CALICO REDUX: ARTIFACTS OR GEOFACTS?

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On closer inspection, Calico does not appear to be a natural rock crushing geofactory. Nor is it the case that Calico is bereft of definite and repetitive artifact types. Most tool types are either unifacial (including notched specimens) or bifacial in nature, hundreds of them, and delicately notched perforators (reamers, gravers). There are dozens of artifact types and subtypes represented, and there are thousands of flakes and tool types without cortex and with multiple flake scars. After a review of the controversy, tabulated data are presented.

This paper reports on the findings from an examination of over 70,000 fractured subsurface lithic specimens from SBCM 1500A, the Calico Early Man Site, located just east of Barstow, California. The fractured materials are chert, chalcedony, agate, jasper, and other siliceous varieties from medium to high quality. The specimens were collected during excavations from Master Pit 1 (MP1), Master Pit 2 (MP2), with a small fraction from other associated excavations, including Master Pit 3, Trench 1, and several pieces collected from Control Pit 1. Ninety-five percent of the pieces were collected during the 1960s and 1970s in 3-in. levels inside 5-ft.-by-5-ft. units.

The classification system was established in the 1960s and 1970s with very few subsequent changes. Occasionally assisted by avocationalist and longtime member of the Friends of Calico, Chris Vedborg, the examinations took place in the Anthropology Laboratory at the San Bernardino County Museum (SBCM) where all specimens are stored. The classified contents of MP1 and MP2 are contained in roughly 60 standard museum boxes. About 30 other boxes of specimens from other associated excavations remain to be examined and classified.

Over the past three decades, examinations often consisted of sampling single boxes of specimens or one or more total excavation unit collections, with results often unpublished in the form of notes and comments logged into catalogue binders. In addition, a number of filled binders of comments by professionals date directly to the 1970 Calico international conference. Several significant publications, pro and con, will be discussed below.

These results are preliminary. Each specimen received only a quick and cursory inspection. The primary mission of this first stage of analysis is to record specimen attributes on a spreadsheet for the purpose of developing an inventory of the collection that is easily accessible. A more thorough examination of the lithic specimens will proceed once the inventory is complete.

Each specimen is given a serial number, except for collections of multiple flake fragments and clusters (e.g. concentrations of multiple flake fragments, or debitage) that routinely turned up in the 3-in. levels. In many instances, the materials had been presorted by unit into specific artifact types. Many of these earlier designations held up, but others were interpreted differently when the need arose.

One of the advantages of running all specimens by a single set of eyes is that it promotes consistency and continuity throughout the collection's classification, and this applies to correct as well as incorrect attribute assignments. It will hopefully provide a consistent, or at least orderly, foundation for other analysts studying the collection in the future.

My approach to examining the collection initially focused on the concept of fracture densities and that all specimens with hard (conchoidal) fracture signatures were "suspects," be they artifacts or geofacts. Laws of fracture mechanics dictate that something had to conchoidally fracture the rocks. Discerning chemical splitting or thermal fractures from conchoidal (hard) fractures is fairly easy given my background rooted in flintknapping, including thermal experimentation with various siliceous materials.

The collection is largely composed of pieces with conchoidal features, exceptions being the crushed surfaces of anvil- and hammerstone-types. The vast bulk of the collection (70 percent or more) consists of debitage, flakes, and tools with little or no cortex.

A rock does not conchoidally fracture all by itself. It needs help. Further, many of the specimens exhibit multiple flake scars indicating that multiple fracture events occurred around the same time on a given piece.

Very few subsurface specimens exhibit multiple generations of flake scars; also, very few were weathered or patinated, suggesting minimal surface residency times. In general, edges were in fairly good shape, and some were still sharp.

An abiding issue is whether the fracture densities are homogenous throughout the entire subsurface of the fanglomerate complex. As geofacts, it is reasonable to expect that if natural agencies capable of fracturing siliceous rocks are represented in the Master Pit (MP) zone, then the same agencies should have been operative in the fanglomerate deposits beyond these excavations. In other words, the same fracture densities at the MPs should exist throughout the fanglomerate in general. Whatever natural agencies were involved in breaking the rocks at the MPs, it is reasonable to expect that they would also be in play in other areas of the deposit.

Preliminary assessments suggest, however, that the fracture densities in the Master Pit zone are perhaps hundreds of times greater than in the sediments excavated in the test and control units located within the fanglomerate beyond this zone. No natural agency -- other than perhaps some kind of small-diameter explosion -- can account for or explain this super-local increase in fracture densities. Another feature related to site deposition is that the fanglomerates of the Yermo Formation in the MPs are virtually parallel with a slope of about one degree.

It is fortunate that any and all issues and data entertained in this article can be physically tested, checked, and rechecked. There is still plenty of site area left for excavation and testing of a multitude of issues. Archaeology as forensics is coming of age, and Calico represents an ultimate challenge.

THE GEOLOGICAL CONTEXT OF THE CALICO SUBSURFACE

The alluvial fan complex of the Calico Hills is made up of sediments laid down in possibly a dozen depositional events (Baty and Seff 1994; Shlemon and Budinger 1990). The alluvial fan was cut off from its source possibly tens of thousands of years ago and began to erode over the millennia. In turn, it has become the source of smaller alluvial fans jutting out from its perimeter. The specimens were captured within the alluvial matrix during the period that the Yermo Formation was building. To date there is no evidence that the specimens were redeposited within secondary depositional insets. Uranium Series dates of 200,000 years were obtained from the base of the formation in the early 1980s (Bischoff et al. 1981). Thermoluminescence dates suggest a minimum antiquity of 135,000 years (Debenham 1999).

From the Calico Early Man Site (EMS) website, Fred Budinger (2005) provides a summary of what is currently known of the Yermo Formation:

Calico Site Stratigraphy

The artifact-yielding Yermo Formation overlies the Barstow Formation, and consists of two depositional units: a basal mudflow and overlying, crudely intercalated debris flows and fanglomerates; and overlying, reworked fan deposits, primarily arkosic sand, with a strongly developed relict paleosol at the surface (Shlemon and Budinger 1990).

The mudflow and fanglomerate consist of lenticular, poorly stratified layers of sands and angular gravel. There are no buried paleosols or significant unconformities. Deposition probably occurred within one climatic cycle of perhaps a few tens of thousands of years.

The upper, reworked arkosic sand unit (about 1.5-m thick at Master Pit I) contains highly weathered tuff fragments. Based on its lithology, distinctive red color, and other weathering characteristics, the sand was probably derived from nearby, previously weathered fan-deposits. The overall stratigraphic section provides evidence that deposition occurred in response to gradual changes from semiarid to arid climatic conditions.

There is no evidence for depositional insets or cut-and-fill episodes observed in the Master Pits that could theoretically account for the redeposition of the specimens. The sedimentary matrix is well lithified and unattractive to reworking by local rodentia as well as to human trowelbearers who must learn the way of the hammer and chisel.

A main question is, where did the fractured specimens come from? Were they redeposited from elevationally and/or stratigraphically higher exposures of the fan complex, which presumably were nearer the source outcrops? Or were the specimens fractured in situ prior to final deposition and burial? Are both true to a degree? If so, how can we tell the difference? These issues will be dealt with below in response to a series of papers supporting the geofact hypotheses, followed by a couple papers supporting the artifact hypothesis.

THE GEOFACT-ARTIFACT CONTROVERSIES

Background

Histories of the Calico Early Man Site excavations and research and photographs of the artifacts can be reviewed in several works (Budinger 1983, 2000, 2004; Budinger and Simpson 1985; Calico Early Man Site 2005; Leakey 1972; Leakey et al. 1968, 1970; Minshall 1976:30-40; Schuiling 1979; Simpson 1980). Briefly, dense lithic workshops captured in wide swaths of desert pavement in the Calico Hills were brought to Dee Simpson's attention during the 1950s. With degrees in both archaeology and geology from University of Southern California, she was uniquely qualified to reach the conclusion that Calico's surface lithic workshops were different than the assemblages of other early surface sites in the region, most notably the artifact types from Pleistocene Lake Mojave (Simpson 1960). Walking over the square miles of workshops on the western alluvial fans near Calico, above Pleistocene Lake Manix, the assemblages had a more ancient quality about them than other paleo-artifact assemblages. There was also a nearly total absence of projectile points and other artifacts typical of later prehistoric periods. Further, the artifacts observed above the higher lake stands were much more weathered, hence older, than those at lower elevations.

Armed with a small collection, she set off for London to show them to Dr. Louis Leakey. He was immediately interested. He had never seen artifacts like this from the New World before. A few years later he came out to the area to have a look for himself and came across buried artifacts in the profile of a bulldozer trench. In 1964, with support from National Geographic, the Calico Early Man Site was born. The geofact-artifact controversy started soon after.

The oldest accepted Paleoamerican finds in the Mojave Desert were all surface artifacts. Calico's 5 ft. by 5 ft. units were going down 20 ft. in a dead fan. Tensions were high. A conference held in 1970 resulted in a hung jury and thoughts that the site's age might be a half million years old. Such an antiquity (500,000-100,000 years) for a New World site was simply too extreme at the time.

In 1973, Science published C. Vance Haynes's critical article that effectively, though hypothetically, dismissed Calico's collection from serious attention. Haynes listed a number of agencies capable of fracturing chert -- at the outcrop source of the fan materials, during transport, and postdepositionally (1973:107). The article is persuasive because it ascribes a highly dynamic geological scenario to the alluvial fan-building process at Calico. With all those forces in play, nature could just about make any kind of simple tool form imaginable, even bifacially flaked edges and delicate becs. The continuing absence of spearheads and human bone apparently clinched for Haynes the non-artifactual nature of the assemblage.

Most, if not all, of the professionals with a curious eye on Calico after the 1970 conference turned away when the article was published. Few felt confident enough about their lithics acumen to stake their careers on this perceived avalanche of fractured stone. Leakey had passed away in 1972 and therefore could not rebut Haynes. Instead, the entire affair was left in Dee Simpson's capable lap, but with no funding and academic support virtually gone.

Geofacts Gone Wild

The political and scientific status of Calico has remained essentially the same since that time. The vision of the Yermo Formation as a gigantic rock crusher still persists. Most New World debunkers seem to have no problems believing that the simple nature of non-handaxe Middle Paleolithic tool assemblages, like those from East Asia, can be readily mimicked by Calico's fan building processes, and that it would be next to impossible to distinguish natural fracture from artificial under such circumstances. And the critics have won out in popular society, as shown in a recent article in Science Illustrated about the earliest Americans; the unknown author of the piece refers to Calico as “The Oldest Mistake” (Footprints from Our Past 2008:49).

Haynes lists agencies associated with the source of the rock itself, followed by those agencies related to transport, and ending with postdepositional fractures as the most logical geofact contributors -- from start to finish (Figure 1).

(1). Fracturing of outcrops by tectonic stress and weather fracturing, root pressure, freeze-thaw cycles, solar heating.

(2). Movement of cherts down steep slopes by free-falling, tumbling, sliding, either individually or en masse.

(3). Tumbling for several miles down low to intermediate slopes by water and mudflows, carrying igneous rocks as well as cherts.

(4). Buried in aggrading alluvial fan, erosion can re-expose cherts to further fracture and flaking by intergranular pressure.

(5). Erosion and redeposition can account for several generations of flaking observed on some pieces of chert (Haynes 1973:307).

Source of Cherts

The source of the material carried down by the ancestral fan has not been located, so the fracture agencies listed under (1) above cannot yet be verified. Although such processes may be observed today at siliceous rock outcrops elsewhere in the Calico Mountains, these have not been studied (George Jefferson, personal communication 2008).

Fracture via Transport

With respect to agencies of fracture typified by transport ((2) and (3) above), several control pits were excavated upslope from the MP zone in 1967 to test whether the same kinds of fractured specimens turned up beyond the MP excavations. According to Haynes, questions about lithological populations beyond the Master Pit zone "led to the excavation in 1967 of two control pits, which I believed at the time would be an inadequate test because more and smaller test pits would have been statistically more representative" (1973:308). Later, other smaller test units were sunk to test this suggestion and came up virtually sterile. (Results of these test excavations and other ancillary excavations will be published when the classification of the materials recovered is completed.)

Figure 1 shows the location of these units. Control Pit 1 extended down more than 80 ft., with only several dozen fractured pieces collected. There was a story about five of the best being shown to Dr. Leakey and that he rejected all of them. However, I have seen a few pieces that could possibly be identified as “scraper” types. The examination just commenced, so there might be some surprises in store. On the other hand, Control Pit 2 yielded nothing that corresponded to the standards of selection set by Leakey. Using the same criteria as they used in the MPs (Dan McCarthy, personal communication 2008),

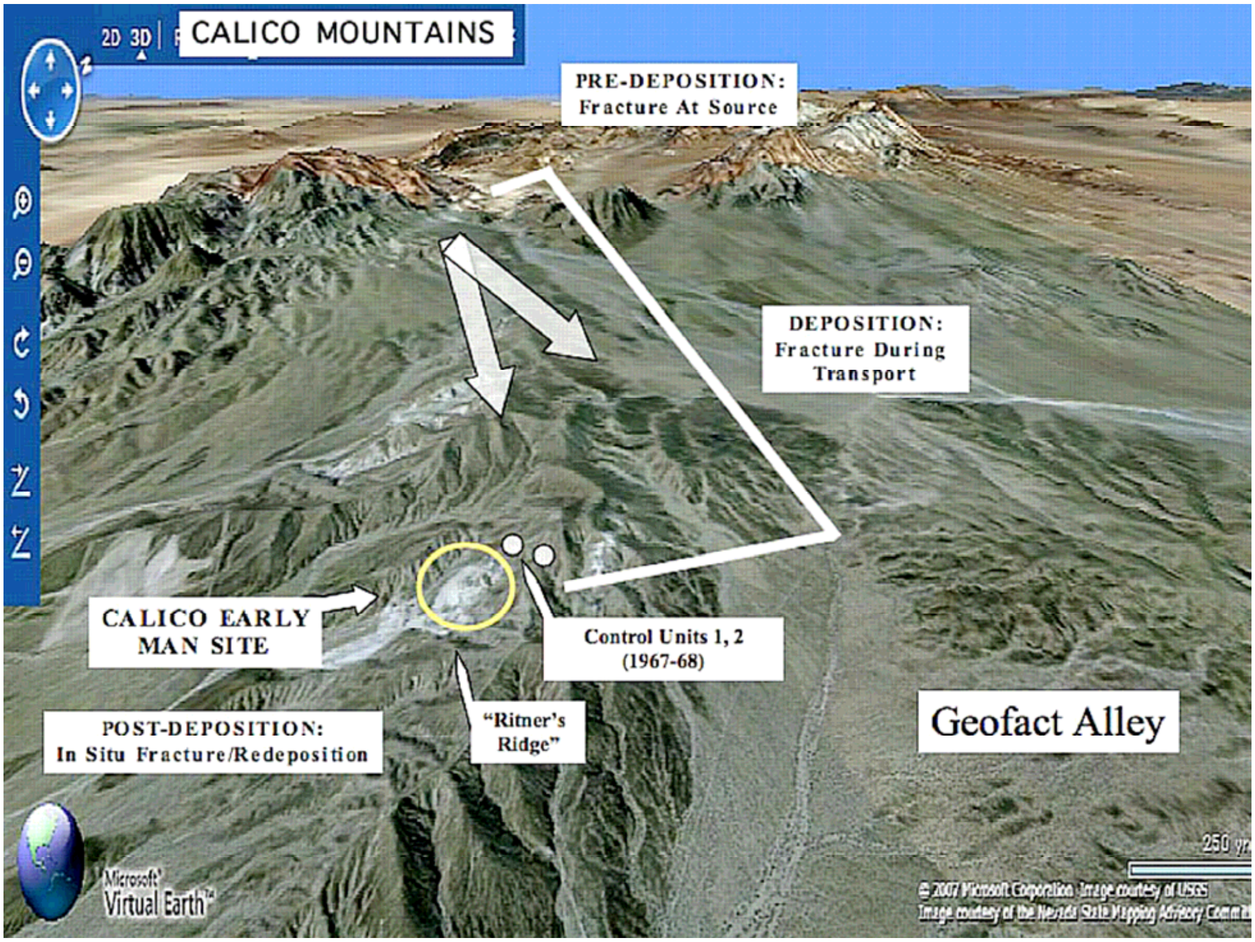


Figure 1. Geofact Alley: the hypothetical source of Calico's fractured specimens. The source, transport route, and the site are shown looking west towards the Calico Mountains. The two control pits are upslope from the Master Pit zone, and below it is Ritner's Ridge.

the numbers of collected specimens from the control pits were extremely low when compared to the yield from the MPs.

The following quantities are preliminary totals of fractured specimens from Master Pits 1 and 2 (including entry trench specimens), and Master Pit 3 which is incomplete and only about 8 ft. deep at present and has not reached the base of the Yermo Formation. (Master Pit 2 is about 30 ft. deep.)

Master Pit Collected Specimens (~85 percent debitage):

MP 1: 46,057

MP 2: 21,829

MP 3: 2,816 (incomplete)

These totals, when compared to other excavations outside the Master Pit zone, appear to indicate an inhomogeneity of fracture densities from different parts of the fanglomerate. This needs to be resolved if the geofact argument is to be supported. In the future, more test units would help to define these densities beyond the MP zone.

One anomaly is known to exist, and is located just east of the bulldozer cut where Leakey found the first subsurface artifact. It is called Ritner's Ridge after the person who excavated the locus.

Hundreds, maybe thousands of specimens were collected, including some definable tool types and much debitage. Excavations went down about 6 ft. The location of this site indicates that specimens continue to be found more distally on the paleo-fan than the MPs, relative to the outcrop source, but specimen count decreases markedly above them toward the source of chert. This needs to be explained. Again, artifact populations of this and other ancillary excavations still need to be tabulated. However, it is safe to say that none approach the fracture densities present in the MP zone.

For the moment, the "breakage during transport" idea still needs to be tested by geologists before it can be cited as a cause for the "geofacts" encountered in the MPs.

Post-deposition Fracture

Fracture agencies listed for postdeposition breakage also come up short. To begin with, no cut-and-fill episodes or insets were found during the excavations that demonstrated any potential contamination by thousands of the accepted surficial artifacts. More importantly, no in situ fractures were ever encountered during the excavations, a feature Dr. Leakey told everyone to be on the lookout for on the first day. In situ fractures are those that might occur during the tectonic activity that rumbled through the deposit, where buried rocks may have bumped together with sufficient force to cause fractures. Had this occurred, the fractures and the natural "core" would have been uncovered together, in situ.

Dig a hole and put an obsidian boulder into it and cover it with dirt except for the top. Hit it with a large sledgehammer. It fractures into many pieces, but they all remain close by. You can easily fit them back together. If this occurred naturally in the MP sediments, the fragments would have been very close to the "core" and they could be put back together. To date, no back-fitting pieces have been found. This is not to say there are no "backfits" in the collection, since some examples might turn up during subsequent examinations, but it does remove the postdepositional fracture agencies as primary explanations for geofact production. Even if in situ fracture had occurred a few times and went unrecognized during the excavations, it cannot explain the more than 70,000 fractured specimens classified to this point.

Another strange anomaly encountered during excavations are called clusters – dense deposits of debitage and small flakes of siliceous material numbering from a couple dozen fragments into the hundreds, or in one instance, in the thousands when window-screened (MP1, Unit R-20, 138 in.). A few examples follow. All are composed of fragments from multiple source rocks and are mostly without cortex.

In MP 1:

Unit P-19, at 196 in.: 248 fragments;

Unit S-19, 50 in.: 220 fragments.

In MP 2:

Unit J-13, at 312 in., 525 fragments (debitage);

Unit K-10, at 294 in.: 327 fragments.

Had these clusters resulted from two large rocks grinding themselves down during tectonic and settling events throughout the eons, Leakey, Simpson, and the crew chiefs would have easily noticed these natural features during excavation. None of these kinds of natural fractures were observed.

If the Yermo Formation clusters of lithic flakes, like the larger rocks within the deposit, were transported together from higher up on the ancestral fan to their final resting place at the site, what would explain these dense clusters of similar-sized chert clasts? What kept them together as a "body," so to speak? Why didn't they get mixed up more homogenously during the multi-mile trek from the source? Haynes (1973:309) reasons: "Reworking of the fan surfaces by water could … concentrate flakes, so natural causes for such concentrations cannot be precluded."

If he is correct, then why do the vast bulk of the small specimens still retain fairly sharp edges? Had they been transported over a mile or so? Or transported short distances, repeatedly? If so, would you not expect the edges and other high points on the pieces to exhibit some degree of rounding via transport in the gravelly matrix? This is a question Lee Patterson also asked when he examined the Calico collection 20 years ago (Patterson et al. 1987:101). After going through the collection, my experience is that the edges, on the whole (80 percent or more), are in fairly good shape, hopefully good enough for usewear and polish investigations. Some are very sharp, and some of these pieces were whacked off during excavation. Small fractions are extremely rounded, and others exhibit varying degrees of varnish and patina; so far, these total less than 1,000 specimens.

Haynes laid out a full spectrum of possibilities (hypotheses), but neither he nor any other critic ever returned to test them out. Long before he published the article, the excavations themselves had already tested his claims by negating two of the three sources of natural fracture; the fracture agencies at the source still require verification. Hopefully this will inspire other scientists to test these negative results. As it stands, while many geofact-making agencies could possibly be present, excavation results tend to show they were negligible.

There is another flaw in the professional certainties that claim Calico is all about geofacts, namely, the absence of any other geological precedent for such a geofact factory. If the Yermo Formation is a natural rock crusher producing myriads of artifact-looking geofacts, it remains a singular example. None of the critics, from Vance Haynes to his colleagues and his students, have cited any other precedent for this kind of display of geofact production anywhere else in the world. And if the critics are correct, Calico should have represented to them a preeminent geofact anomaly. Here was a place to investigate geofact production like no other site on earth. Instead, it was lightly dismissed as if such “geofactories” were commonplace.

Geofacts by the Numbers

What is it that actually makes the Calico subsurface collection geofactual? Was it by virtue of the strange morphologies turning up? Or was it by virtue of their incredible age, minimally 200,000 years old? If the specimens were found in a 15-25,000-year-old context, would they have been accepted as human artifacts? Or is there something in the nature of the collection, something intrinsic to this deposit of fractured materials itself that qualitatively casts doubt on their artificiality? Or are there indefinable overlaps between populations of geofacts and artifacts that we are unable to resolve, and that resolution is only accomplished when the age of the population accommodates present-day human evolutionary theory? Or is there some kind of objective measure using a replicable statistical methodology that can decide once and for all whether a fractured stone is an artifact or geofact?

Two papers (Duvall and Venner 1979; Payen 1982) stand out as attempts to demote the Calico specimens to geofact status, and both rely on statistical models based on edge angles of fractured rock. Both papers postulated that the higher the angle between fractured surfaces (closer to 90 degrees), the more probable is the specimen’s geofact status. Sam Payen’s contribution followed the lead of the Barnes Test, by an Englishman who tried to set up a system to discern natural versus human fracture (Barnes 1939). Duvall and Venner follow the lead of previous statistical work with Clovis and other Paleoamerican assemblages.

Both attempts failed because both ignored the realities of the full spectrum of humanly fractured rocks. Both statistical methodologies are based on direct percussion techniques, as is another attempt to achieve the same geofactual result (Gillespie et al. 2004). None take into account the residues generated during bipolar fracture (Schick and Toth 1993; cf. Hardaker 2001). If these investigators had ever thought to include bipolar variability into their statistical schemata, they would have arrived at a very different conclusion; namely, that bipolar residues entirely negate their a priori assumptions regarding humanly generated lithic residues that result from direct percussion.

By their own admission, the closer that edge angles are to 90 degrees, the less likely the specimen's fracture angle was made by humans (Payen 1982:199). Yet the first thing you become aware of when you split cobbles and pebbles using bipolar flaking is that fracture angles, like the striking angles, are routinely 90 degrees, by definition. (If they aren't, you won't have any knuckles left.) A perfect opposition between anvil and hammerstone is required for the simultaneous fracture at both ends. Great energy is unleashed. With respect to shape, split cobbles and “orange slices” are common.

Sam Payen may be referring to bipolar flaking when he writes about "uncontrolled" flaking characteristics (1982:197, 200), and, if so, he secures a geofact-like status for the residues of a 2.5-million-year-old technique (Schick and Toth 1993). A similar tactic was recently used by Goebel et al. (2008) where at least one pre-Clovis assemblage is questioned on the basis that “the assemblage was not produced through conventional Paleolithic technologies" (2008:1500; emphasis added), without defining what that means. Is that a reference to all pre-bifacial thinning/pre-blade technologies, and that these residues do not count?

Similar drawbacks are readily seen in Duvall and Venner's questionable approach (Gruhn and Young 1980). They compared edge angle traits from the Calico flake collection with über-Paleoamerican technologies. For Patterson, "Statistical comparison of a sophisticated Paleo-Indian lithic industry with a possible primitive industry, such as that represented at Calico, does not seem to have any specific meaning" (Patterson et al. 1987:92). For there to be any kind of technological relevance, Duvall and Venner would have done well to avoid the super Paleo techs and applied their geofact-artifact formulas to samples of lithics from the archaic La Jollan culture or, probably more relevant, the East Asian Middle Paleolithic.

Artifactual Arguments

Lee Patterson did not mention bipolar flaking, either, in his examination of the Calico collection (Patterson et al. 1987), but he did assemble an experimental population of flakes derived by direct percussion to compare with the collection. His conclusions using an empirically quantified comparative method were very different from the statistical methodologies of the other papers. From a total population of 473 flakes from Calico's subsurface, 26 percent had distinct force bulbs, 70 percent were free of cortex, and 47 percent had "two or more dorsal face facets, demonstrating serial flake removals from a core" (Patterson et al. 1987:104). In addition, "large numbers of flaked stone specimens are found in clusters, as would be expected in a human lithic industrial site"; "patterned flake-size distributions are present, similar to the products of modern flintknapping experiments"; "the striking platform angles are nearly all acute"; and "both the flake-size distributions and the absence of rounding on flake edges support the concept that the Calico flakes have been found at the location of manufacture and that these flakes have not been redeposited by natural forces" (Patterson et al. 1987:104).

Recently, the combined attributes of a total of 3,502 flakes and blades were tabulated for Master Pits 1-3 (Table 1). This sample excludes clusters and flake fragments (debitage). Again, a great deal of work remains to be done with the flake and debitage populations from Calico, and these are just cursory observations.

Another type of flake in the collection exhibits concavo-convex platforms with both positive bulbs (ventral face) and negative bulb cavities (dorsal face). Haynes (1973:308) correctly notes that, "given the right shape, such a flake can be produced by a single blow with a hammerstone.” At Calico, so far we have identified at least 400 of these types of platformed flakes and blades from the MPs. Another type of flake that turns up has the "lipped" feature that can occur during soft-hammer reduction (Crabtree 1972:74). There are about 170 of these "soft hammer" flakes recorded so far.

Simpson et al. (1986) examined numerous aspects of the Calico collection, including an intensive study of specimens and artifact frequencies from units H-13 and I-13 in Master Pit 2. In general, a case was made that Calico represents a complete Early or Middle Paleolithic toolkit similar to East Asian Pleistocene sites. Clay Singer (1979) examined the edges of specimens for signs of usewear on a macroscopic level (10x-40x magnification) and found evidence suggesting activities involving cutting, scraping, and boring. Lee Patterson, who had previously published on experiments seeking to clarify edgewear on choppers (1982), observed similar wear patterns on some of Calico's choppers.

Table 1. Attributes of Flakes and Blades from Master Pits 1-3.

CODE	ATTRIBUTE	TOTAL	CODE	ATTRIBUTE	TOTAL
21	Bulb - diffused	1440	60	Platform	1255
22	Bulb - concentrated	525	62	Force lines, rings	1840
23	Bulb scar	915	100	Cortex - >75%	283
26	Hinge	630	101	Cortex - 25-75%	258
54	Step fracture	696	102	Cortex - <25%	2763

The data presented in Simpson et al. (1986) developed the theme that the technological attributes, the dozens of artifact types, and their high frequencies of repetition are beyond nature's capacity to produce, especially when considering they apparently only occur in a relatively small fraction of a large alluvial fan complex. In Simpson et al.'s defense, no critic of the Calico has ever identified a similar natural assemblage of artifact-like fractured specimens anywhere in the world. This absence of precedent on the one hand, and fairly absolute certainty on the other regarding Calico's alleged geofacts, goes to show that you can have true believers on both sides of an issue.

The Question of Bias

There was another component to the Haynes paper (1973), emphasized in the later paper by Duvall and Venner (1979), that requires a brief comment. This was a criticism against the actual directors and crew workers involved in the excavations, carrying with it innuendos that the crewmembers were true-believer types (Duvall and Venner:459, 462; Haynes:308). The implication is that the crew was probably guilty of biased selection practices: if something looked like an artifact, then it was selected and placed into the collection as an artifact. In reading their articles, I got the idea that great expectations among the crews who were involved in such a monumental undertaking involving one of the giants of the day, probably laid the foundation for overexuberant (i.e. incompetent) collection practices.

For Haynes, out of the tonnage of broken stone turning up in the excavations, some were bound to look like artifacts. "There appears to be a gradual transition between what are considered to be artifacts, probable artifacts, possible artifacts, and non-artifacts" (1973:307); this leaves the reader to conclude that out of this lithological chaos, only the ones that looked like artifacts were selected.

Haynes viewed the body of fractured rocks as specimens at various stages of their journey towards decomposition: from the veins and boulders at the source to cobble-sized chunks, then pebble-sized, to gravel and then to sand. He gives the impression that the true believers at Calico were guilty of not recognizing this reductive continuum in the fan’s rocky matrix, and instead enthusiastically picked out only the fractured pieces that mimicked simple artifacts, and that these constitute the present Calico collection.

Later, Haynes concludes (1973:309): “In fact, normal natural processes are adequate to explain the origin of all of the phenomena observed at the Calico site. This does not mean that I am convinced that all of the specimens are geofacts, even though I am inclined to suspect it.” "Adequate" perhaps, but not demonstrated. Adequacy, or even likelihood, does not constitute proof. Just listing a number of “possible” causes for geofact production does not satisfy the case. "Could" is not "is."

Duvall and Venner were more openly accusatory. The crews of the project were guilty of form selection: "the selection of naturally fractured rocks that look like man-made tools, thereby creating a biased sample of rocks from the total population of naturally fractured rocks" (1979:459). Alongside their own misguided statistical attempts to define human workmanship, "form selection" became a primary basis for their geofact conclusions.

This revisionist history needs to be corrected now. Field crews never had the last say in the matter of whether something was or was not an artifact worthy of the permanent collection. For the first 55,000 specimens or so, Leakey was the last word. When Leakey died, Master Pit 1 was complete and Master Pit 2 was about half finished, and the types of patterns and characteristics associated with various artifact types had been sorted out. After Leakey died, the same standards were followed. The classification system was a direct outgrowth of Leakey's initial input. Therefore, any claims of true belief, "form selection" biases, and general incompetence of judgment should actually be aimed at Dr. Leakey himself, which would call into question his 40-year history of identifying early man tools – as yet, no professional publication has ever made that charge.

MASTER PITS 1 AND 2

It seemed appropriate that this study be grounded in the same hypothesis that ran throughout Haynes's 1973 paper: All subsurface collections from Calico are geofacts. In science, this means we only have to prove a single artifact to establish human presence. At this point, we are not dealing with the more complex issues regarding the traditional roots of the lithic assemblage, the taxonomy used to classify the forms, or how a certain tool was used, or how the artifact makers got here in the first place. At this point, as far as the professional community is concerned, every single subsurface specimen is a geofact. And, every single piece of the 70,000+ collection must be a geofact for the hypothesis to be valid -- but to be valid it must be demonstrated. That gives Calico an advantage in a way. There are a lot of chances to find that artifact; but the critics have to come up with a reason why it is a geofact every single time as well. They have to be right all the time. Calico aficionados only have to be right once.

The current project is essentially a continuation of previous work on the assemblage and inherits the same list of categories and protocols developed by Dr. Leakey and by Dee Simpson during the 1970s-1980s. The attribute list (Table 2) summarizes the current classified population divided into its artifact categories. These are general form-function terms common back in their day, but they remain instructive. Since all specimens are regarded as geofacts, if some represent artifacts, it does not really matter what you call them since the primary goal is demonstrating human presence: a qualitative distinction. If one artifact finally gets accepted, then which others are artifacts, too? Or are they all geofacts? If so, they automatically become the most infamous collection of geofacts ever assembled, guaranteed to put a chill down the back of any paleo-archaeologist worldwide. Either way, the collection is entirely significant.

The present classification project involving the entire collection is important because when the data collected from the MP zone (including a large trench and some test pits) are digitized, they become immediately accessible for any number of explorations. For example, the 1-degree slope of the site allows us to explore the entire zone as a series of single elevations (Budinger, personal communication 2006). It also allows us to compare previous findings, such as vertical frequencies of various attribute types (Simpson et al. 1986:Figure 5).

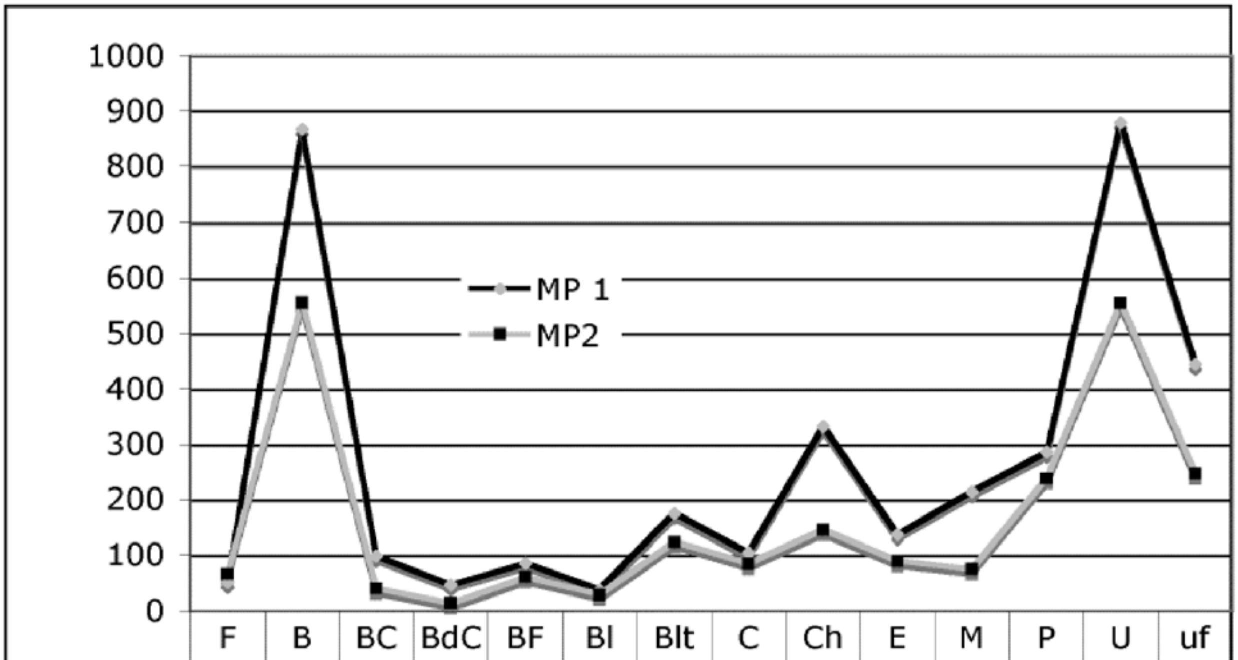
The Attribute List

The preliminary list below offers a wide variety of forms and shapes categorized as alleged identities. There are actually multiple attributes that can be assigned to any given item, including "Not Sufficient Evidence," a category reserved for ambiguous objects teetering on the edge of the round file. At the other extreme, there are a number of specimens with two or more functional attributes, i.e., multifunction and multipurpose tools, and they will be assigned special attribute numbers in the future. For now, the list represents an initial breakdown of primary attribute patterns among the assemblage. Detailed descriptions for each attribute can be found in Simpson 1999.

There might be criticisms leveled against the attribute list, that it is outmoded, ambiguous, subjective, and the like. That is to be expected. At this stage, however, we are still at the great wall between geofact and artifact. When the archaeological nature of Calico becomes accepted, then we can

Table 2. Attribute List with Current Counts.

Code	Attribute	Count	Code	Attribute	Count
1	Scraper, Convex Side and End	18	42	Scraper, strangulated	14
2	Scraper, Concave Side and End	15	43	Graver or scraper graver	312
3	Hammerstone	89	44	Eccentric finds	216
4	Reamer	153	45	Flake -- soft hammer	158
6	Bevelled Tool	3	46	Core tool (??)	3
8	Alternate Flaking (on cutting edge)	26	48	Flake, sharp-edged	182
9	Anvil	31	49	Spall	218
12	Wedge	250	50	Scraper, straight edge	170
14	Handaxe	3	52	Bladelet (< 4.5 cm)	308
15	Concavo-convex flake	418	53	Bec	9
16	Utilized flake	1426	54	Step fracture	1
17	Chopper	258	55	Percoir	81
18	Bipolar flake	158	57	Denticulate	155
19	Calico cutter (diagonal crest)	2	58	Notch	336
20	Burin complex	74	59	Debitage	61994
24	Core block	93	61	Random retouch	56
27	Scraper, concave (hollow)	327	63	Core, blade/bladelet	68
28	Quartered cobble	1	64	Core, fragment	21
29	Cleaver	2	65	Nucleus	2
30	Pointed tool	51	66	Drill	4
31	Quartz crystal	26	67	Fossil palm root	244
32	Pick	8	68	Edge-modified flake	209
33	Flake (thermal)	50	69	Knife	4
34	Edge-modified core	2	70	Scraper w/ protuberance	69
35	Blade (4.5 cm or longer)	51	72	Flake	2289
36	Bipolar core	130	73	Core, micro	3
37	Cutting tool	693	74	Biface	23
38	Scraper, thumbnail	14	75	Scraper	10
39	Scraper, end	90	76	Uniface	28
40	Scraper, convex side	134	77	Core	81
41	Scraper plane	23			
	Total Identified	72007			
	Problematic ID	1213			
	Total Collection	73227			



	F	B	BC	BdC	BF	Bl	Blt	C	Ch	E	M	P	U	uf
MP 1	51	867	98	46	85	37	175	104	332	137	215	286	879	444
MP2	66	555	40	14	60	29	123	84	145	89	74	239	554	247

Figure 2. Comparative frequencies of lumped attribute types. Lumping together categories of attributes facilitated a generalized picture of the frequencies of their occurrence in both Master Pits. F-Fabricators; B-Bifacial edges, w/UFb; BC-Bipolar core; BdC-Blade Core; BF-Bipolar Flake; BL-Blade; Blt-Bladelet; C-Core; Ch-Choppers, Wedges; E-Eccentrics; M-Miscellaneous (nondescript flaked items); P-Penetrators, gravers; U-Unifacial, w/o UFs; uf-Utilized Flakes.

review, revise, or even restructure this framework of identities, perhaps merging it with frameworks devised for East Asian Paleolithic inventories.

Frequency Charts

In order to facilitate charts and graphs, many of the types were consolidated into general classes of artifact types: bifacial edges, unifacial edges, perforators/gravers, choppers/wedges, utilized flakes, debitage, and certain types of flakes and cores. When compared with their overall frequencies in Master Pits 1 and 2, these lumped classes seem to match up (Figure 2). (Note: debitage and general flake populations were omitted from this comparison.)

Figure 3 is an overview of the vertical frequencies of the entire collection for Master Pit 2, excluding debitage. The upper surface of Master Pit 2 is roughly 10 ft. higher than Master Pit 1, and is covered by 10 ft. of overburden from a subsequent alluvial fan called the Upper Yermo Formation. When the excavations met the Lower Yermo Formation, the specimen yield picked up c

Was it appropriate to combine retouched bifacial edge types with utilized flakes with bifacial wear patterns (UFb) together as one class? This was rationalized because it is harder for nature to generate a “utilized” bifacial edge than a “utilized” unifacial edge. Anyone who has knapped or just

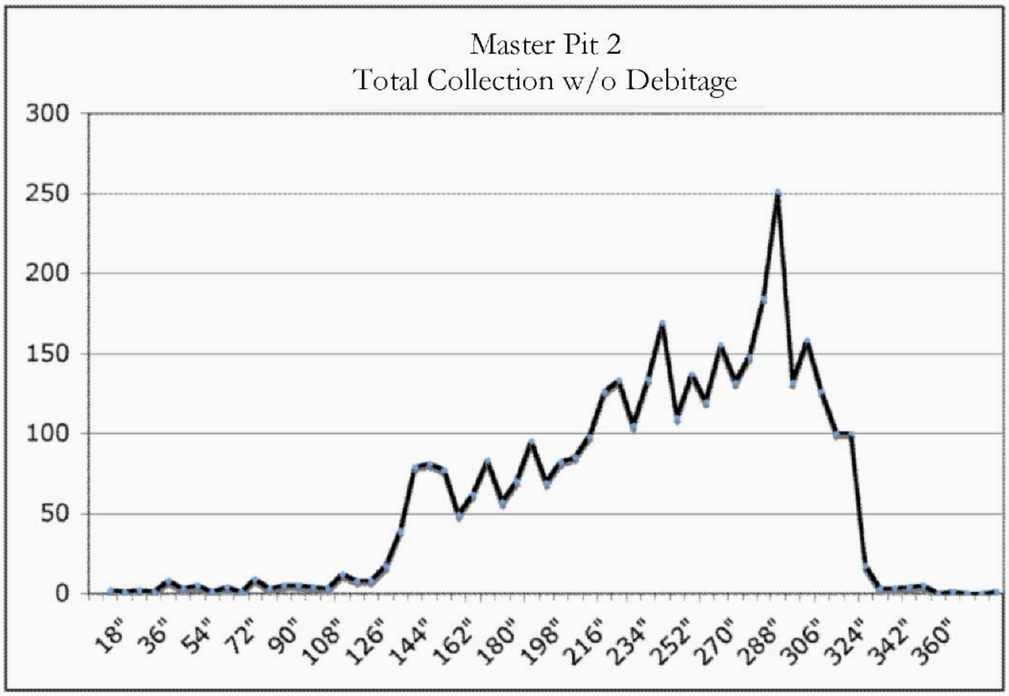


Figure 3. Master Pit 2 frequencies of its combined collection, excluding debitage (~85 percent of total collection). Master Pit 2 is covered by a 10-ft. overburden of a later alluvial fan not present down at Master Pit 1. Once the excavation meets up with the artifact-bearing level of MP 1, collections increased dramatically.

walked on a pile of flakes has noticed it is very easy to make a simple unifacial edge by accident. Bifacially edged flakes were assumed to require a higher order of serendipity to naturally form, so the two categories were combined together since both can generally imply cutting activities. It seemed like a good idea at the time, but my judgment had to be checked.

Given the unknown degree of personal, day-to-day, relative subjectivity that can affect decisions about "retouch" versus "usewear," it was best to check the validity of this combination. The bifacially retouched group from MP 1 (n=505) was separated from the bifacial UFs (n=362), and each set was plotted individually (Figure 4). Next, the two groups were combined in order to compare the frequency graph of the retouched specimens with the aggregate (n=867). The combined graph mirrors the pattern of the retouched specimens (n=505). This seemed like positive feedback, but this is only a hypothesis until we begin to test it with usewear analysis.

Figure 5 demonstrates a comparison between the frequencies of specimens with unifacially and bifacially retouched edges (excluding all utilized flakes) as they play out in Master Pit 2. These graphs can be used for all classes and for any single attribute we want to track.

The collections from Master Pit 2 were tallied for every unit at 3-inch levels. Figure 6 illustrates the "level assemblage" in Master Pit 2 at a depth of 210-213." Concentrations of tools and flakes varied per level and were found to shift at various depths. These snapshots of 3-inch levels seem to challenge the geofact hypothesis. If nature was responsible for the fractured stones, would it not be likely that fractured specimens should occur randomly throughout the deposit?

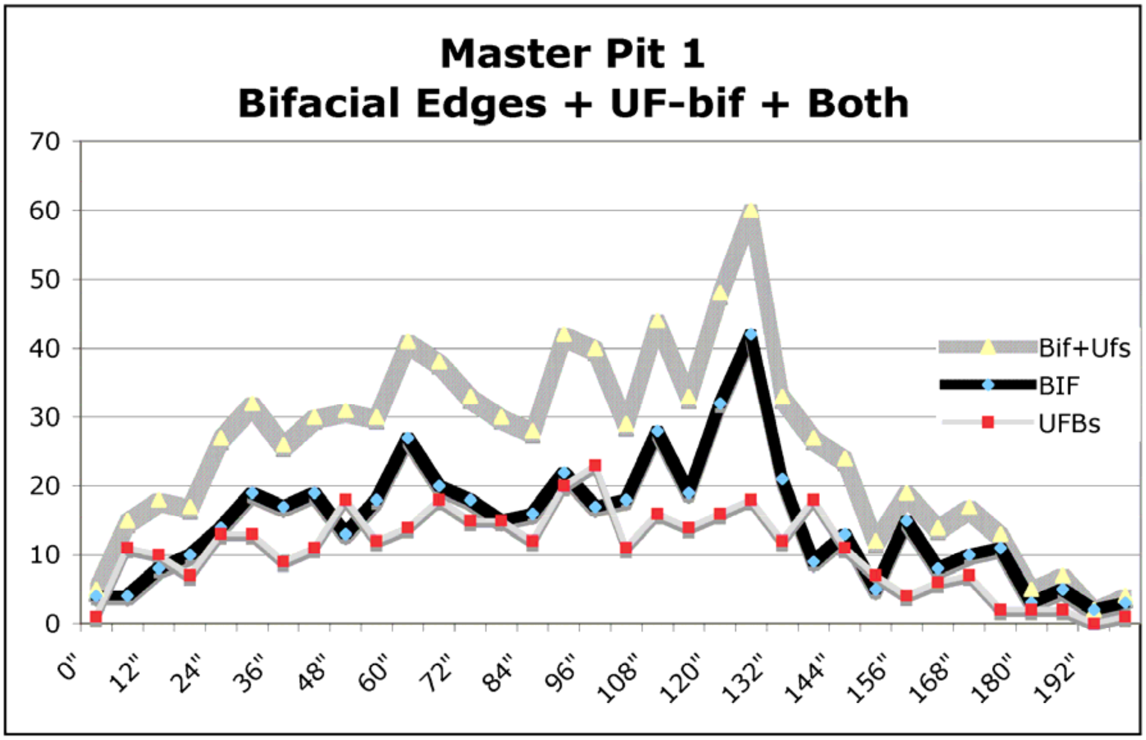


Figure 4. Comparison of retouched bifacial edges (n=505), utilized flakes exhibiting bifacial use wear (n=362), and their combination (n=867).

CONCLUDING STATEMENT

This has been a survey of the issues and controversies surrounding the Calico Early Man Site, and a report on highly preliminary data garnered from classifying the specimens from Master Pits 1 and 2. The combined indications tend to favor an archaeological identity for the Calico collection. If there is another spot on earth that produces fractures like this naturally, it needs to be identified. Conversely, there are thousands of pieces that would easily be accepted as artifacts anywhere you have Pleistocene archaeology, … except Calico?

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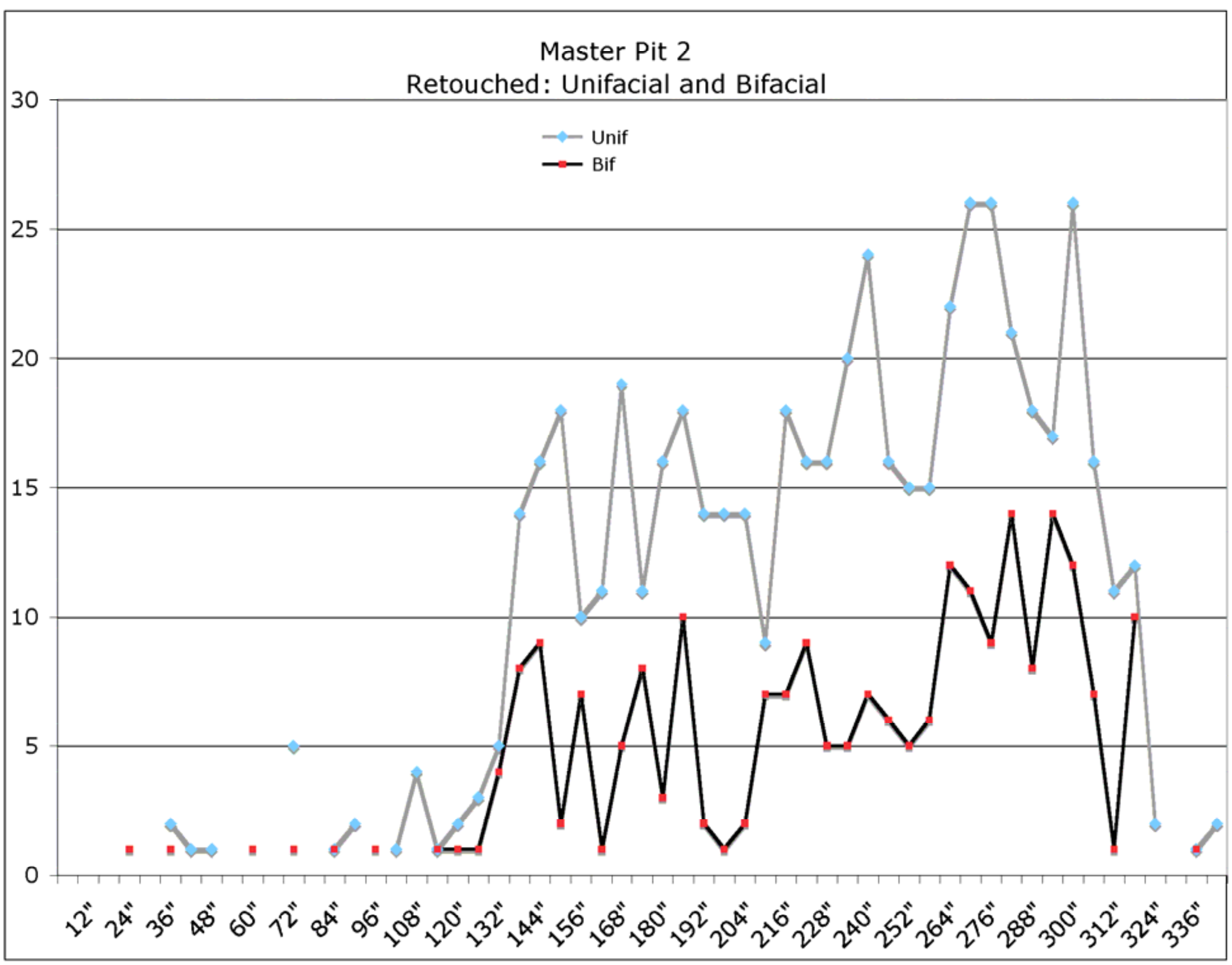

Figure 5. Master Pit 2: frequencies of bifacial and unifacial retouched specimens, not including utilized flake types.

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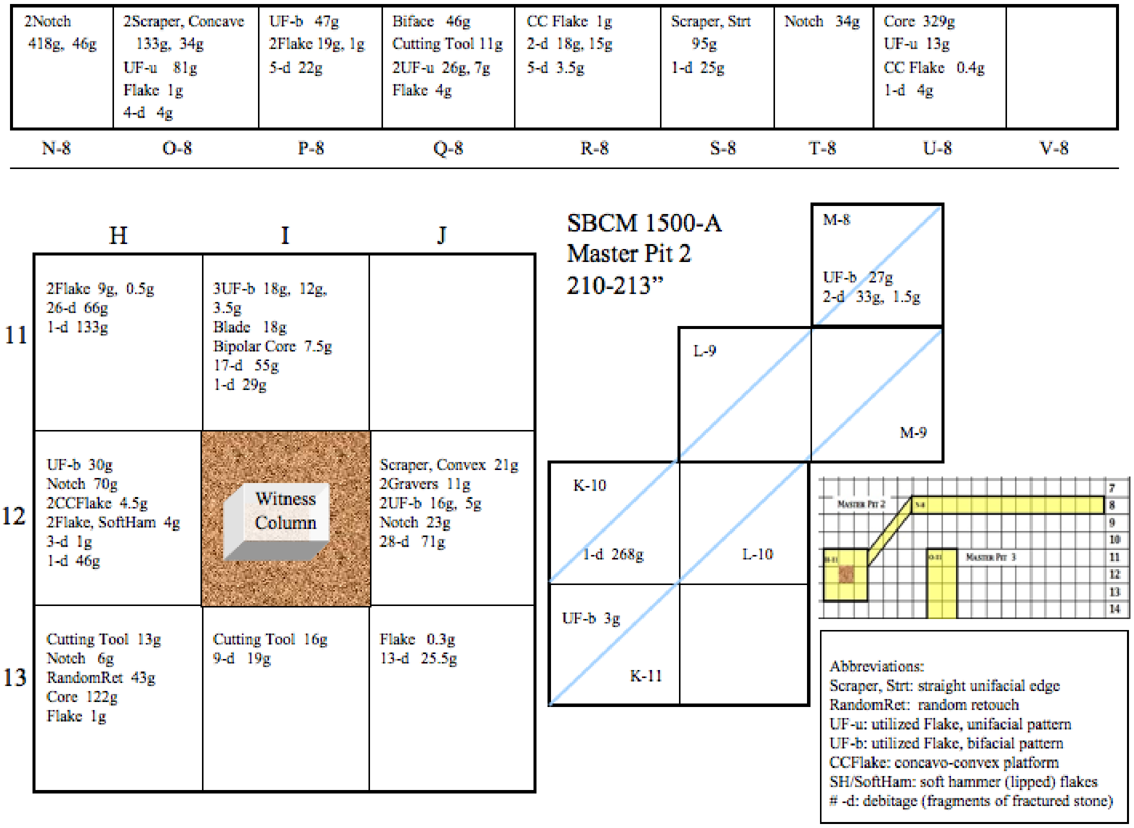

Figure 6. Level assemblage: MP 2, 210-213 in. specimen tally for a 3-in. level for Master Pit 2.

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