In 1914, eight years before the discovery of KV62, Theodore Davis proclaimed, "The Valley of the Kings is exhausted."

What an over-understatement that was!

This essay explains the rational behind the expectations, not only for more tomb discoveries in the Valleys of the Kings, but also which of these may be king tombs, to whom they may belong, and where they may be found.

IV. Undiscovered Tombs in the Valley(s) of the Kings

by MICHAEL J MARFLEET

That same year Howard Carter, arguably the most famous and successful tomb discoverer of them all, commenced his search for Tutankhamun. Carter had an extremely simple premise. Assuming only pharaohs from the XVIIIth, XIXth & XXth Dynasties were buried in the Valley of the Kings (VoK) then, since the tombs and/or the mummies of all pharaohs but Tutankhamun had been identified, of the remaining undiscovered tombs only that of the boy king can have any chance of being found complete. All discovered royal tombs had been robbed, and it stands to reason that any identified royal mummies whose tombs remained undiscovered must have come from similarly violated sepulchers. Therefore there remained one last remote, but nevertheless real possibility of finding an exceptional treasure. To have survived untouched for three thousand years it had to be deeply buried, and under ancient debris. Following the trail of small finds attributed to the boy king that had turned up during the period of Theodore Davis' productive ten-year concession in the VoK - the items and fragments in KV54, KV55 & KV58, and the faience cup discovered by Edward Ayrton in the rock debris of the valley bottom nearby - there seemed to be only one place left to look: beneath the tons of chippings dumped by
the tomb masons who cut the three later XIXth & XXth Dynasty tombs located in the center of the valley, KV's 7, 8 & 9, Carter's so-called 'triangle'.

Partly due to suspension of his search during WWI, Carter would not realize the fruits of his premise for a further eight years. Ultimately the Egyptologist's perspicacity was rewarded. He found his prize buried under tons of flood debris, tomb chippings, and the foundations of ancient tomb masons' huts seven meters east of, and just over four meters below the entrance to KV9.

Carter's logic would suggest that following the discovery of KV62 no more royal tombs complete with their treasures remain to be found. But could one or more violated king and/or queen tomb still lie undetected?

**Why continue the search?**

1. The imperative to continue looking for tombs can be driven by a purely empirical observation: rate of discovery. During Napoleon's Egyptian campaign in 1800AD around fifteen tombs lay open in the VoK. By the time the circus strong man and adventurer Giovanni Battista Belzoni had explored in the valleys the number had risen to 22 tombs. When John Gardner Wilkinson published his map of the Theban Necropolis in 1830 the count had become twenty-five. By 1922, when Carter made his famous discovery, the catalogue of numbered cavities had risen to 62, including tomb commencements and KV41, (which actually lies outside the VoK *per se*). As of 2020 there were 65 numbered 'tombs'. Less than half of these are true royal tombs. Delete KV41 because it does not qualify, and plot these finds on a graph - X-axis, total cumulative number of discoveries (numbered 'tombs'); Y-axis, year. From 1800 to 1922 the rate of discovery approximates a straight line. Between 1922 and the dawn of the 21st Century there were no new discoveries, but following the excavation of KV63 in 2006, and with the help of modern remote sensing technology, another upward trend, albeit less steep, is becoming evident.
Inference - More 'tombs' to be found!

Critique - Irrefutable. It is likely most undiscovered hypogea will prove to be pit 'tombs', not unlike KV's 63-65.

2. Of the thirty-two pharaohs, male & female, included in the XVIIIth, XIXth and XXth Dynasties - more or less the overall timespan during which the VoK appears to have been in use as a royal necropolis - the final resting places of six are yet to be positively confirmed: Ahmose I, Amenhotep I, Tuthmosis II, Ramses VIII, and perhaps Amenhotep IV, and Smenkhkare/Nefertiti. (Neferneferuaten nefertiti, is identified by Dr Nicholas Reeves FSA as one and the same as 'Smenkhkare', the co-regency successor of Amenhotep IV who may have briefly survived the heretic pharaoh; [Essay V appearing on this website August 13th, 2021]).

Of these 'lost' tombs:
1. Ahmose I may never have been buried in the valley.
2. Amenhotep I also may never have been buried in the valley, but has previously been connected with KV39 by the Egyptologist, Arthur Weigall. Weigall observed the unique situation of KV39 seemed to fit that described in a robbery papyrus for the tomb of Amenhotep I, (the so-called 'Papyrus Abbott*'). He suggested KV39 could have been the tomb of the second pharaoh of the XVIIIth Dynasty, and therefore may have been the first cut in the valley. However, there is ambiguity in the translation of the papyrus description of the tomb's location. Also, the architectural style of KV39 bears clear parallels with that of later XVIIIth Dynasty tombs such as KV23 in the West Valley and TA26 in the Royal Wadi at el-Amarna, the mausoleum of Amenhotep IV, (Technical Essay 8, February 11th, 2022).
3. Tuthmosis II may have been buried in KV33, discovered by Victor Loret in 1898. The location of the tomb's entryway is very close to that of his son, Tuthmosis III/KV34. From a sketchy description dated 1902 the tomb appears in design not unlike KV38, the tomb attributed to his father, Tuthmosis I, situated some 150m away in the adjacent tributary valley head. It has never been thoroughly excavated. The entrance is currently out of reach beneath the pathway to KV34.
4. Amenhotep IV and Smenkhkare/Nefertiti, originally buried at Akhetaten, may never have been re-buried in the VoK or the West valley; (but see Technical Essay 8). Their mummies so far have not been positively identified.
5. Ramses VIII - whose mummy also has never been positively identified - may have been interred in the foreshortened KV19. This incomplete tomb was certainly intended for Ramses VIII but subsequently usurped by Ramses IX for the burial of one of his sons, Prince Mentuherkhepeshef. This may have occurred because in antiquity the tomb had been found open and violated, and the mummy of Ramses VIII destroyed.

Keep in mind that the ancient Egyptian dynastic divisions are XIXth & XXth Century AD creations, some with questionable logic. The XVII/XVIIIth dynastic divide between the reigns of Kamose and Ahmose I is a case in point. Sequenre Tao II, Kamose (XVIIth Dyn.), Ahmose I & Amenhotep I (XVIIIth Dyn.) were all related to one another, but Tuthmosis I (XVIIIth Dyn.) was not. He began a new line; ie: the dynastic break was between Amenhotep I & Tuthmosis I, not Kamose & Ahmose I as per current convention**. If VoK burials are tied strictly to dynastic definition, Tuthmosis I might therefore be claimed legitimately as the first pharaoh to be interred in the VoK.
Could there be VoK burials that pre-date the beginning of the New Kingdom?

Inference - Up to five XVIIIth Dynasty king tombs and possibly one of XXth Dynasty age could still lie undiscovered/unconfirmed in the valley, maybe more.

Critique - Of these six KV33 is very likely to have been the tomb of Tuthmosis II, KV19 is likely originally to have been the tomb of Ramses VIII, and KV39 could have been the second mausoleum for the restored mummies comprising the AMARNA royal family, (Technical Essay 8). There remains disagreement over the identity of the decomposed male mummy found in KV55. Dr Nicholas Reeves FSA maintains it is the body of Amenhotep IV. Inconclusive DNA results may suggest otherwise, (Technical Essay 2, November 19th, 2021).

Also we should not overlook Reeves' assertion that Queen Neferneferuaten nefertiti may still lie buried in a possible unexplored extension to KV62, (Essay VII, September 10th, 2021).

Whose tomb should we be searching for?

Not Tuthmosis II, Amenhotep IV, Smenkhkare/Nefertiti, nor Ramses VIII.

Included in the DB320 mummy cache (Essay III) were the mummies of Amhose I and Amenhotep I, plus two wives of Ahmose I and possibly his grandmother, Tetisheri. They lay side by side later kings known to have been removed from their tombs in the VoK - Tuthmosis I, II & III, Seti I and Ramses I, II, III & IX - as were several of their offspring. Also included was the mummy of Tao II, the second last pharaoh of the XVIIth Dynasty, and his wife and offspring. The mummy of the last pharaoh of that dynasty, Kamose, has not been identified, but a daughter of his has, alongside two unidentified male mummies, one of early date, and three unidentified females, (Bib. 36).

Inference - The restorations of Ahmose I, Amenhotep I, and perhaps Tao II and Kamose, could have been more or less contemporary with those of other VoK royals found amongst the mummy hoard in DB320. They may well have originated from the VoK themselves.

Critique - Some tombs excavated outside in the adjacent Theban necropolis have been attributed to these pharaohs. Therefore the violated mummies of Ahmose I, Amenhotep I and Tao II could have been restored from a necropolis located outside the VoK.

Where should the search be concentrated?

One simple approach the 'armchair archaeologist' can use to seek out the possible locations of as yet undiscovered tombs in the VoK is by looking for patterns. A selection of the most obvious and the more obtuse follows.

ASSOCIATIONS

1. Topography & hydrology: Without exception, all royal tombs, in fact almost all hypogea in the VoK, have their entrances in, or proximal to dry watercourses. With the sole exception of KV39, they also are situated below the main escarpment and close to or inside the 200m contour, (Fig. 1).
Inference - The entrances to king tombs as yet undiscovered will lie in similar situations; perhaps within watercourses that to date are barren of discovered tombs.

Critique - Excepting the observation that the easiest location to begin cutting a tomb would be at a low point in any valley (ie: where water also tends to flow), this correlation appears irrefutable.

2. Geomorphology: A similar but less definitive correlation concerns the orientation of king tomb axes and the association of many of them with nearby 'satellite pyramids' - peaks subordinate to that of el-Qurn that occur along the ridges that form the watershed boundaries to the two valleys, (Fig. 2) - notably those of XVIIIth Dynasty date. KV22 in the West Valley is a good example of a XVIIIth Dynasty tomb closely and perhaps intentionally associated with a 'satellite pyramid', (Figs. 2 & 3).

Inference - Undiscovered king tombs, particularly those of early XVIIIth Dynasty date, may be found with similar associations; ie: their entryways not that far removed from and their axes oriented towards 'satellite pyramids'.

Critique - Several king tomb axes - mostly those cut during the later dynasties of the New Kingdom - show little or no association with nearby 'satellite pyramids'.

All king tombs are cut more or less at right angles to the escarpments and the valley flanks, and as they progress deeper into the hillside naturally underlie higher ground.

The observed correlation may appear real but at best it is tenuous. It is far too imprecise to be of practical use.
3. **Pit or shaft 'tombs':** These cavities are recognized as 'embalming caches'. They are usually located close by the king tomb with which they are associated. These hypogea are referred to as tombs because many have been re-used to accommodate later burials. They are characterized by a vertical entryway - a shaft, (very rarely a steep stairway) - and usually include just the one chamber. KV63, discovered in 2006, is an excellent, complete example, (*Technical Essay 1*, November 5th). The storage jars and black coffins discovered stacked inside the single, crudely cut chamber were found to
contain refuse from an XVIIIth Dynasty funerary ceremony along with materials used during mummification. The types and styles of the artifacts closely mimic those found in the KV54 embalming cache. The contents of KV54 are confidently attributed to the burial of Tutankhamun. KV63's related 'king tomb' has not been positively identified but also may be that of the boy king. The entrance to KV62 lies just 20m away.

To date the ratio of royal tombs to pit 'tombs' is around 3:2. If we assume an embalming cache is associated with each king tomb there could as many as a dozen more pit 'tombs' still lying undiscovered.

On the other hand, a few anonymous pit 'tombs' are situated remote from the entryways to known king tombs - KV's 27, 28, 44 & 45 comprise two notable groups.

Inference - The entrances of up to four royal tombs could remain undiscovered nearby KV's 27, 28, 44 & 45, (Figs. 1 & 4).

Critique - KV’s 27, 28, 44 & 45 are located around 100m away from the 'area of interest' on Fig. 4. Most pit 'tombs' are located far less than one hundred meters from the king tomb with which they are associated.

While KV's 44 & 45 appear to be classic examples of pit 'tombs', the architecture of KV's 27 & 28 is different. They are multi-chambered, KV27 remaining unexcavated beyond a second doorway, (Bib. 68). These two tombs may instead represent mausoleums for pre-deceased royal offspring.

4. 'Papyrus Abbott': The ambiguity in the translation and interpretation of 'Papyrus Abbott*' allows room for a conclusion very different from that of Weigall. The ancient's statement, '...120 cubits (c60m) below its "ahay" called "the high place"...', can be read to mean: a) '60m below (as in distant) the Village du Repos'; i.e: KV39, Weigall's interpretation; or b) '60m below (as in elevation) the nearest satellite pyramid'; for example, the 'area of interest' indicated in Fig.4.***

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*Fig. 4 - NE quadrant of VoK - Area of interest*
**Inference** - The 'area of interest' in Fig. 4 is the location described in the Papyrus Abbott text.

**Critique** - This situation is not definitively unique. Similar associations can be cited in regard to other 'satellite pyramids' situated upon the ridges surrounding the VoK. Also, 'high place' may mean some specific location of higher elevation and not necessarily a peak.

5. **Evidence of tomb cutting activity:** The remains of ancient workmen's shelters might be expected to lie close by the tombs the masons were working on. There are several areas of ancient tomb workers' huts evident in the two valleys, (Fig. 5). Where these remains are not associated with an existing tomb could lead one to suspect an undiscovered tomb may lie nearby, (or beneath; cf: KV9 & KV62**.*

![Fig. 5 - Locations of remains of workmen's huts](image-url)

**Inference** - The most notable area where there are hut remains with no tomb in proximity is in the southeastern extremity of the West Valley, (Fig. 5).

**Critique** - The several groupings in this general area may all be associated with the cutting of KV's 23 & 25, although the recent discovery of KV65, (Fig. 1), may suggest otherwise.

**ALIGNMENTS**

1. **The pyramid - shrine - tomb - temple complex of Ahmose I - 'The Ahmose protocol':** Ahmose I was the last pharaoh to build a pyramid. The remains of this structure lie on the west bank at Abydos where he had built a funerary complex that included a cenotaph pyramid (no internal or subterranean chambers), a shrine to his grandmother, Queen Tetisheri (whose mummy, some believe, is that of 'Unknown Woman B' in DB320, [Essay III]), an unfinished and unused ?tomb (crudely cut and sinuous in plan, not all that dissimilar from KV20), and a terraced mortuary temple, (not
unlike that of Queen Hatshepsut at Deir el-Bahari). These are positioned separate from one another along a line extending about 1km (c.2,000 cubits) from pyramid to tomb; i.e.: more or less in line with the summer solstice in this part of Egypt - the *Ahmose protocol*:

A similar arrangement may be observed in the VoK: the peak of el-Qurn, the iconic 'cenotaph pyramid' at the southern end of the valley; the multitude of shrines clustered upon its north-eastern flank (*Bib. 68, Sheet 1*); the tombs in the valley below and more distant, the temples on the West Bank more distant still, (Fig. 6).

It may be no coincidence that in the VoK the earliest known tomb with a confirmed owner, KV20/Hatshepsut & Tuthmosis I, is situated a little under a kilometer from el-Qurn. The following notable sites lie more or less on the 1km perimeter around el-Qurn: Queen Hatshepsut's cleft tomb; the Valley of the Queens; Deir el-Medina; DB320; Deir el-Bahari; KV41; and the gateway to the VoK, (Fig. 6).

**Fig. 6 - The 'Ahmose protocol' & sites approximately coincident with a 1km radius around el-Qurn**

![Diagram showing sites around el-Qurn and the 1km radius](image-url)
Inference - The 'Ahmose protocol' could have been intentionally repeated in the VoK****. The 1km perimeter around el-Qurn has fundamentally ritualistic significance.

Critique - The apparent coincidence of the 'Ahmose protocol' may be just that - coincidence. The perimeter alignments are approximate and based upon Google Earth satellite imagery of the West Bank area. I have been unsuccessful in locating a precise regional topographic map of recent date. The detailed topo-map in Bib. 68, Sheet 1, dated 2000, unfortunately does not extend outside the limits of the two Kings' Valleys. The apparent coincidences, therefore, require checking against XXIst Century survey data.

2. The summer solstice: El-Qurn, the area of shrines, and the entrance to KV20 more or less lie along the line of the summer solstice sunrise. The locations of the entrances to the tombs of Tuthmosis III/KV34 & Tuthmosis IV/KV43 also lie on this alignment, (Fig. 7).

Inference - The earliest New Kingdom king tombs could lie on the azimuth of the summer solstice sunrise and in line with these known tombs; cf: the 'Ahmose protocol'.

Critique - This leap of faith can apply in either of the two valleys. However, only in the VoK does the alignment coincide with el-Qurn, the shrines and KV's 20, 34, & 43; (and KV33, assuming this is the tomb of Tuthmosis II).

The two valleys themselves more or less are oriented in the direction of the summer solstice sunrise. Is the configuration no more than a natural coincidence?

3. The 'ascendency protocol': During the early New Kingdom succeeding pharaohs appear to have been buried south to southwest of their predecessors.

Inference - Hitherto undiscovered XVIIIth Dynasty tombs earlier than KV20 may be located in this northeast quadrant north of KV20, (Fig. 8). In this general area there is room for at least four more tombs.

Critique - Irrefutable.

Fig. 7 - Summer solstice alignment with early tombs
4. Celestial: For the more imaginatively creative an additional, far more fanciful set of alignments can be invoked by employing the constellation of Orion. Associated with Osiris, the god of rebirth and afterlife, the constellation was fundamental to ancient Egyptian beliefs. The positions and alignment of the three main Gizeh pyramids have long been recognized as closely resembling the arrangement of the three stars in Orion's 'belt'. To the Gizeh necropolis the constellation was the crucible of regeneration.

If the relative positions of the principal stars in Orion are appropriately scaled and overlain on a map of the VoK (Bib. 68, Sheet 1), the following tombs more or less coincide with six of the seven principal stars in the Orion constellation: KV22/Amenhotep III - Betelgeuse; KV35/Amenhotep II - Alnitak; KV57/Horemheb - Alnilam; KV55/Amarna Royals (Technical Essay 8) - Mintaka; DB320/Pinudjem - Rigel; & KV39/Amarna Royals - Saiph, (Fig. 9). But for KV22 these include all the known mummy caches, (Essay III). The correlations are not pinpoint exact, but one may appreciate that while the survey techniques of the ancient Egyptians at a local level were very accurate, they would be less precise over greater distances where line of sight was obscured by topography.

Intriguingly, the point corresponding with the seventh star, Bellatrix, correlates with a location in the VoK that has not (so far) yielded a tomb. It lies at the head of the tributary valley rising north from KV1, and just inside the 200m elevation contour.

Inference - The entryway to a hitherto undiscovered king tomb may lie in the vicinity of KV1.

Critique - Accusations of sheer fantasy aside there are other issues with invoking an Osiride 'grand plan' for the VoK along the lines of that recognized at Gizeh. The main one is succession. In the timespan between the regencies of Amenhotep II and Horemheb there is an intermediate reign that apparently does not conform with any 'grand plan', that of Tuthmosis IV/KV43, (although the entryway to KV43 does lie on the alignment
between DB320 & KV55, Fig. 9). Also KV43 also does not exactly obey the 'ascendency protocol' referenced under section '3' above.

Incidentally, the timespan for the Gizeh pyramids also includes one intermediate pharaoh - Djedefre, the son of Khufu - who chose to locate his pyramid some 8km NNW of Gizeh, (displaced from any correlation with the constellation of Orion).

It would be a stretch to countenance a 'grand plan'. Perhaps 'pure coincidence' would be more appropriate than 'grand plan'.

![Fig. 9 - Approx. alignment of constellation of Orion with tomb entrances](image)

**Conclusions**

Given the above observations, there are six areas in the valleys that could yield as yet undiscovered king and/or queen tombs, (Fig. 10).

As to who those kings might be - and placing dynastic divisions to one side; ie: considering them irrelevant - is it not possible, even likely, that the tombs of the first two pharaohs of the XVIIIth Dynasty, Ahmose I & Amenhotep I, and possibly the last two of the XVIth Dynasty, Tao II & Kamose, still lie undiscovered somewhere in the VoK?

The earliest known/confirmed tomb in the VoK, KV20/Hatshepsut & Tuthmosis I, is located in the northeast quadrant, inside but close to the 1km perimeter around el-Qurn. At least two anonymous pit 'tombs' are situated in this quadrant - KV's 44 & 45, (Fig. 4). Their entrances lie in a watercourse draining into the main valley that upstream is fed by a number of tributaries. The apex of the most southerly of these branches more or less coincides with the entrance to KV43/Tuthmosis IV; that of the next with KV20/ Hatshepsut & Tuthmosis I; the four watercourses north of this appear 'barren', (Fig. 4). Could this be the area with the best chance of finding the tombs of Ahmose I and Amenhotep I, and perhaps also those of Tao II and Kamose?

The entrance to KV20 had been discovered well before Napoleon's time, but it is clear from Carter's description of his search for the tomb that it had subsequently become
re-buried under talus from the cliff above. The talus slope is clearly evident in the drawing that forms the frontispiece to Davis' volume, as is the area excavated to reveal the entrance to the tomb, (Fig. 11, at left). Prior to excavation the view would have appeared similar to the modern photo of the West Valley, (Fig. 11, at right).

There are, therefore, any number of reasons why further tombs could still await discovery near the base of the escarpment that extends north from KV20, (area '6', Fig. 11).

**Fig. 10 - Valleys of the Kings - Areas of interest for hitherto undiscovered king tombs**

**Fig. 11 - KV20 entrance as found & West Valley talus slopes**
The *association* and *alignment* patterns observed for each of the six starred areas in Fig. 10 are as follows:

1 - Barren watercourse; c200m; escarpment; nearby workers' huts; proximal to facsimile cenotaph pyramid: el-Qurn
2 - Barren watercourse; c200m; escarpment
3 - Barren watercourse; c200m; escarpment
4 - Barren watercourse; c200m; escarpment; possible celestial alignment
5 - Barren watercourse; c200m; escarpment;
6 - At least four barren watercourses; c200m; escarpment; summer solstice sunrise alignment; possible correlation with location description in Papyrus Abbott; potential for ascendency protocol with KV20; coincides with 'Ahmose protocol'; anonymous pit 'tombs' c100m distant

Therefore, the first place I would look for undiscovered king tombs - specifically those of Ahmose I & Amenhotep I - would be in the northeast quadrant of the VoK; ie: area 6. Too many 'patterns' coincide in this location to ignore it.

As for Tao II and Kamose, assuming that indeed they were laid to rest somewhere within the boundaries of the two Valleys of the Kings, since the XVIIth Dynasty was a dynasty of pyramid builders, and because their reigns were extremely short and there would have been no time at all to construct even a small pyramid, it is tempting to suggest their no doubt small and hurriedly cut tombs will be located in the valley that most closely approximates the 'readymade' pyramidal peak of el-Qurn; ie: the very upper-most reaches of the West Valley - area '1'.

When/if these tombs are finally discovered almost certainly there will be no treasure to compare with that found in KV62. With the unlikely but possible exception of Kamose, whose mummy could still lie buried securely within his tomb******, all king tombs will have been entered and relieved of their bullion by robbers and/or by the high priests of Thebes during the economic imperatives of the Third Intermediate Period, (XXIst Dynasty, *[Essay III]*)

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I confess the above reasoning derives from little more than 'armchair archaeology'. I have not walked the areas in question. No doubt they will have been exhaustively picked over through the centuries. But so had the locations in which KV's 62, 63, 64 & 65 were ultimately uncovered.

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* Translation of the relevant extract from Papyrus Abbott: ‘...The Horizon of Eternity of king Djeserka(re), son of Re, Amenhotep [I], that is 120 cubits [c60m] below its “ahay” called “the high place”, north of the House of Amenhotep of the Garden...’

** Dodsdon, Aidan & Hilton, Dyan "The Complete ROYAL FAMILIES of Ancient Egypt", Thames & Hudson Ltd 2004

*** There is at least one other possibility outside the VoK. Since the mummy of Amenhotep I was found in DB320, the papyrus text may be referring to the mummy cache and not an original tomb. But this, surely, cannot be. The papyrus is dated 1275-1250bc, pre-dating the accepted timing of Pinudjem II's tomb by some two centuries. That is, unless DB320
was in existence long before Pinudjem who could have usurped and extended it for his own purposes, (Essay III). As in most things ancient Egyptian, the list of possibilities is lengthy.

**** The association of the remains of workers' huts near the mouth of KV9 led Carter to believe the entrance to an as yet undiscovered tomb, buried in antiquity under the tailings from the cutting of KV9, could lie beneath. He was right, of course. His clearance to bedrock below these foundations led to the discovery of KV62.

***** Such a conclusion might then suggest Ahmose I was the first pharaoh to commission his tomb in the VoK.

****** The same could be said for Amenhotep IV & Smenkhkare/Neferneferuaten nefertiti; (but see Technical Essay 8).

Next: ESSAY V ‘SMENKHKARE, the Amarna changeling’ published August 13th, 2021