+/- 1,314)</td>
</tr>
<tr>
<td>BHC-14</td>
<td>Fluted point pref.</td>
<td>16,095/13,362 (14,729)</td>
<td>(+/- 2,175)</td>
</tr>
<tr>
<td>BHC-11</td>
<td>Fluted biface</td>
<td>17,310/12,927 (15,119)</td>
<td>(+/- 3,196)</td>
</tr>
<tr>
<td>BHC-4</td>
<td>Fluted point</td>
<td>16,120/15,140 (15,630)</td>
<td>(+/- 1,386)</td>
</tr>
<tr>
<td>PS-813</td>
<td>Cumberland point</td>
<td>38,193/33,016 (35,604)</td>
<td>(+/- 3,907)</td>
</tr>
<tr>
<td>PS-1514</td>
<td>Side- &amp; endscraper</td>
<td>21,094/26,818 (23,956)</td>
<td>(+/- 4,368)</td>
</tr>
<tr>
<td>S-743</td>
<td>Biface (celt)</td>
<td>23,949/21,900 (22,925)</td>
<td>(+/- 1,808)</td>
</tr>
<tr>
<td>PS-1329</td>
<td>Cumberland point</td>
<td>17,214/20,973 (19,093)</td>
<td>(+/- 2,316)</td>
</tr>
<tr>
<td>PS-640</td>
<td>Beak</td>
<td>18,492/19,670 (19,081)</td>
<td>(+/- 2,563)</td>
</tr>
<tr>
<td>PS-1809</td>
<td>Sidescraper</td>
<td>20,447/17,446 (18,947)</td>
<td>(+/- 2,514)</td>
</tr>
<tr>
<td>PS-1850</td>
<td>Side- &amp; Endscraper</td>
<td>20,364/16,292 (18,328)</td>
<td>(+/- 3,154)</td>
</tr>
<tr>
<td>PS-1423</td>
<td>Hollow scraper</td>
<td>16,967/18,107 (17,537)</td>
<td>(+/- 2,904)</td>
</tr>
<tr>
<td>PS-586</td>
<td>Burin</td>
<td>16,287/18,526 (17,407)</td>
<td>(+/- 2,190)</td>
</tr>
<tr>
<td>PS-231</td>
<td>Beak</td>
<td>16,120/15,140 (15,630)</td>
<td>(+/-1,386)</td>
</tr>
<tr>
<td>PS-1395</td>
<td>Beak</td>
<td>13,767/16,159 (14,963)</td>
<td>(+/- 2,479)</td>
</tr>
<tr>
<td>PS-1694</td>
<td>Util. prism. blade</td>
<td>12,952/13,201 (13,076)</td>
<td>(+/- 3,031)</td>
</tr>
<tr>
<td>PS-1422</td>
<td>Beak (on biface)</td>
<td>11,095/14,129 (12,612)</td>
<td>(+/- 2,355)</td>
</tr>
<tr>
<td>PS-1280/573</td>
<td>Cumberland pt. preform</td>
<td>10,515/12,583 (11,549)</td>
<td>(+/- 1,828)</td>
</tr>
</tbody>
</table>

Mean 16,908 +/- 2,341

Mean 18,622 +/- 2,629
Captions and Figures.

Figure 1. Area of distribution of Cumberland Tradition remains (dotted line) and the location of Dutchess Quarry Caves (A) and the Phil Stratton site (B).
Figure 2. Entrance to Dutchess Quarry Cave No. 1, 2007. From left, Kevin Storms, Kirk Spurr, and Del Beck.
Figure 3. Kirk Spurr stands at the entrance to Dutchess Quarry Cave No.8, 2007.
Figure 4. Middle or Late Stage Cumberland point tip fragments from Stratum 4, Dutchess Quarry Cave No. 8. *Top*, photograph of freshly excavated Cumberland point tip (NYSM, A90.3.13.1), 1988 photograph by Harold Decker; *bottom*, Cumberland point tip of weathered yellow jasper (NYSM, A90.3.13.1) together with smaller Cumberland point tip of brown jasper (NYSM, DQC8-14) that was recovered by J. S. Kopper from Stratum 4. Photographs by Kirk Spurr.
Figure 5. Photographs of the same face of a complete Barnes point (NYSM, A-2001.17.001) from Dutchess Quarry Cave No. 1. *Left*, point fresh from the excavation within DQC No. 1, 1965 photo by Harold Decker; *right*, point with calcareous crust removed, NYSM photo, courtesy of Dr. Robert E. Funk.
Figure 6. Distribution of complete, fragmentary, and uncompleted Cumberland points (N = 18) and channel flakes (N = 46) across the Phil Stratton site. Dashed lines link conjoined fragments. Pound sign (#) = Cumberland point. Plus sign (+) = channel flake.
Figure 7. The excavated area of the Phil Stratton site showing natural erosion scarp (heavy, dashed line) and western (A) and eastern (B) sample collection areas for OSL-dating.
Figure 8. Plotted OSL dates for the eastern and western trenched areas of the Phil Stratton site, best-fit curves, and intercepts with the zone of Cumberland occupation. The dashed lines to either side of the circles and triangles represent standard deviations (+/- one sigma) of measured values.
Figure 9. Cumberland flaked stone celt resting at 35 cm below surface within Peorian loess of unit S2E5, western area of the Phil Stratton site. Length of celt = 72 mm. R. M. Gramly photograph.
Figure 10. Excavation of the well-preserved 2-m square S2E0 in the western sector of the Phil Stratton site, November, 2010. The count of artifacts and manuports within this unit by spit is, as follows: 0-10 cm, 10 objects; 10-20 cm, 12 objects; 20-30 cm, 24 objects; 30-40 cm, 16 objects; and 40-50 cm, one object. R. M. Gramly photo.
Figure 11. Logarithmic curves fitted to OSL dates from eastern (A) and western (B) trenches at the Phil Stratton site and combined curve incorporating dates from both trenches (C).

The mathematical solution – one of several possible solutions (see text) – for all three logarithmic curves is, as follows:

(A) \( e^{\lambda x} = 1.2429654; y = 14,795.02 \) calendar years (25 cm b. surf.)

(B) \( e^{\lambda x} = 1.2943388; y = 15,341.80 \) calendar years (30 cm b. surf.)

(C) \( e^{\lambda x} = 1.2940961; y = 14,487.01 \) calendar years (27.5 cm b. surf.)
Figure 12. Findspots of Cumberland points (A-N) across southern Logan County, Kentucky and locations of the Blue Hole Clovis and Phil Stratton sites (inset) in relation to the Red River and Pleasant Grove Creek.
Figure 13. Basal aspects of Cumberland Tradition points marking 3,000-3,500 years of technological evolution beginning with narrow, unfluted, cordiform points and ending with thin, relatively wide specimens. A, beginning or El Joboid Stage (16,000 calendar years BP?); B, Proto-Cumberland Stage (16,000 calendar years BP?); C, Early Stage (15,500 calendar years BP?); D, Middle Stage (14,500 calendar years BP); E, Late Stage (13,500 calendar years BP); F, Terminal Stage (12,500 calendar years BP and later).
Arrows draw attention to the absence of secondary trimming at the proximal end of channel flake scars on the last side to be fluted (Side B).