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# Llactapata: the Re-Discovery of an Inca Site

Field Report

Thomson-Ziegler Andean Research Expedition 2003

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# 1 OBJECTIVES

To make a systematic exploration of the ridge and mountain slope of Llactapata, which lies on the western side of the Aobamba drainage facing Machu Picchu, using both aerial reconnaissance with thermal-imaging devices, and investigation on the ground.

A primary objective was to relocate and study Hiram Bingham's Llactapata group, which had been 'lost' since its initial reporting in 1913.

Another objective was to determine whether there were any further as yet unreported sectors of the site.

A further objective was to properly map for the first time the full extent of the extended Llactapata site, with these multiple sectors, and produce detailed plans of each sector.

The Thomson-Ziegler Andean Research Expedition 2003 was formed to achieve these objectives. A full list of the members of the expedition and its sponsors will be found at the end of this report. The expedition was supported and approved by the Royal Geographical Society, the Explorers Club and the Mount Everest Foundation.

## 2 THE HISTORICAL BACKGROUND

By Hugh Thomson

### Hiram Bingham 1912

The first published account of Llactapata was by Hiram Bingham as part of his article on Machu Picchu for National Geographic, 'In the Wonderland of Peru' (April 1913).

While the clearance and excavation of Machu Picchu was taking place in 1912, Bingham had sent various reconnaissance teams into the surrounding area to look for further Inca sites.

A team led by his assistant Kenneth Heald attempted to head up the Aobamba valley, but met with 'almost insuperable difficulty', as 'the jungle was so dense as to be almost impassable. There was no trail and the trees were so large and the foliage so dense that observations were impossible even after the trail had been cut.' Heald's team were further discouraged when an *arriero* was almost bitten by a poisonous snake.

Bingham himself then attempted to investigate the area and, in his own words, 'got into the reaches of the valley about ten days later, and found some interesting ruins...The end of that day found us on top of a ridge between the valleys of the Aobamba and the Salcantay.' (The Salcantay valley is now more commonly called the Santa Teresa valley).

Here Bingham reported a site called 'Llactapata, the ruins of an Inca castle':

'We found evidence that some Inca chieftain had built his castle here and had included in the plan ten or a dozen buildings.'

In his later re-writing of this account for *Lost City of the Incas* (1948), Bingham commented that Llactapata 'may well have been built by one of Manco's captains. It was on a strategic spot.'

After mapping and photographing the site, Bingham pressed on rapidly up the valley to the site of Palcay which lies at the head of the Aobamba valley. He had spent just five daylight hours there.

One might think that Bingham would have both spent more time examining the site, but he was handicapped in that he had a most unwilling team with him: three *arrieros* who had been pressed into service by a local landowner as a service to Bingham and who seem to have caused him considerable difficulty.

His published account spends far more time lamenting their deficiencies than describing the ruins themselves. Later in the same journey they eventually deserted him.

Bingham's decision to move on rapidly is also of a piece with his previous actions when he first saw Machu Picchu, in 1911: again he had initially spent just a few hours there before heading on rapidly to his next objective. Only later had he sent a team back to clear the site. A certain impatience was characteristic of the man.

In this case he clearly decided that the difficulties of returning to Llactapata for further investigation were prohibitive, although he seems to have regretted this, commenting:

‘It would be interesting to excavate for three or four weeks and get sufficient evidence in the way of shreds and artefacts to show just what connection the people who built and occupied this mountain stronghold had to the other occupants of the valley.’ (Bingham 1913)

Unfortunately he left few published details for anyone who might want to return to the site to do just that. Both the map published with the 1913 magazine article and his account are imprecise: ‘the end of that day found us on top of a ridge between the valleys of the Aobamba and the Salcantay’ gives little indication of where exactly he is between two long and densely covered valleys. The same difficult vegetation that had defeated Bingham's assistant Heald still characterizes the area, and without proper compass bearings or directions, no further expeditions were able to report on it (Fejos 1944).

The slight nature of Bingham's account of Llactapata must be set in its literary context. The same *National Geographic* report, ‘In the Wonderland of Peru’, contains the first descriptions of Machu Picchu itself, of Vitcos and of Bingham's discoveries at Espiritu Pampa. Given that any one of these by themselves would have constituted a major discovery, it is perhaps understandable that he did not devote as much attention to Llactapata as he might otherwise have done.

### **Drew -Thomson 1982**

In 1982 David Drew of the Cusichaca Project went back to the area with a small reconnaissance team led by Hugh Thomson. Ascending directly from Suriray in the Santa Teresa valley, they crossed over a ridge into the Aobamba valley and found some sites in the area immediately on the Aobamba side.

They reported one sector of buildings (which we are now describing as Sector II) that while similar in size to that indicated by Bingham, and in the rough area suggested by Bingham's vague description, did not match his published plan of

the site. They also reported finding a higher two-storey building on the ridge above (Sector IV; the 'Overlook Building'), and 2 small groups of buildings between Sectors I and IV.

Drew commented:

'At Llactapata, the fact that none of the four different groups of ruins discovered on reconnaissance match those found by Bingham would suggest that further remains are still to be found in the *montaña* here and that the site is considerably larger than Bingham first imagined.' (Drew 1982)

### **Reinhard 1985**

In 1985 Johan Reinhard passed over the site of Llactapata while investigating the Inca trail that leads northwards from Palcay along a ridge of Mt Salcantay (Reinhard 1990).

While he did not try to investigate the main sectors of Llactapata, he reported coming across a substantial building on the ridge-line above, at 3,037m /9,960 ft: 'the ruins of a large structure (135 x 5m) or series of structures that have a nice view towards Machu Picchu'. Reinhard mapped the building. He also reported that looting had taken place at the site: 'Some digging had been done here, including one hole dug recently, i.e. possibly within the past year.'

From further investigation by the present expedition, this appears to have been part of the overall Llactapata site and may well have functioned as a *qolqa* (storehouse) for the residential / administrative sectors below. It is described as Sector IV of the overall site.

### **Unpublished journals of Hiram Bingham**

In 2002, Hugh Thomson went to consult the unpublished journals of Hiram Bingham, which are held at the Sterling Memorial Library at Yale University, and the collection of unpublished photographs held on card index by the Peabody Museum.

He found that Bingham had left a more detailed record of his investigations at Llactapata than had been realized.

Bingham's handwritten journal records that on August 1st 1912 he left the hacienda of Huadquiña at 7.30 in the morning and arrived at 'Surirai' at 9.00. The modern hamlet of Suriray lies in the Santa Teresa (Salcantay) valley, so Bingham had decided to approach the Aobamba / Santa Teresa ridge from that side, after Heald's difficulties in the Aobamba.

At Suriray he scribbled hastily in his notebook: 'men here speak of ruins: Llactapata ruins; Cochapata - laguna; Mishihuaunca – lugar; Palcai – old pueblo; Pampacahuana – best ruins of all.'

By 9.30 he had reached a hut 600 ft above Suriray, noting that 'quite a little coffee' was being grown in the small holdings he passed.

By 12.00, after a 'hard climb', he reached a clearing at the top of the ridge and met Marcello Añanca 'who lives at Llactapata'. (There is still a small holding on the top of the ridge today, near Sector V). By 12.35, presumably having descended over the ridge, he saw the ruins which 'lie at 9100 ft, i.e. 1100 ft lower than MP [Machu Picchu]'.

He remarked on 'the wonderful view' and that the snow peak of Salcantay was visible.

The photographic evidence supplements the details left in his journal (see Thomson 2002 for full discussion of Bingham's use of the camera). Bingham published just one photograph of Llactapata in his original *National Geographic* article 'In the Wonderland of Peru' (April 1913), and none subsequently. However the Peabody Museum has a full archive of all the photographs taken by the Yale Expeditions, and these include six unpublished prints of the Llactapata site:

The first picture Bingham took (#2850), at 1.00 on August 1912, was of the 'wonderful view' he had mentioned in his journal 'looking towards Machu Picchu and the Torontoy massif'. Clearly the unusual sighting of Machu Picchu impressed him more at first than the actual ruins themselves, as it did for later visitors (Thomson 2001). Bingham had just come from Machu Picchu and the careful sight-line positioning of his newly cleared discovery on a distant ridge to the east must have struck him forcibly. Ironically too, given that our interpretation below suggests that Llactapata was closely affiliated to Machu Picchu, Bingham's last act before leaving that site on July 30th had been to intercept a group of *huaqueros*, treasure-hunters, who had gone there in search of a 'Greater Machu Picchu' that might lie beyond it (cf #2838).

#2852 is of the view to the south, showing Mt. Salcantay from Bingham's camp-site. From both these pictures, and the subsequent ones, #2853 and #2854, it seems that his campsite was on the small *pampa* that the present expedition also used, just below the Sector 2 ruins, of which one wall is visible. However Bingham did not document or record Sector 2 in any way, and it may well be that in the very limited time he had available, he was not able to clear it. From the subsequent pictures he took, #2854, #2855 and #2856, it is clear that the surrounding vegetation was as thick as it is today. With just three *arrieros* and a few hours of daylight remaining, Bingham would not have managed to see much.

Perhaps because of this, Bingham seems not to have appreciated the architectural features of the site. Used also to the granite of Machu Picchu, he did not appreciate the metamorphic rock used at Llactapata, which cannot be cut as finely as granite but which, as at Choquequirao, would have been plastered. We discuss this in detail later on.

His caption to one picture, #2855, reads baldly: 'the corner of another house with Bartolo, one of the Indians who deserted later.'

Bingham determined to press on to Palcay and the other sites he had been told about below at Suriray. The next day, August 2nd, he rose at 5.40, noted that the clouds were rising rapidly from below and that Machu Picchu was in the clouds. At 7.45 the sun burnt off the clouds and he left camp at 8.05. At 8.45, 'after passing through dense jungle', he reported finding 'the stone walled ruin of a single house, about 11 by 15 ft', which seemed from the hole in its centre to have been looted.

He then arrived at the 'small, apparently shallow lake' of Cochapata, about 150 ft long by 75 ft wide, at an altitude of 10,600 ft. At 11,000 ft he noted seeing violets. His big strong white mule fell backwards and its cargo had to be carried by the porters (Bingham did not record the hostile porters' reaction to this additional load). He spent that night on 'a grassy slope on the side of the mountain at about 15,000 ft', near to a small spring', before proceeding towards Palcay.

From the above description, it seems that when Bingham left Llactapata, he traveled back up to the ridge dividing the Santa Teresa and Aobamba valleys, and skirted along the ridge on the Santa Teresa valley side (where there are still areas of bog and thick vegetation) before crossing a high pass back into a steep-walled valley of the higher Aobamba. Palcay lies at the head of the Aobamba valley. (Reconnaissance teams from the present expedition retraced part of this route).

Bingham's field journal contains several sketch maps of the Llactapata site with some details he never published: the area in front of the double recessed doorway he marked as an 'open plaza facing Machu Picchu', and he indicated that there was 'a sunken alley' beside it.

Most important of all, in his journal he recorded compass bearings from the site. These have likewise never been published before:

'Machu Picchu sacred plaza bears 52° degrees.  
Machu Picchu Heights [Mt Machu Picchu] 67°.  
Huaina Picchu Heights [Mt Huaynu Picchu] 45°.'

This information prompted the present initiative to try to re-locate 'Bingham's Llapata', and establish clearly how extensive the site was.

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### 3 OPERATIONS

#### Reconnaissance 2002

In May 2002, Hugh Thomson returned to Llactapata with Gary Ziegler, with whom he had previously collaborated on several previous expeditions (Thomson 2001, Thomson & Ziegler 2002) and John Leivers, for an initial short reconnaissance. Ziegler had also previously passed by the Llactapata site in June 1998 while investigating the Inca road system connecting Machu Picchu with the western Vilcabamba. Following this route, Ziegler had camped at the sector investigated by Drew – Thomson 1982 (which we now identify as Sector II). With limited time, he assumed that he was camped at Bingham's documented and then completely overgrown Llactapata site so moved on without investigating (Ziegler 2001), just as Reinhard had not stopped to investigate the main Llactapata site when following the nearby Salcantay ridge route in 1985.

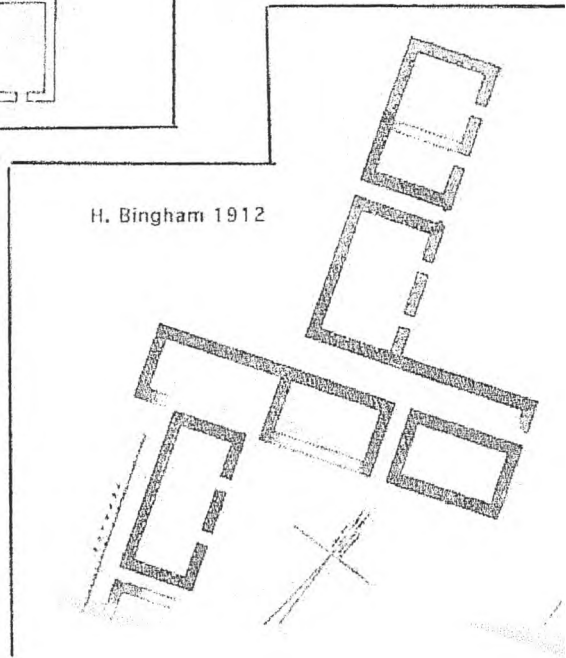
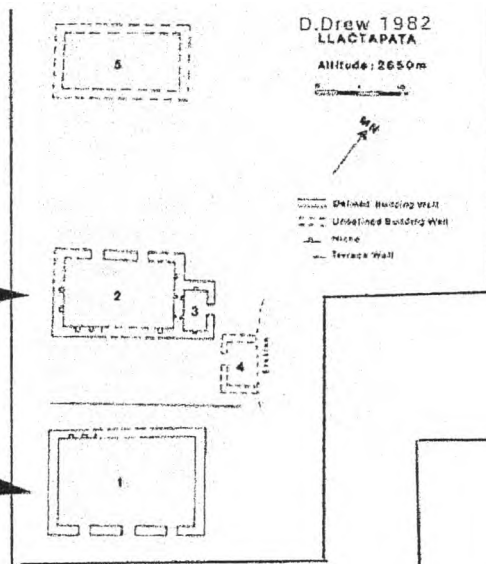
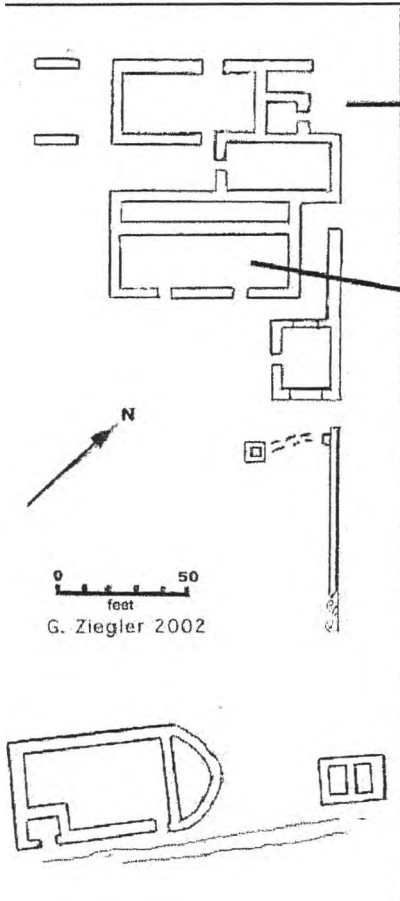
It is worth noting that one reason this region so close to Machu Picchu has been relatively ignored is that the Inca architecture does not appear as impressive as that of Machu Picchu and the upper Urubamba region. Machu Picchu is constructed from a local fine-grained, white granite, while most Vilcabamba sites to the west were built from a fragile, metamorphic material that could not be shaped polygonally, or easily rounded. The result is a rather crude appearing, coursed construction, consisting of flat slabs and blocks joined with mortar. However, the evidence shows that walls were coated inside and out with a light-coloured clay hiding the stonework beneath a smooth attractive coating. This was first mentioned by Ziegler at the Vilcabamba site, Choquequirao, as a possible reason why this major Inca complex may not have been given its proper importance by investigators (Ziegler 2001, Ziegler and Malville 2003).

On this initial brief reconnaissance, Thomson, Ziegler and Leivers established that there were several other previously unreported ruins, that the site originally reported by Hiram Bingham had still not been re-located, and that a larger scale research expedition was both feasible and desirable. They also noted that the Overlook Temple (Sector V) seemed to be on a direct East-West line with the Intihuatana Stone on the Urubamba below, and Mt. Machu Picchu beyond, and that this careful placing of the Temple was unlikely to have been coincidental.

#### Thomson-Ziegler Andean Research Expedition 2003

The expedition arrived in Cusco in late April 2003 (see Appendix A for expedition members and sponsors). The primary work - aerial flights and then investigation by land - was accomplished during May. Further investigation into the orientation

Llactapata Site Plans  
Bingham 1912  
Drew/Thomson 1982  
Ziegler/Thomson 2002



of some sectors at Llactapata was carried out in June, at the time of the solstice; further study of correlating features at Machu Picchu and the Coricancha in Cusco was undertaken during July and August. This report was produced in early November 2003.

### **Thermal imaging reconnaissance**

In early May, two separate flights were made over the area, using a thermal-imaging device. This was only partially successful, in that it was difficult to achieve optimum conditions. For the thermal imaging data to register, the difference in temperature between stone and vegetations requires several hours of sunlight. However later in the day, cloud cover tends to obscure this area of the Vilcabamba. Finding a 'window' which is late enough in the day to produce temperature differentials, but early enough to escape cloud cover, proved difficult.

The thermal imaging device was also used from fixed positions in and around Machu Picchu.

A full report on this, THERMAL INFRA-RED SURVEY OF INCA SITES IN THE VILCABAMBA, by J. McKim Malville, who accompanied the expedition, is attached as an appendix to this report.

### **Ground reconnaissance**

The expedition travelled to the Llactapata area, with the considerable help of Perurail who provided a special train to take field workers and *arrieros* to the railhead at the hydroelectric plant in the Urubamba valley.

From there, the expedition travelled up the Aobamba valley (which was devastated by a landslide in 1998). Mules were unable to cross the rope-bridge across the Aobamba, so supplies were taken on foot to this point, and transferred to mules on the other side of the river. The ten muleteers came from the upper Santa Teresa valley, in the area around Colcapampa, and as with all the ground operations were coordinated by Manu Expeditions of Cusco. Amy Finger coordinated the running of the expedition in the camp itself.

Base camp was established at a clearing at approx 2700m on the spur descending from the ridge towards the Aobamba, by a team led by John Leivers and head wrangler Pio Espinosa. This was just below Sector 2 of the site. The camp overlooked the Urubamba canyon, with an impressive view of Machu Picchu and the ice covered Veronica range beyond. Salcantay lies to the southeast, at 20,000 feet.

Clearing and exploration of the area began. In doing this, the expedition were armed with the unpublished Hiram Bingham material from Yale, with the results of the aerial reconnaissance and with the few known previous investigations of the area: these included Bingham's published reports from his visit in 1912, the Drew-Thomson reports of 1982 (Drew 1982, Thomson 2001) and Johan Reinhard's description of a building (Reinhard 1985).

The expedition split up into several smaller reconnaissance teams: these teams were led by Amy Finger, John Leivers, Hugh Thomson and Gary Ziegler. Each team carried two-way radios for communication, a navigational GPS, machetes, measuring tapes and notebooks.

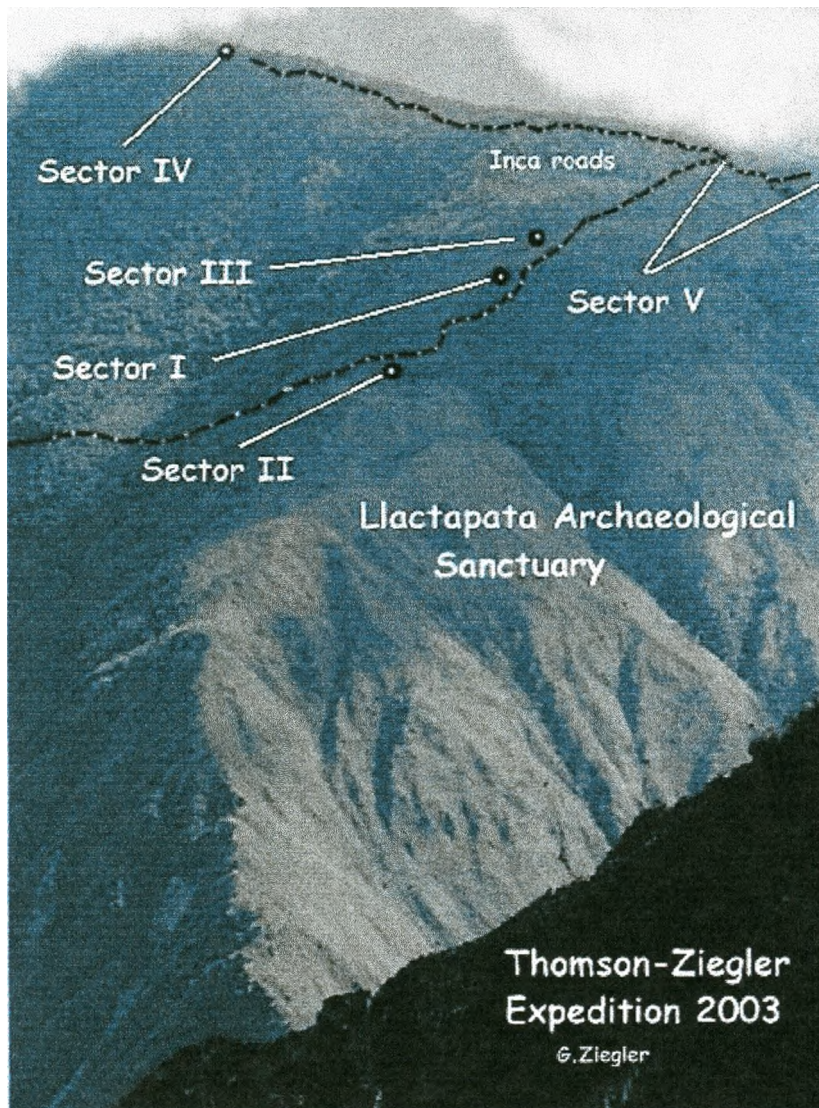
Hugh Thomson's team set out to re-locate the 'Reinhard site' (Sector IV) on the ridge above; there were no known coordinates for this site. The site was re-located and is documented below in the Site Description section of this report, along with the other sectors below.

Amy Finger and John Leivers visited the lower ridge (Sector V), with a team that included Kim Malville. John's goal was to extensively investigate the platforms and walls on a rocky promontory that we had located the previous year.

Gary Ziegler's initial objective was to clear; survey and map the Drew-Thomson sector (Sector II) just above camp. He subsequently led the team which uncovered the substantial *usnu* and surrounding buildings of Sector III, which were previously unreported.

John Leivers led a team through a near impenetrable tangle of cloud forest vegetation on steep slopes to reach the convergence of compass bearings from Machu Picchu, indicated in Bingham's field notes as being the location of Llactapata. Nothing was found: it appears Bingham's compass azimuths were wrong.

The search was renewed and a field worker, Bob Mrocek, managed to locate a sector which, after being mapped by Amy Finger and colleagues, clearly matched the plans left by Bingham for 'his' Llactapata. The resulting study of this sector, the most important at the site, is the first to have been undertaken since Bingham. Astronomical readings taken by Kim Malville immediately established that this sector was aligned to the position of sunrise on the June solstice. His further analysis of the astronomical position of Llactapata is attached below.



Sector IV

Inca roads

Sector III

Sector V

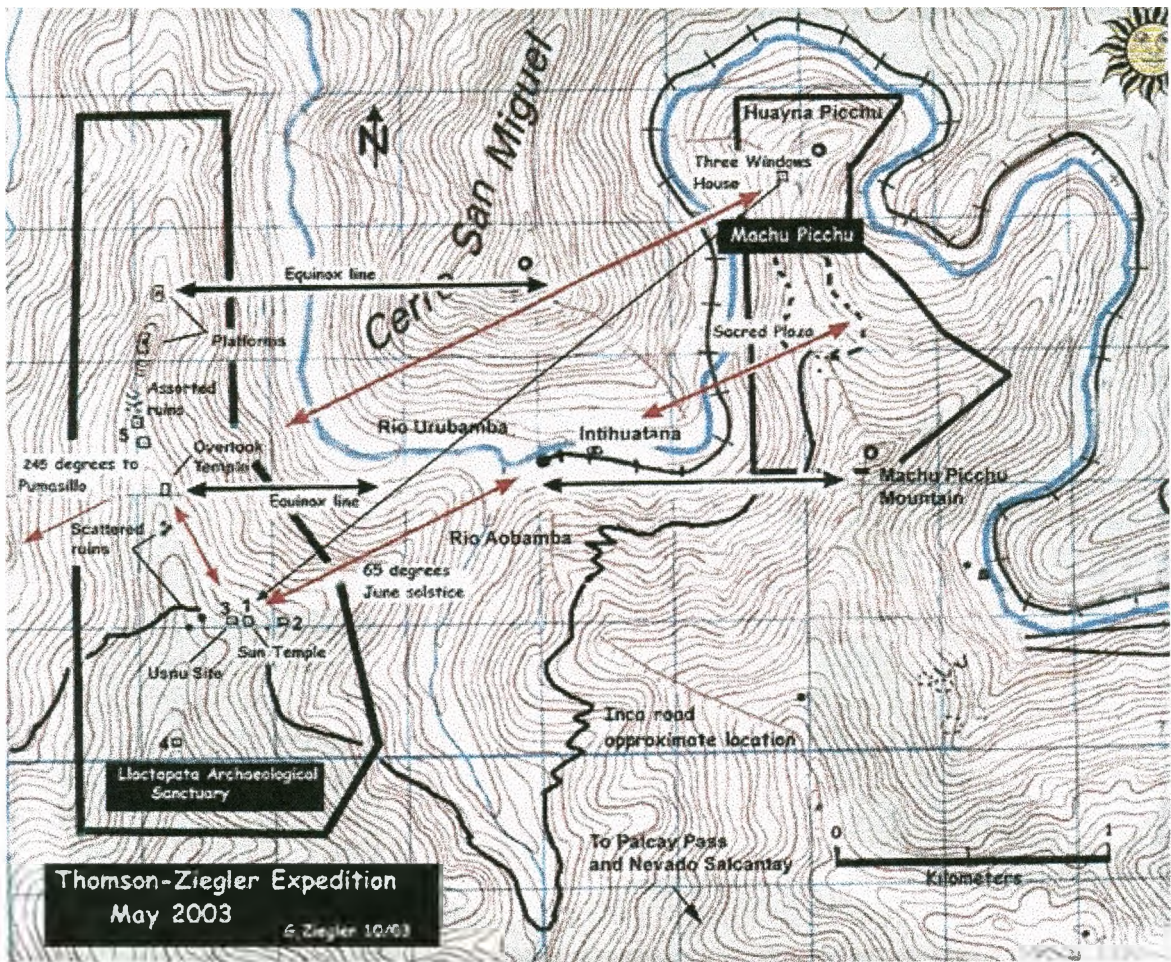
Sector I

Sector II

Llactapata Archaeological  
Sanctuary

Thomson-Ziegler  
Expedition 2003

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*Overall site plan of Llactapata relative to Machu Picchu*

## 4 SITE LOCATION

By Gary Ziegler

Add General map

The Llactapata archaeological complex is situated on and below a long ridge that descends north to the Urubamba Canyon from the region's highest peak, Mt Salcantay; the complex faces Machu Picchu and the two peaks to either side of that site, Mt Huayna Picchu and Mt Machu Picchu. The parallel Machu Picchu ridge some five kilometres to the east is separated from the Llactapata ridge by the Aobamba canyon, whose river carries glacial melt water down from Salcantay.

The climate, vegetation and fauna are similar to that of the Machu Picchu Sanctuary, receiving more than 75 inches of annual rainfall (Wright-Valencia 2000). The altitude of the zone ranges from 2500 to 3000 metres.

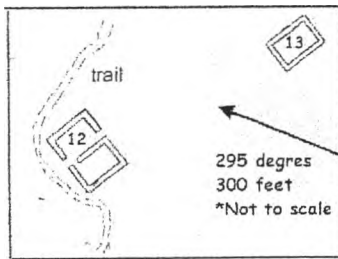
Original cloud forest covers most of the zone but some areas show evidence of previous clearing and burning by the owners of small-holdings, resulting in a tangle of thorny shrubs and bamboo thickets. The forest is home to numerous varieties of birds and the spectacled bear is in evidence. A few scattered farming plots have been cleared and recently planted with corn. There is evidence that some of the Inca structures have at some stage been partially occupied and altered by local herders. A number of potholes indicate that looting or treasure hunting has taken place by *huaqueros*. This is a common occurrence throughout the region as almost every site has been visited at sometime by a local herder or prospector.

### Geological setting

At Machu Picchu the regional mountain base is part of an uplifted Paleozoic era (250 million years old) intrusive igneous feature classified geologically as a batholith. These are massive upward travelling bodies of molten material (magma) that penetrate the upper layers of the earth's surface before stopping short of the surface. Here the rock type is mainly resistant fine-grained, small crystallized, white granite, which proves excellent for hammering (the pecking method) into finely shaped blocks and sharply defined angles. (Wright-Valencia 2000. Ziegler 2001)

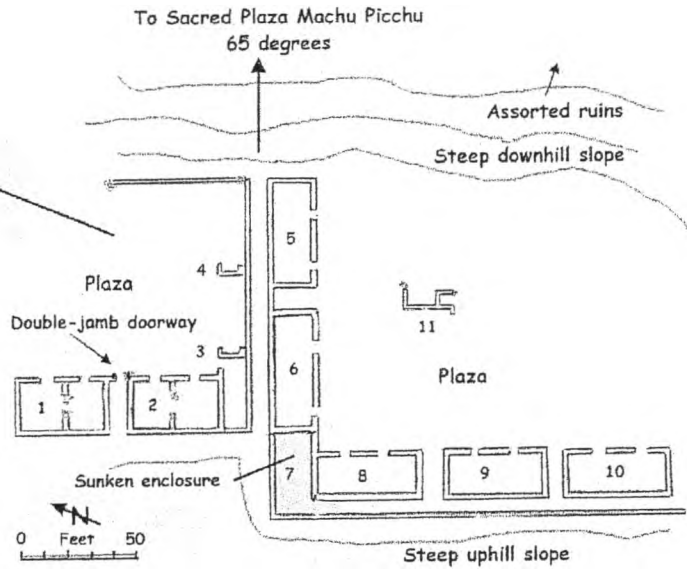
The geology of the Llactapata zone differs significantly. Although only a few kilometres distant, the Llactapata ridge is composed of metamorphosed, compressed meta-sediments; quartzite, schist and altered shale with some later igneous activity in the form of isolated intrusive dikes. The present topography has been eroded by the Urubamba River, and by rain and breakdown from the nearby peaks, as continuing tectonic forces slowly lift the mountain mass of the Andes. Glacial processes played a part as well. Numerous faults and subsurface fractures resulting from mountain

building pressures are present. As base rock is exposed by erosion, these fractures offer zones of weakness subject to ground water penetration and other surface forces that create fragmentation and disintegration into blocks and eventually into mixed mineral-organic residue soil. These loose boulders and rocks are the material that supplied the building stone for Machu Picchu and Llactapata, although because of the geological differences, the stone differs substantially between the two sites.



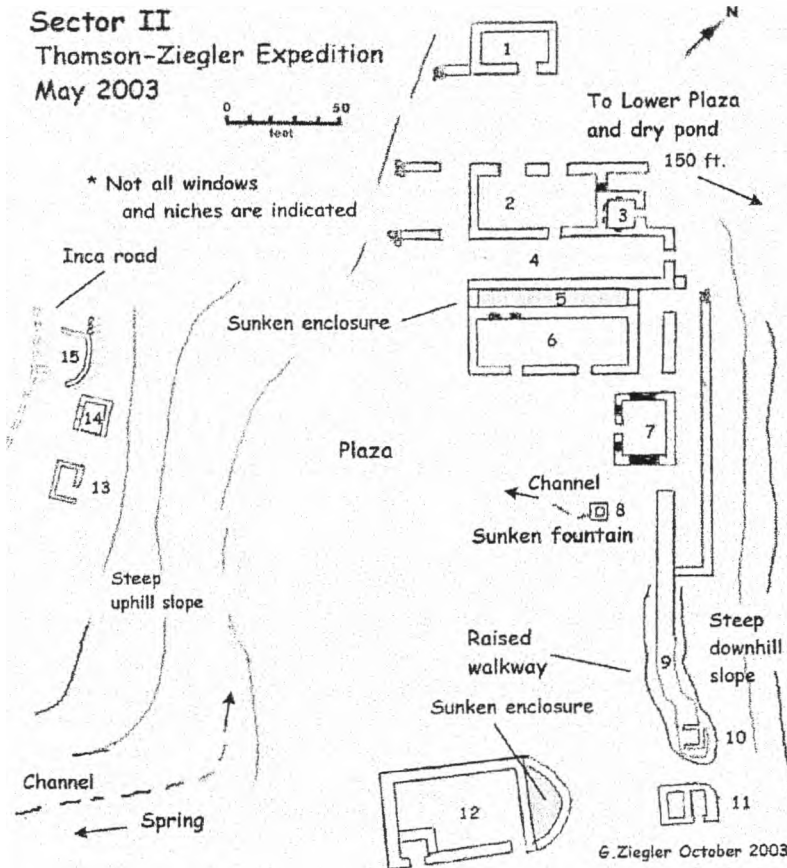
**Sector I**  
**Bingham's Llactapata**  
 Thomson-Ziegler Expedition  
 May 2003

Field survey by Amy Finger and Kim Malville  
 \* All niches and windows not indicated  
 G. Ziegler October 2003



**Sector II**  
 Thomson-Ziegler Expedition  
 May 2003

\* Not all windows  
 and niches are indicated



## 5 SITE DESCRIPTIONS AND ARCHAEOLOGICAL DETAIL

By Gary Ziegler

Add site map

### Overall description of Complex

The archaeological complex consists of several interrelated high status building groups, agricultural areas, isolated structures, lower status urban ruins and a connecting road network scattered over several square kilometres. We have organized the zone into five Sectors with the primary features surveyed and diagrammed on individual site plans. A number of isolated structures and features are indicated as scattered or assorted ruins on the general site map. Some site plans are less detailed, indicating that additional field information is needed.

Sector I Plan

### Sector I The Bingham Group: Description

By comparison with Hiram Bingham's drawing we have identified this group *conjunto* as the location that he briefly visited and called Llactapata in 1912. The site contains seven well-constructed, large buildings 45 to 50 feet in length. All have multiple niches with shaped corner stones and coursed walls, in a style similar to other high status Vilcabamba sites. (Ziegler 2001). Residue of tan coloured clay in several protected niches indicates that walls were originally covered with plaster, creating a pleasant smooth effect.

All of the buildings were gabled but only remnants of some remain, as destruction from roots and tree growth has caused significant damage. Two structures in particular contain badly crumbled internal dividing walls (1, 2). Some doorways are partly filled in and a crudely made field stone wall extends out from building 2. These may have been added later by local herders using the site as a corral. A double-jamb entranceway between buildings one and two indicates high status. These are found in the most important structures at regional Inca sites such as the Coricancha in Cusco, Vitcos, Ollantaytambo and Choquequirao (Gasparini 1980).

A unique feature is a 145 feet long sunken corridor with six feet high walls that aligns on Machu Picchu. The alignment of 65 degrees also points to sunrise over Machu Picchu during the June Solstice. The long axis of Sector I aligns with the Overlook temple at an azimuth of 335 degrees. These issues are discussed further in the Archaeoastronomy section below.

Two smaller U shaped structures, *masmas*, are attached to an outside wall of the corridor. One is badly crumbled but the other contains a tall five feet high niche facing outward with the same alignment as the corridor. U shaped shrines go far back as

important ceremonial features for Andean people. The American anthropologist Michael Moseley believes that U shaped sanctuaries are the most enduring form of ceremonial architecture in the Andes with an evolution spanning four millennia (Moseley 1992).

On either side of the corridor and connected buildings 5 and 6 are large plazas ending in a steep drop off to the east or front. A badly ruined structure is situated near the centre of the right side plaza (11). Feature 7 is a sunken enclosure formed by the long corridor wall and the walls of buildings 6 and 8, which connects to a walkway behind buildings 8-10.

Two outlying structures (12-13) are located some 300 feet to the north. Structure twelve is a double-room house 30 feet long by 22 feet wide. One deep inside niche is located in the south wall. The structure was gabled but now badly crumbled. The remaining walls are approximately six feet high. The probable route of the Inca road passes nearby. The location suggests that this was an entrance or administrative point for the main group to the south.

Some 75 feet in the direction of the main group is a smaller low walled rectangular foundation, 15 feet by 22 feet and three feet high. (13) The lack of breakdown rubble indicates that this is probably the original height. It is likely that the walls were retainers for a wood-sided house as described at Corihuayrachina, Cota Coca and other Vilcabamba sites (Lee 2000, Von Kaupp 2002, Ziegler, 2001, 2002). It could have served as quarters for a resident caretaker or attendant to the main group. Evidence of local herder activity indicates that it could have been constructed in recent times.

### **Sector I The Bingham Group: Interpretation**

The site has striking similarities to the Coricancha Sun Temple at Cusco. A detailed description follows in the section "Archaeoastronomy". We therefore suggest that this group was a Sun Temple dedicated primarily to the June Solstice in conjunction with sunrise over Machu Picchu and the Veronica Range.

## Sector II: The Drew – Thomson Group. Description

### Sector II plan

This sector was reported for the first time by Drew and Thomson in 1982 (Drew 1982, Thomson 2001).

The sector consists of a tightly grouped assortment of carefully constructed large buildings, walls and smaller structures arranged around a central plaza with several outlying structures of lesser quality. The group sits upon a flat bench with a steep, rising embankment behind and a steep downhill slope to the front. Another levelled, plaza like, area is situated just below (NE) which we believe was a pond or water feature now dry and filled in. The only present water source identified for the region, a spring is located just above to the south of the plaza. Remains of a stone lined channel *acequia* originating at the spring is indicated on the site plan. This leads into a nicely made, sunken, stone lined enclosure (8) resembling one of the fountains or ritual baths at Machu Picchu or Wiñay Wayna.

The main buildings (1-7) have shaped corner blocks of quartzite and coursed slabs, with blocks for the walls. Remains of clay indicate that the structures were plastered. Roots and trees have crumbled parts of most structures, but some walls are standing close to the original height. Building 6 has a back wall height of 14 feet. 1, 2 and 6 had gabled roofs; number 12 may have as well. This is undetermined for the remainder. Buildings 1-7 had internal niches and some windows. Minor details are lacking because of surveying demands created by the unexpected size and extent of the findings.

By contrast, structures 12-14 are of poorly constructed, mortared fieldstone without niches. Structure 13 has a low walled open side and a long low window lined with adobe blocks. Four rocker-shaped grinding stones for corn were found inside, made of granite. Building 12 appears to have been modified by an internal enclosure. It is likely that local farmers or herders used these buildings in later times. Building 12 could have served as a caretaker residence or entrance control for the main group as suggested for structure 12, Sector I.

Drawing of three windows house

The central section of the group has multiple passageways that open out to a long filled, low walled platform/walkway that forms an overlook of Huayna-Machu Picchu and the Veronica Range beyond. The long axis points to and views the Overlook Temple (Sector V).

Building 2 has a window that opens into a short corridor viewing Huayna Picchu. Structure 3 is a small structure 10 feet by 10 feet with 4 internal niches. The one entranceway faces 50 degrees toward Huayna Picchu. Its size and location suggest that it was a shrine.

Feature 4 is a courtyard like area between building 2 and a long sunken enclosure *recinto* (5) It is closed by a wall at the end that faces Huayna Picchu. Here an entranceway with an alignment of 50 degrees opens to the outside platform/walkway.

Structure 9 is a low wall slightly above the plaza level that measures six feet high on the downhill side. The wall merges into a raised earth platform, which takes a curious jog to terminate at structure 10. The wall and mount may have been used as a ritual walkway to reach a shrine. This feature is a small 10 feet x 10 feet U shaped structure *masma* with the open side facing inward to the plaza at 230 degrees.

Building 7 is an interesting feature. It is an unusual structure 30 feet by 30 feet with internal niches and a single entranceway facing into the plaza. The back or Huayna Picchu side lacks windows and has five rectangular niches. The two sides perpendicular to the entrance have matching long windows. The workmanship is in the best Vilcabamba style, with shaped corner blocks and carefully fitted, coursed, wall stones. The location gives immediate access to the bath/fountain (8) and water system. The building remains an enigma deserving further study.

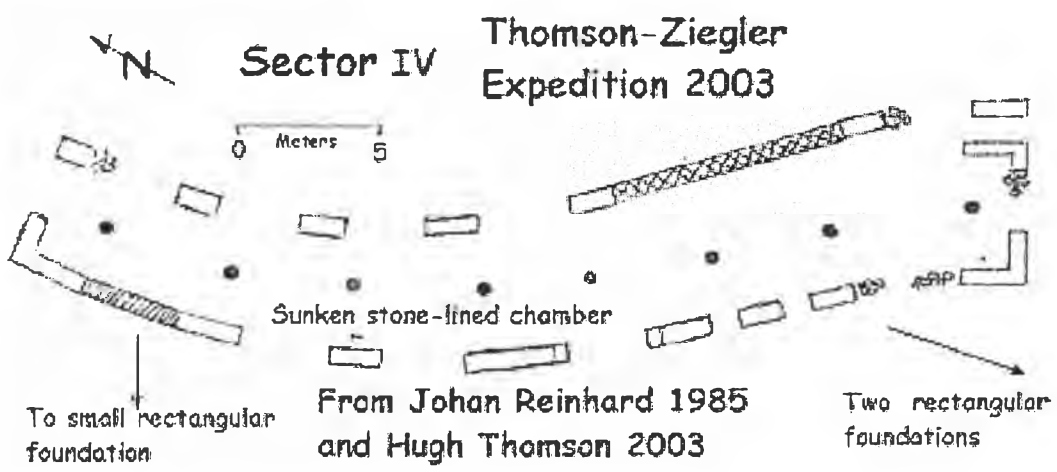
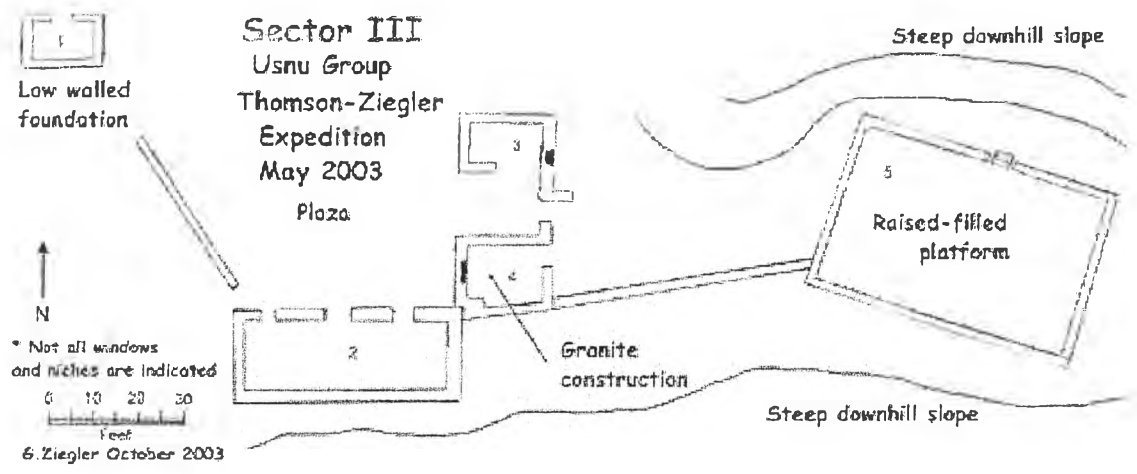
A steep escarpment falls off to the northeast. Some 20 metres below is a sizable *pampa* area with swampy depressions and a profusion of water plants. We believe that this may have been a pond or developed water feature associated with the group above. It served us well as our base and campsite.

## **Sector II: The Drew – Thomson Group. Interpretation**

A most notable aspect of this Sector is that the main group is orientated to face Huayna Picchu at an azimuth of 50 degrees, and the Overlook Temple at 320 degrees. This creates a sight line to each at a right angle or 90 degrees to each other. If this is not coincidental, then the placement of the temple and/or Sector II had to be carefully planned and by design. Alignment on Huayna Picchu and its Three Windows shrine that looks back on the main Sectors suggests that Huayna Picchu may have been an important spiritual focus of sector II (Ziegler-Malville 2003).

Sector II has a number of unusual features that appear to have had a ceremonial function. The main group is orientated to face Huayna Picchu at an azimuth of 50 degrees. The long axis of the group points to the Overlook Temple at 320 degrees similar to the long axis of Sector I. Near the summit of Huayna Picchu is the House of Three Windows, a shrine containing a replica stone closely resembling the Llactapata ridge that focuses attention on and is in alignment (230 degrees) with the Llactapata sites (Ziegler-Malville 2003).

A ritual fountain/bath along with a pond suggests that water was an important design element here as well. The small U shaped shrine (10) faces inward to the plaza and hillside. Its focus is directed toward the spring and only water source



for area. The American anthropologist Susan Niles describes similar Inca sites as water shrines or *moyas* (Niles 1999).

Buildings 1, 2 and 6 could have served as temporary lodging for important parties travelling on official business, state sponsored pilgrimages or ceremonial processions to and from Machu Picchu as a sort of high status shrine and *tambo* with ceremonial purpose. Like Wiñay Wayna on the eastern road to Machu Picchu, the main Llaqtapata groups are situated several hours travel along the western approach.

There are similarities between the two sites. Wiñay Wayna is at an altitude of 2,600 metres and a distance of eight kilometres from Machu Picchu. The Sector II group is at 2,700 metres and about the same distance by the original western road. Both are designed around water features. Reinhard believes that Wiñay Wayna was built as a ritual-stopping place along the road to Machu Picchu. The similarities with Sector II suggest that it may have in part, served the same function.

Hugh Thomson suggests that Sectors I and II may represent upper and lower divisions, *hanan* and *hurin*, a duality common to Inca urban design and socio-political administration (Gasparini and Margolies 1980). The Eastern and Western Sectors at Machu Picchu, separated by the main plaza are identified as such by Alfredo Valencia and others. (Wright-Valencia 2001)

### **Sector III The Usnu Group: Description**

#### Sector III plan

Located some 100 metres from the uphill side of Sector I and 30 metres higher in altitude, this sector is associated with Sector I. The design indicates that it may have been ceremonial.

Structure 2 is a long building with three entranceways facing east into a small plaza. The roof was probably gabled but considerable breakdown has occurred. No windows are evident. It measures 90 feet by 20 feet with the back wall 9 1/2 feet high. The alignment is cardinal north south.

Structures 3 and 4 border the north side of the plaza. 3 is low walled with the slope falling off to the north and west leaving a higher north-facing wall with an outside niche. Structure 4 is more interesting. Most wall stone is a shaped white granite similar to that of Machu Picchu making the architecture unique for the area. The material must have been imported from either near Machu Picchu, or some closer isolated granite dike. A single internal niche faces east toward the one entrance. A passageway leads down through a gateway between structures

3 and 4 to feature 5, the most important structure of the group, which appears to be a Sacred Platform or *Usnu*.

The *Usnu* is a 60 feet by 40 feet raised, earth filled platform, enclosed by a five feet high retaining wall. It is connected to building 4 by a 60 feet long low wall. Stone steps lead onto the platform from the northeast side. The platform is aligned 20 degrees by 110 degrees. and overlooks Sector I below.

Another low wall, 40 feet long, leads off from the northwest corner of building 2 at 330 degrees. Beyond the wall is a low walled rectangular structure (1) that is similar in size and placement to outlying structures at other sections. It may have been built for a caretaker or attendant.

**Sector III A** John Leivers led a machete team down through thick tangle near Sector III. A long structure on a curved mount was reported and a number of smaller structures. Unfortunately there was not sufficient time to survey these.

### **Sector III The Usnu Group: Interpretation**

The main buildings and plaza are aligned with cardinal directions. Johan Reinhard has written of the importance to the Inca of cardinal directions, equinox alignments and their unique relationship to sacred mountains at Machu Picchu (Reinhard 2002) Although alignments would somewhat differ, it follows that this would be true for Llactapata sites as well. Sector III is an extension of Sector I, which we suggest was a Sun Temple ceremonial site associated with the June solstice and Machu Picchu. The upper group may have served an equinox related function or other yet to be determined astronomical identification. The northwest wall of the plaza, aligned at 335 degrees, creates a sight line to the Overlook temple. However, we have not established that the temple can be seen from the plaza. A similar wall running out at an angle from a building at Cota Coca creates a sight line to the water shrine Pinchu Unuyoc near Choquequirao. (Ziegler 2001, Ziegler-Thomson 2002)

An important feature is the large platform that we call an *usnu*. The term has several meanings. *Usnu* is used to describe a stepped platform upon which the Inca was seated from an early description by Guaman Poma (Poma 1956 [1613]). An *usnu* has also been described as a place to view sunset with markers on the horizon. (Zuidema 1986). The great *usnu* of Cusco, *Usnu Capac*, had a central pillar for astronomical sighting (Moseley 1993). We believe that the name appropriately describes raised platforms associated with ceremonial sites.

With an alignment of 110 degrees and 20 degrees, the platform is orientated close to the December solstice line for the rising sun of 112 degrees noted by Johan Reinhard for Machu Picchu (Reinhard 2002). As no significant summits are close to this alignment to suggest a topographic focus, nor does the platform

align toward Machu Picchu, it is possible that the primarily ritual activity related to the December solstice. Overlook *miradores* and raised platforms are common throughout the region but few are of this large size. Only hill top platforms at Choquequirao and Cerro San Miguel are larger (Lee 2000, Ziegler 2001, Reinhard 2002,). The size suggests that this was a very important ceremonial location. Sector III requires additional study.

#### **Sector IV The Reinhard Group: Description**

##### Sector IV plan

During 1985 Johan Reinhard conducted an exploratory investigation of the upper regions of the Aobamba drainage. He visited and surveyed the high site of Palcay (3600 metres) previously documented by Bingham (Bingham 1913). While descending down to the Urubamba Canyon, he surveyed and reported what we now identify as Sector IV. (Reinhard 1990).

Following his description and map, we re-located the site where indicated on a lofty shoulder of the Llactapata ridge amongst tall ancient fern-covered trees at 3000 metres altitude. The remains are badly deteriorated, with deteriorated walls. The main structure is a long (120 feet) narrow building with 12 entranceways spaced along the sides. No niches are visible. The building follows the slightly curved contour of a small hilltop. A number of equally spaced holes are centred along the inside floor. All have been opened by treasure hunters, *huaqueros*. They appear to have been stone lined chambers similar to others that have been observed in the Vilcabamba. (Ziegler 2001, 2002). Three smaller low walled rectangular structures are located nearby. The building is situated near the route of a likely Inca road that connected Palcay above with Llactapata and the main westward Inca road below.

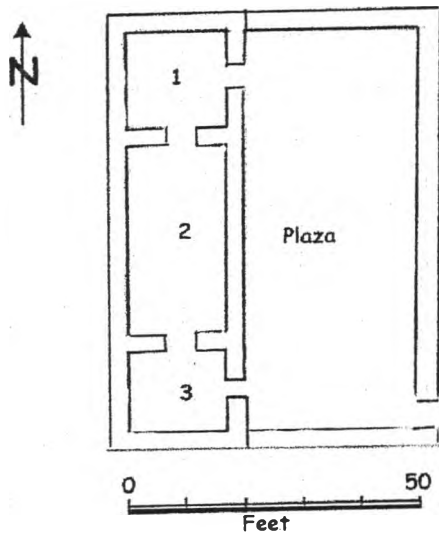
#### **Sector IV The Reinhard Group: Interpretation:**

Similar long structures with multiple entrances have been identified as meeting halls, *kallankas*, such as the largest building at Machu Picchu, located outside and above the main gateway (Wright-Valencia 2000). These large buildings seem to be located near or are part of a larger site such as at Choquequirao, Cota Coca and Machu Picchu. It would be unusual for a meeting hall to be placed as an isolated structure in a remote region. Some long buildings have been identified as storehouses. Examples are a group between the upper and lower Plazas at Choquequirao and a long isolated building with multiple entrances and windows at Sapamarca. (Ziegler 2001)

Storehouses were frequently placed in a high open area for ventilation and other reasons such as at Ollantaytambo (Protzen1993). The holes or chambers in the floor present an enigma. Reinhard thought the holes were dug by *huaqueros*. However, we were able to

# Sector V Group A

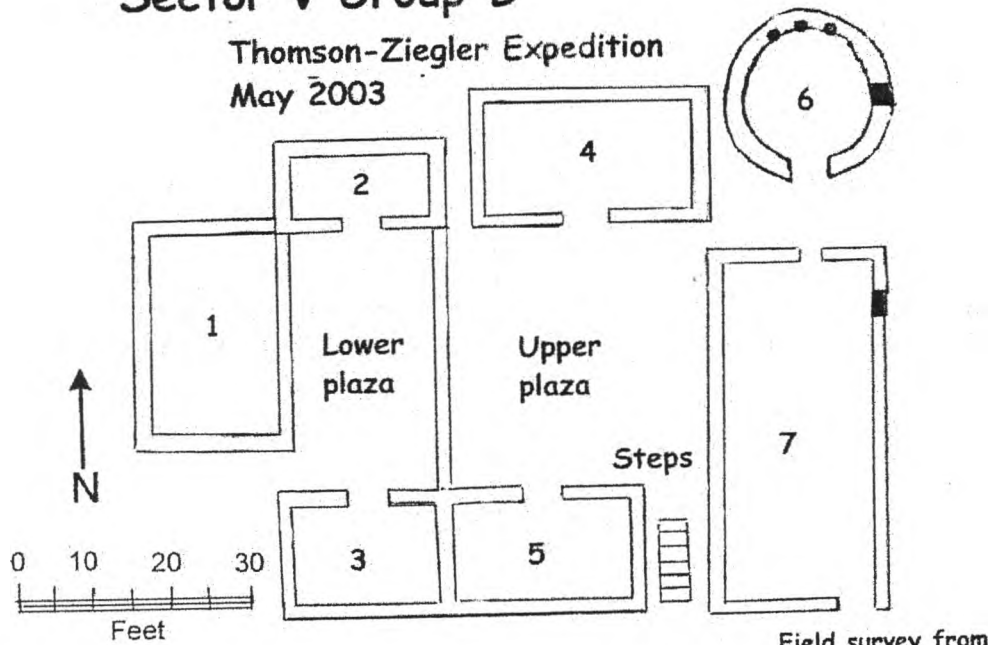
G.Ziegler October 2003



G.Ziegler. October 2003

# Sector V Group B

Thomson-Ziegler Expedition  
May 2003



\* Details lacking...additional study is needed

Field survey from  
Amy Finger

examine several with a layered stone lining. From excavations at Corihuayrachina we found that similar chambers contained simple offerings and low status burials (Ziegler 2002). Hugh Thomson suggests that the chambers might have been cisterns for storing water during the dry season, as this sector lies above the water-line. Some Chachapoya houses have this feature at the northern Peru site of Chacha Picchu. However, no Inca examples are known to the authors. Apparently household water was stored in ceramic containers.

It is interesting that the alignment of the east wall is 40 degrees, creating a sight line to the summit of Huayna Picchu. An azimuth of 340 degrees for the opposite or north end offers a sight line down the Urubamba Canyon to the site of Sapamarca. The building was likely a storehouse, located below the frost zone on the road to Palcay. Perhaps local residents used it as a convenient mausoleum at a later date, during or following the decline of Machu Picchu. The three low walled structures may have been simple wood-sided huts for a caretaker family.

## **Sector V: Group A and Group B: Description**

### Sector V Plan A and B

This complicated Sector encompasses a large area of the lower ridge dividing the Santa Teresa Valley and the Aobamba drainage, terminating when the two river merge in the Urubamba River and Canyon at an altitude of 1,500 metres. We explored more than two

kilometres of the ridge crest from 2,800 metres down to a partially clear saddle at 2,600 metres. From the saddle, the ridge rises steeply up into several rocky crags with steep cliffs on either side before again plunging downward. The upper portion is cloaked in heavy dense forest and thick, nearly impenetrable vegetation. Exploration of the crags requires careful hands-on climbing and technical mountaineering training. Local herders had worked cows up to the few clearings on the ridge. A rough trail reaches the saddle from the Santa Teresa valley side. A seasonal hut and several cornfields account for the cleared areas.

Reopening an old herder's path winding through the undergrowth, a passable trail down to the saddle was cleared. Four main groups were located and incompletely surveyed; Groups *conjuntos* A and B, the Overlook Temple and the crag top platforms. Several freshly dug holes indicated that the local farmer had visions of buried treasure. The real prize however, was a solitary, unique two story building perched on a ledge viewing Machu Picchu, which we unimaginatively, but descriptively named the Overlook Temple.

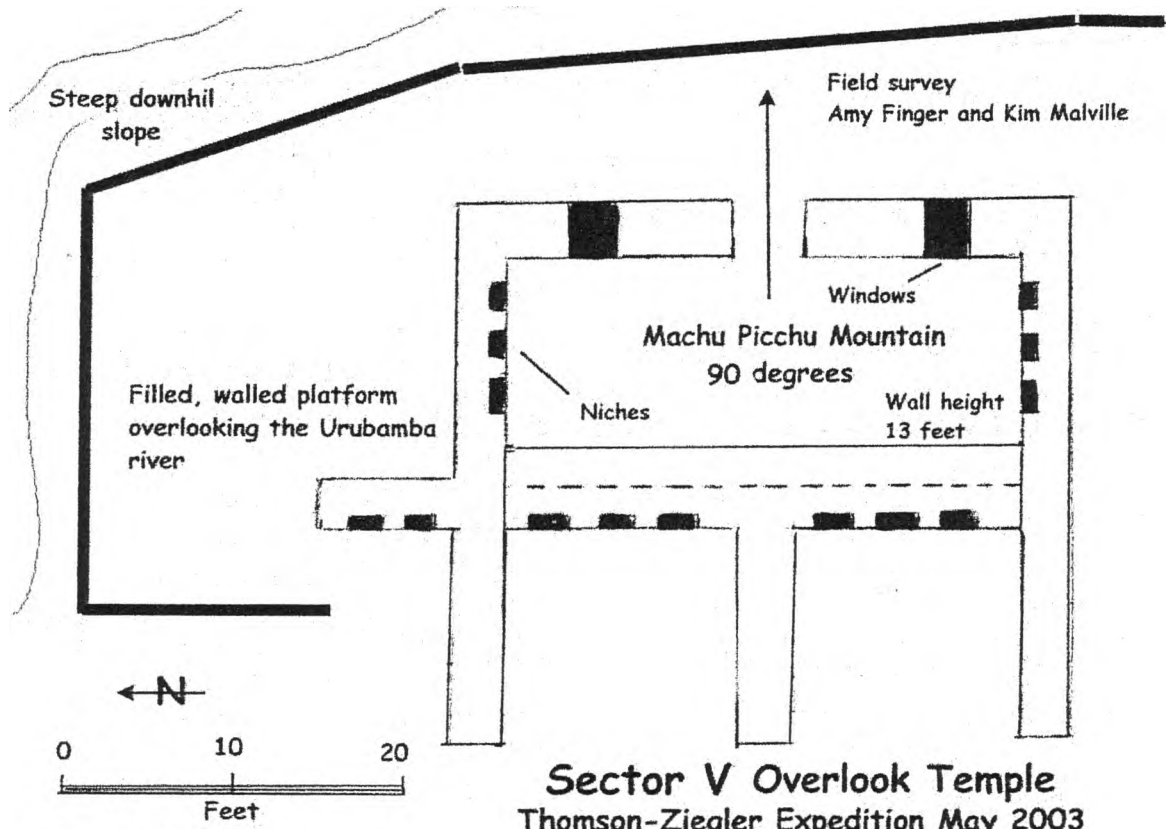
**Group A:** This feature is a rectangular walled compound *kancha* measuring 75 by 55 feet enclosing a long three room, badly crumbled building. The outside wall is six feet high and three feet wide of crude slab construction. The alignment is cardinal with east facing entranceways offering a sight line to Mt Machu Picchu.

**Group B:** Located two hundred metres down the ridge and at a slightly lower altitude, this group of seven buildings is built upon a small hill. A central wall divides the group into lower and upper sectors each with an internal plaza. The alignment is north south with entranceways at buildings 1-5 opening into the two plazas. Building 6 is round with an inside diameter of 16 feet. The entrance faces south. The north wall has three niches. A single window faces east offering a sight line to Mt Machu Picchu.

Other groups and features: With the discovery of the Sector I and III groups, we concentrated our efforts on these sites to best utilize the days available. The difficulty of the terrain and distance from base camp to Sector V was also a deterrent. The result is that we were not able to adequately examine and document the full extent of archaeological features scattered through out the broad ridge top. Hugh Thomson, Gary Ziegler and John Leivers had already located numbers of simple structures, walls and terraces during their reconnaissance in 2002. John and a small crew managed to climb on top of the rocky crags. He reported a number of low walls and several platforms, probably *miradores*, indicated on the general site map. Much more remains to be investigated here.

### **Sector V: Group A and Group B: Interpretation**

The extent of scattered foundations and crumbled, poorly made walls suggest that the lower ridge was a settlement of low status workers. The gently sloping and level areas of the long ridge are well suited for agriculture as demonstrated by several recent cornfields located near the saddle. Although this needs considerable further study, two



G.Ziegler October 2003

**Sector V Overlook Temple**  
Thomson-Ziegler Expedition May 2003

possibilities are that Groups A and B were either storehouse groups, *qolqas*, or administrative centres/residences for the local administrators or *karakas*. These were hereditary heads of kinship groups, *ayllus*, that worked and managed agricultural lands. The duality of Andean social organization required two for each settlement (Moseley 1993). If so, Group B could have housed the principal or more powerful administrator. The round house with window view of Mt. Machu Picchu may have served a ceremonial function. Additional study is needed.

Platforms and low walls on the rocky crags above may have been ceremonial, offering a view to the east of Mt Machu Picchu Mountain, Mt Veronica and Mt Pumasillo to the west. The summit of Salcantay can be seen to the South. Reinhard and others have shown these mountains to be particularly important to the Inca. Of interest is that the crags lie exactly on the equinox line from near the summit of Veronica. The line crosses the Machu Picchu Intihuatana and the summit of Cerro Miguel, which has a platform and upright marker stone on the equinox line (Reinhard 2002). The Sector V platforms were especially suited to worship sacred geographical features in combination with equinox alignment and other astronomical phenomena.

#### **Sector V: Overlook Temple: Description:**

##### Overlook Temple plan

On the lower ridge above groups A and B there is an unusual, solitary, two-story structure perched on the edge of a steep drop above the river some 1200 metres below. Construction is of the finest Vilcabamba style with larger blocks of shaped quartzite utilized for corners and doorjambs. The building contains 14 niches. The one entrance way and two windows open to a balcony or walled, filled platform providing an impressive view of Machu Picchu, the Veronica Range, Cerro San Miguel, Salcantay and the Urubamba River. The west-facing wall has two open chambers with niches, which look out on a broad gently sloping area with no visible evidence of constructions. A short wall with two niches extends out eight feet from the northwest corner creating an angled passageway leading onto the front platform. Nearby, a walled path descends toward the Urubamba and the riverside Intihuatana shrine.

The building is cardinal aligned. Its eastern facade and doorway focus a sight line to Machu Picchu Mountain in alignment with the *huaca* site called the Intihuatana in the Urubamba Canyon below. This is the line the sun would be seen to follow during equinox for a viewer at any of the three locations. The ice summits of Veronica and Salcantay are also visible. The summit of Cerro San Miguel lies at an azimuth of 60 degrees from the temple. The sun would rise over Huayna

Picchu during the June Solstice and be seen close to the summit of Cerro San Miguel when first viewed. Both June solstice and equinox ceremonies could be conducted from the temple.

An unusual feature of the location of Overlook Temple is that it lies close to the extension of the long axes of the Llactapata Sun Temple (Sector I), the possible *moya* of Sector II, and the *usnu* of sector III. A person standing on the courtyard of the Sun Temple facing the June Solstice sunrise would find the Overlook Temple to be 90 degrees away from the sun. Conversely, a viewer at the Overlook Temple would have the Sun Temple at a right angle to the rising sun during the equinox.

### **Sector V: Overlook Temple: Interpretation**

This solitary, unusual structure seems to have been a most important ceremonial feature of the Llactapata archaeological zone. The setting, construction, design, external niches and platform *mirador* suggest that the building had an important ceremonial purpose.

Sight lines to sacred topographic features in relationship to equinox and solstice alignments suggest that solar rituals and ceremonies were primary activities. A sight line orientated directly east, passing through the *huaca* Intihuatana at the sacred Urubamba River, *Wilcamayu*, to Mt Machu Picchu is particularly significant. The Intihuatana site has yet to be studied. Reported by Bingham, the feature has not been surveyed (Bingham 1913).

However, the location at almost the mid way point between the Overlook Temple and Machu Picchu Mountain would allow an observer to view sunrise near the Mountain, and then sunset near the temple during equinox. Reinhard and others have demonstrated the importance of Mt Machu Picchu to the builders of Machu Picchu (Reinhard 2002, Ziegler-Malville 2003). The placement of the Overlook Temple in relationship to these important features gives it special ceremonial significance.

Add regional map

## 6 ARCHAEOASTRONOMY AT LLACTAPATA

by J. McKim Malville

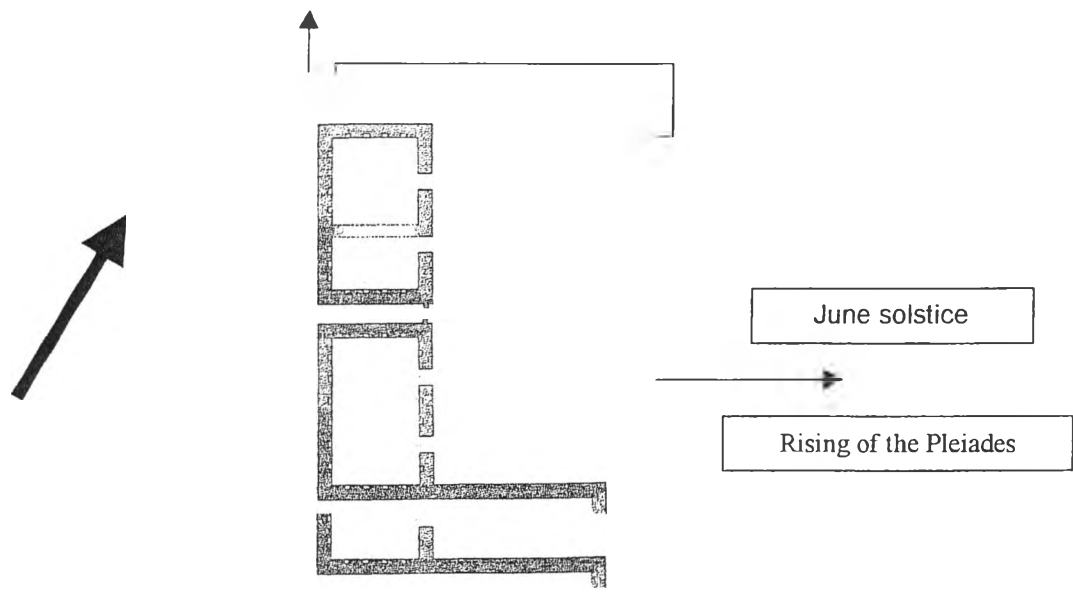
Sector I consists of a complex set of seven buildings, passageways, and courtyards, which may have functioned as a sun temple in a manner similar to that of the Coricancha of Cusco. The Inca road leading across the so-called drawbridge from Machu Picchu would have allowed the Inca and his retinue to visit Llactapata on special occasions to celebrate the rising of the sun and the Pleiades.

The long ceremonial passageway and two courtyards may have been sites for rituals involving the sun and the Pleiades. In particular there may have been processions along the passageway toward the sun and the Pleiades. The double-jamb doorway into the shorter of the two ceremonial passageways is a clear indicator of Llactapata's high status and is remarkably similar to that of the Coricancha and other sun temples such as that at Vitcos (Gasparini and Margolies 1980).

The Coricancha of Cusco is the great exemplar of sun temples of the Inca. It contained seven halls, six of which opened onto a courtyard, which was some 35 metres on a side. These buildings were dedicated to various deities such as the sun, the moon, Venus, the Pleiades, thunder, and rainbow. The western section of the courtyard consisted of a continuous façade containing two halls surrounding a passage with a double-jamb doorway. The doorway faced the north-eastern horizon where the sun at the June solstice and the Pleiades could be seen to rise. As the most important sanctuary in the Inca Empire it served as a model for other temples of the sun throughout the empire. It has been something of a puzzle that Machu Picchu seems to lack a similar structure that combines worship of the sun with sanctuaries to major Inca deities.

The middle level of the site is dominated by a corridor, which is 2.5 m wide, 33 m long, and opens to an azimuth of  $64.5^{\circ}$ . At the south-western end of the corridor there is merely the hillside, but to the northeast there is a dramatic view of Machu Picchu lying on the shoulder between Huayna Picchu and Mt Machu Picchu. The view from the corridor also includes the rising sun on the summer solstice and the rising of the Pleiades. The first gleam of sun at the June solstice has an azimuth of approximately  $64.30$  on the distant jagged horizon.

The rising of the Pleiades would have occurred nearby at an azimuth of  $66^{\circ}$  in A.D. 1500. Of great interest would have been the heliacal rising of the Pleiades near June 9, which may have been the first day of the Incaic year (Zuidema 1982). The walls of the corridor are unbroken, with no side doors or passages, suggesting that it may have functioned as a processional passage leading toward Machu Picchu and the June solstice sunrise.



Sun Temple at Llactapata

Figure 1. Detail of plan of sector 1

**Comparison  
of Structures and Orientation  
At Ilactapata and the Coricancha  
in Cusco**

Ilactapata  
Buildings 1 and 2  
Bingham 1912

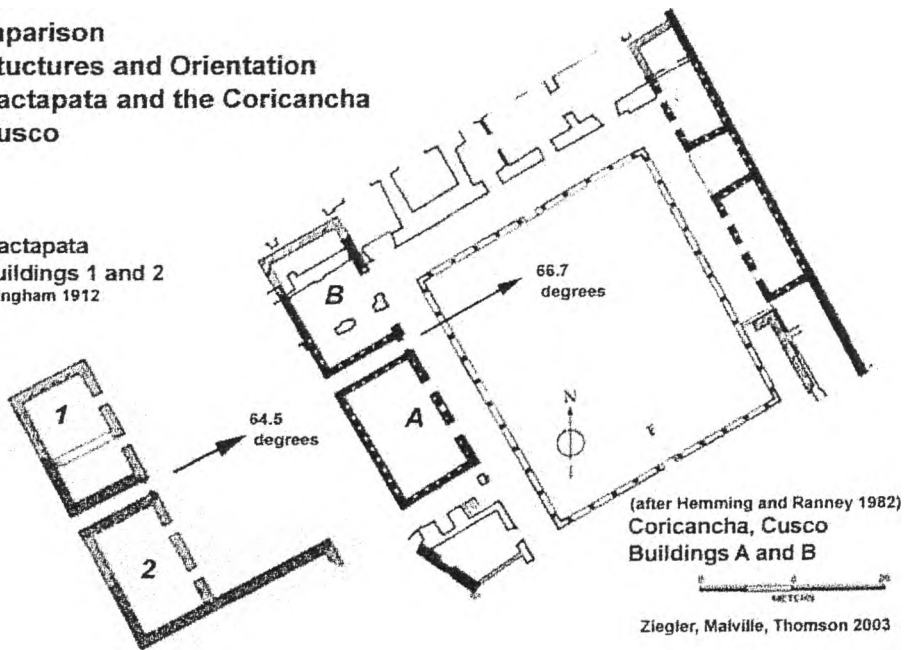


Figure 3

Buildings 1 and 2 of Sector 1 open onto a courtyard, which is approximately 30 metres long on one side. The double-jamb doorway that lies between the buildings leads to a second passageway, which is 8.5 m long and 2.4 m wide. In the courtyard, two U shaped shrines facing the June solstice are located on the southern wall. The five buildings on the other side of the long corridor open to larger courtyards on the lowest level of the site. These may have been associated with the other deities that are found in sun temples.

The double-jamb doorway that is in the centre of the façade at the upper level of the Bingham site is characteristic of entryways to spaces that were ceremonially important to the Inca. There are eight such doorways in Machu Picchu, but none is associated with the combination of ceremonial courtyards, passageways, and adjacent halls that are found in the Coricancha.

As detailed in Table 1, the dimensions of the Coricancha and the upper level of the Bingham site are remarkably similar. The double jamb doorway of the Coricancha faces an azimuth of  $66.7^{\circ}$  (Zuidema 1982) and opens to a courtyard that apparently was the scene of ceremony and ritual. Just opposite the doorway, a gap in two structures permitted a view through which the Pleiades could have been seen rising above the eastern wall and above the distant horizon. The rising sun at the June solstice could apparently have been viewed just at the edge of that gap. Twenty-five days before the June solstice the sun would have risen in the centre of the gap. Both courtyards of Llactapata have unobstructed views of the June solstice sunrise and the rising of the Pleiades. At the time of the solstice, the Pleiades preceded the sun by several hours.

The jagged horizon visible from Llactapata would have allowed precise determinations of the number of days before the June solstice.

### **Figure 2. Sunrise on the north eastern Horizon of Llactapata**

In contrast to the irregular horizon of Llactapata, the smooth horizon at Cusco does not provide natural fiducial marks, and pillars were erected by the Inca to mark the sunrise/sunset positions at solstices and other significant dates (Rowe 1946; Aveni 1981; Zuidema 1981, 1982; Bauer and Dearborn 1995). The chroniclers noted the presence of the Cusco pillars, but their exact location is now a matter of some controversy among scholars.

The horizon calendar of Llactapata may have established the place as a special calendrical station and ritual centre during the time that Machu Picchu was occupied. The rising of the solstice sun and the heliacal rising of the Pleiades become doubly momentous when they occur over the heights of Machu Picchu.

remarkable polygonal stones with 32 angles, a stone bench facing southwest, and 13 niches. (Reinhard 2002; Wright and Valancia Zegarra 2001). With an orientation of  $245^\circ$  its long axis is perpendicular to the direction to the sun temple at Llactapata. From the Priest's House's entrance, or from the stone bench within, one can look directly into the Llactapata sun temple. In addition, the December solstice sun can be seen setting near the snow peak of Pumasillo (Reinhard 2002). In front of the building is a viewing platform some 3-5 metres across, with a curved wall reminiscent of the Coricancha, which provides views of Llactapata, Pumasillo, and the setting sun.

The two sight-lines between the Priest's House and the Llactapata Sun Temple and Sector II and the house of three windows on Huayna Picchu function in diametrically opposite directions for both solstices and mountains, suggestive of the ritual of *darshan* in India in which a devotee makes eye contact with a god who then returns the gaze. The intent to achieve such mutually interactive sightlines is strongly indicated by the rotation of these two structures, located at different places in Machu Picchu, toward features in Lactapata.

Another well-known feature on the June solstice line is the Torreón of Machu Picchu, which contains a window that duplicates the view from the Llactapata sun temple by opening to the rising positions of the June solstice sun and the Pleiades. The Torreón is not visible from Llactapata; like the Urubamba Intihuatana stone, it probably functioned as a huaca. Although elegant in construction, the Torreón is not sufficiently large to permit ceremonies in its interior, which is only some three metres across, nor does it contain the multiple halls normally associated with a sun temple (Gasparini and Margolies 1980; Hemming 1981).

### Figure 5. June Solstice Alignment from Llactapata

The eastern façade of the Overlook temple faces Machu Picchu peak and the Intihuatana stone in the Urubamba canyon. We describe this in 'Site descriptions and archaeological detail'. Beyond the Overlook Temple lie two additional structures (A and B) that are also along approximately the same line from Sector I.

The historical record provides no guidance as to whether these various linear groupings of shrines in the Llactapata- Machu Picchu neighbourhood have a meaning and function similar to those of the *ceque* system surrounding Cusco. Writing in 1653, the Jesuit scholar Bernabe Cobo described the system of 41 *ceques* and 328 *huacas* that surround the Sun Temple (Cobos 1983) The *huacas* consisted of natural features such as springs, unusual rocks, and caves as well as artificial structures such as elaborately carved rocks, fountains and pools and temples (Zuidema 1964; Gow 1974; Bauer 1995). Zuidema proposed that the

328 *huacas* represented successive days of the sidereal lunar calendar, and that the flow of time in the Inca world was marked by worship services at consecutive *huacas* by different kin groups. In addition to markers of calendrical time, Zuidema suggested that *ceques* might have been sight lines to sacred mountains and astronomical phenomena, as well as geometrical partitions that organised the sacred landscape. If a defining characteristic of a *ceque* involves a line of shrines and sacred buildings that has geographical, astronomical, or cosmological meaning, these linear groups at Machu Picchu may qualify.

### Site Summary: Llactapata Archaeological Zone

Description	Location UTM and altitude	Alignment and sight lines	Probable principal functions
Sector I 10 buildings, 3 U shaped features, long corridor, 2 plazas, sunken enclosure and walls.	18L 0761802 UTM 8541051 Alt. 2734m	335° to Overlook Temple  65° to Sacred Plaza-Machu Picchu	June Solstice Sun Temple  Astronomical observations
Sector II 9 buildings, 2 plaza, 2 walkways, 2 sunken enclosures, 1 U shaped shrine, 1 bath/fountain, water canal, dry pond, walls.	18L 0762100 UTM 854100 Alt. 2630m	50° faces Huayna Picchu.  320° to Overlook Temple.	Huayna Picchu rituals.  Water shrine  High status <i>tambo</i>
Sector III 4 buildings: 1 granite shrine, 1 long building. 2 raised walls 1 raised usnu platform 1 plaza	18L 0761733 UTM 8541045 Alt. 2763	Cardinal Alignment Wall points 330° to Overlook Temple. Usnu aligned at 110°	Equinox rituals  December solstice Rituals  Astronomical observations

<p>Sector IV 4 buildings: 1 large, long curved structure and 3 low smaller structures. 8 sunken chambers.</p>	<p>18L 071277 UTM 8540156 Alt. 3008m</p>	<p>One end of long structure aligned 40° to Huayna Picchu.  The opposite end aligns 340° toward the site of Sapamarca</p>	<p>Store house with caretaker residences</p>
<p>Sector V  Overlook Temple  1 Building 1 walkway, 1 filled, walled platform Several outside walls</p>	<p>18L 076130 UTM 8542050 Alt. 2700m</p>	<p>Cardinal alignment 90° to river shrine and Machu Picchu Mt.  65° to Huayna Picchu with right angle line to Sector I-III.</p>	<p>Mountain worship: rituals associated with Machu Picchu Mt. and Huayna Picchu.  Equinox ritual  June solstice ritual</p>
<p>Group A and B  10 buildings: 9 rectangular and 1 circular in two groups. 3 plazas and 1 walled compound.</p>	<p>18L A 076101 UTM 854239 Alt. 2725m  18L B 076094 UTM 854254 Alt. 2712m</p>	<p>Cardinal alignment Faces and views Machu Picchu Mt.</p>	<p>Store houses and residences or administrator centre  Possible Equinox ritual with Machu Picchu Mt.</p>
<p>Agricultural group  Many assorted low foundations. Some round and oval structures Many unsurveyed simple houses Walls and leveled areas.</p>	<p>On ridge top from map grid line 41 to 43 Alt 2800m-2600m</p>		<p>Agricultural fields and low status settlement housing for workers</p>

<p>Platform group on crags</p> <p>3 walled platforms and assorted retaining/terracing walls</p>	<p>18L 076096 UTM 854285 Alt. 27739m</p>	<p>Situated on the equinox line from Veronica, Machu Picchu and Cerro San Miguel. Views of Pumasillo, Veronica and Salcantay</p> <p>245° to Pumasillo</p>	<p>Astronomical observation</p> <p>Solstice ritual</p> <p>Equinox ritual Mountain worship</p> <p>Sight and signal activities</p>
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## 7 CONCLUSIONS

The expedition revealed Llactapata to be a far more substantial site than has previously been realised

As group after group appeared, some uncovered after five centuries of concealment we realized that this was far more than a small compound of buildings described by Hiram Bingham in less than a paragraph.

There are parallels to one of Bingham's most important discoveries, Espiritu Pampa in the Vilcabamba, which he only partially uncovered in 1911. Only later, in 1964, were further sectors revealed and its true significance established, as Vilcabamba La Vieja, the last refuge of the Inca.

Likewise Llactapata, the supposedly insignificant ruin with the unassuming name, 'high town', is of much more importance than had been thought.

The interpretations and conclusions presented are of course preliminary. We have attempted to describe the main groups and features in accurate detail. Interpretation is based upon our own experience, research and first hand knowledge of many Inca sites along with application of the accumulated understanding of the Inca from the research and publication of many. The **Bibliography** represents but a few.

Many groups and features at Machu Picchu have been identified as having alignment to astronomical phenomena or specific topographic features. (Dearborn 1987, Reinhard 2002). Johan Reinhard has suggested that Machu Picchu was located, designed and functioned as a 'sacred centre', with a unique convergence of geographical features, sacred mountains and the Urubamba River giving astronomical and cardinal alignments (Reinhard 2002). As a closely related satellite of Machu Picchu, this interpretation applies well to the Llactapata site.

Solstice-equinox orientation in relationship with alignments on Huayna Picchu and Mt Machu Picchu indicates that adoration and ritual focus on these special mountains and the sun may have been the primary purpose at Llactapata. If the Sector I group is a sun temple as we suggest, its location, situated to view the sun rising over the Sacred Plaza, midway between the two peaks during the June solstice, gives great ritual importance to the site.

The solitary Overlook Temple seems to be both a June solstice and an equinox feature, placed to view the sun rising near the summits of Cerro San Miguel and Machu Picchu Mountain. The ridge top platforms also appear to have an equinox

purpose from their placement directly to the west of Cerro San Miguel and Machu Picchu.

The Usnu Group, the newly reported Sector III, may also have had an equinox purpose, as the main structures are cardinal aligned. However, the large, raised *usnu* is the principal ceremonial feature. The alignment suggests that the main function may have been December solstice activities. The platform would also have been used for different astronomical and ceremonial events.

An alignment relationship with the Overlook temple and sight lines to and from the Sun Temple, Usnu Group and Sector II is a phenomenon, which we suggest, was by design. At Machu Picchu every feature or construction appears to be planned and aligned with a purpose. We suggest that the ceremonial groups and features at Llactapata were placed and built in careful consideration of geo-spiritual and astronomical relationships in conjunction with Machu Picchu. Llactapata was part of a carefully designed network of interrelated administrative and ceremonial sites supporting the regional administrative and ceremonial centre at Machu Picchu.

This should be seen in the light of recent work by John Rowe, Richard Burger and Lucy Salazar-Burge, which places Machu Picchu in the context of Pachacuti's personal estate (Rowe 1987, Burger & Salazar-Burger 1993). The high status architecture found not only at Machu Picchu but throughout the Vilcabamba and at sites along the upper Urubamba valley is a reminder of the use of this area for royal estates (Burger & Salazar-Burger 1993, Niles 1999) by the Inca nobility.

Llactapata is an important staging post on a network of roads extending from Cusco to Vitcos. Our investigations have identified the remnants of an Inca road at Llactapata connecting with the 'drawbridge' route west from Machu Picchu. Earlier explorations by Hyslop, Lee, Thomson, Ziegler and others have traced roads from the important Vilcabamba sites of Vitcos and Choquequirao (Hyslop 1984, Lee 2000, Thomson 2001, Ziegler 2001). A major road network connecting with extensive Inca controlled regions to the west reinforces the idea that Machu Picchu was the spiritual and administrative hub of a network of roads, regional settlements and state controlled commerce as suggested by Ann Kendall and others (Kendall 1988).

A large staging area and meeting hall outside the main gate and a number of *qolqas* indicate that Machu Picchu may have been a collecting point for goods arriving from the Vilcabamba to be sent on to the capital or for other distribution. If so, Llactapata would have been an important resting place and roadside shrine for important official parties on the road to Machu Picchu and beyond. We have discussed the similarities of Sector II with Wiñay Wayna, which has been identified as a water shrine and resting-place on the eastern road (the so-called 'Inca trail'). The Sector II group likely served a similar purpose as a sort of high status *tambo* with seasonal ceremonial activities.

The architectural similarities between Sectors I and II reflect the division of the site into *hanan* and *hurin* sectors common to pan-Andean societies (Gasparini & Margolies 1980, Hyslop 1990).

An area of about one square kilometre suitable for agriculture and the abundance of poorly made structures on the lower ridge in Sector V indicate that quantities of corn and other crops were grown here. The American hydrologist Kenneth Wright calculates that the agricultural areas at Machu Picchu could only have produced enough to feed 55 people. He estimates that the site housed 300 permanent residents (Wright & Valencia 2000). The Llactapata crops would have been important for supplementing food production at Machu Picchu.

The number of simple foundations suggests that the area was also a low status settlement that may have housed a population of workers in support of activities at Machu Picchu, just as the settlements in the Cusichaca valley are thought to have been (Kendall 1988). We have estimated the distance along the Inca road to Machu Picchu to be less than eight kilometres.

The identification and study of the Llactapata archaeological area adds significantly to our knowledge and understanding of Machu Picchu as the hub of a complex neighbourhood of carefully placed interrelated administrative and ceremonial sites reaching outward toward distant imperial Cusco and the far Vilcabamba.

The architecture and dramatic landscape of Machu Picchu have always suggested that for the Inca it was a place with considerable depth of meaning and sacred power. Llactapata adds to its significance providing a sun temple, similar to the Coricancha, from which the Pleiades and the June solstice sun rise over Machu Picchu.

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## Appendices

### A SPONSORS AND TEAM MEMBERS

#### **The members of the Thomson-Ziegler Peruvian Andes Research Expedition 2003**

The members of the Thomson-Ziegler Peruvian Andes Research Expedition 2003 were: Roz Allibone (Sponsorship Organiser), Nicholas Asheshov, Barry Bond, Greg Danforth, David Espejo, Amy Finger (Coordinator), Jeff Ford, Antonia Hall, William Heath, Sandy LaJudice, Beth LaTulippe, John Leivers (Fieldwork Coordinator), Kim Malville, Robert Mrocek, Nathan Poole, Hugh Thomson, Jack Vetter and Gary Ziegler.

#### **The sponsors**

Orient Express and Perurail contributed greatly to the success of the expedition with their gift of facilities, and the expedition would like to thank personally Simon Sherwood, Paul White, Filip Boyen, Joanna Boyen, Laurent Carrasset and Yasmine Martin.

The expedition is also extremely grateful to the following sponsors, without whom it would not have been possible:

Inkaterra and the Machu Picchu Pueblo Hotel  
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 Virgin Wines  
 Cotswold Outdoor  
 ActivInsura  
 7E Communications  
 Infoterra

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Perurail and Orient Express contributed greatly to the success of the expedition with their gift of facilities, and the expedition would like to thank personally Simon Sherwood, Paul White, Filip Boyen, Joanna Boyen and Yasmine Martin.

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Andre and Lynette Singer, Michael Boland, Eddie Kruppa and Cafe Productions.

## **B THERMAL INFRA-RED SURVEY OF INCA SITES IN THE VILCABAMBA by J. McKim Malville**

The human eye is adapted perfectly to the light of the sun. The wavelength range of the human eye is between from the deep blue of .39 microns to a blood red .65 microns. Our eye matches the majority of the light of the sun that is reflected from objects and people. Folks living on planets orbiting hotter or colder stars would undoubtedly have different eye sensitivities.

The sun illuminates us with its light, but people and warm objects also produce their own form of light in the long wavelength infra red portion of the spectrum. The sun radiates most of its light at a wavelength of around .5 microns. On the other hand, a warm rock with a temperature of 700 F produces most of its light at

about 10 microns, far beyond the ability of our eye to detect. This region is known as the thermal infrared.

The detectors of an ordinary digital camera can detect light out to 1.2 microns, which is known as the near infrared. Photographs in the near infrared produce interesting effects due to different reflectivity of objects, but in they are still not catching the thermal glow of warm objects.

There are creatures that hunt at night who have powerful infrared detectors. The snakes known as pit vipers, such as the sidewinder rattlesnake, copper head, and cottonmouth, are so named because of a small pit between its nostril and eye. The pit is lined with a thin membrane filled with blood vessels and nerve endings that can detect radiation produced by glowing mouse, rabbit, or unwary hiker at night. It can sense temperature changes as small as .002o C and locate a fast mouse at a distance of a meter.

Various objects of a jungle heat up to different temperatures during the day due to absorption of solar energy. Rocks will be hotter than vegetation, gravel, or soil and hence will be brighter in the thermal infrared than the leaves and grasses that may partially hide them from view. The optimum time of day for distinguishing rock structures from their surroundings is between noon and 2 pm when these objects have absorbed the maximum amount of solar energy. The worst time to use such a thermal detector to detect ruins in the jungle is at dawn when there are only small thermal differences between different features. The best time to fly over the Vilcabamba is soon after dawn when the atmosphere is steady and there are few clouds, but the infra-red imaging needs to be made during the early afternoon when clouds gather.

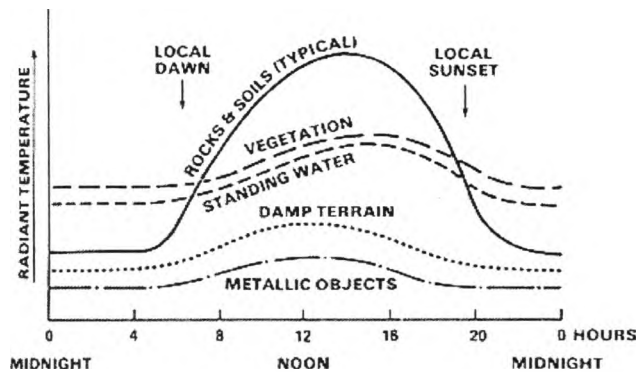
### **Thermal Infra-red Surveys in the Vilcabamba**

On May 2 and May 3 2003, the expedition flew over two regions of the Vilcabamba to test thermal infra-red technology for the purpose of mapping and locating Inca ruins. We employed a Raytheon Palm IR-250 camera, which has a spectral range of 7.5 to 13 microns. This camera filters out the reflect radiation of the sun, and only detects radiation in the far infra-red where warm stonewalls should be hotter than their surroundings.

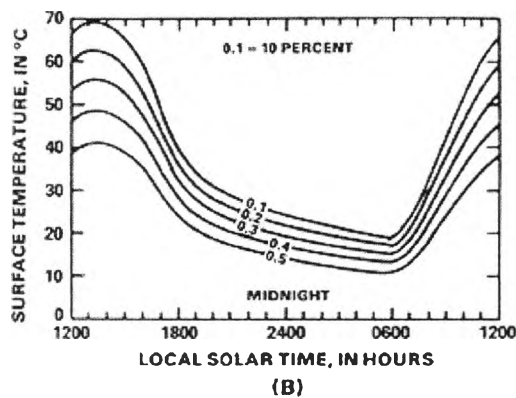
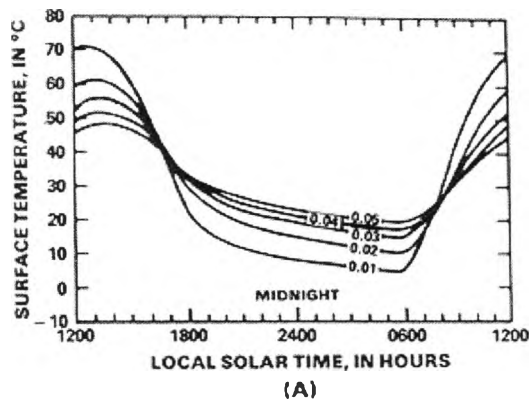
To our knowledge, this is the first time such a device has been used to locate prehistoric ruins in a cloud forest. Payson Sheets, professor of archaeology at the University of Colorado has used thermal infrared detectors in Central America to detect pre-historic pathways. Depressed trails in which one side is in shadow and the other in sun provide excellent infrared signatures. Dr. Tom Sever, an archaeologist associated with NASA, has used thermal infrared detectors to locate prehistoric roads in the American Southwest. These Chacoan roads are

detectable in the thermal infrared because they follow straight lines and often have shadowed berms and associated vegetation that grows in depressions.

The most significant parameters for remote sensing in the thermal infrared are the following: Diurnal heating by solar radiation, which is minimum at dawn and maximum between noon and 2 pm. High altitudes and low latitude such as in the Vilcabamba enhance the effects of solar heating.



Differentiated terrain: Variations in thermal inertia and reflectivity provide thermal patterns in the landscape. In (A) the temperature variation due to differences of thermal inertia are shown. Note the cross-over points at dusk and dawn when there is minimum contrast. Materials with high thermal inertia experience smaller changes in radiant temperatures during the diurnal cycle of heating and cooling. Soil has a small thermal inertia while steel has a large inertia. Specific values of thermal inertia (in standard units of  $\text{cal cm}^{-2}\text{sec}^{1/2} \text{ }^{\circ}\text{C}$ ) are water, .036; shale, .04; limestone, .045; sandstone, .075. Figure (B) shows the effect of different reflectances. The maximum and minimum daily temperatures and their differences increase with decreasing reflectance.



Linear features in the landscape such as walls or rectangular buildings. Variations in heating to topographic or architectural shadowing. Thermal emission from the top of a linear wall in sunlight would be most visible if it is parallel with the cooler portions of the unheated side.

Flying at a height of 1000 feet the infrared camera could resolve objects on the ground that are 6 inches across and could detect a temperature difference of 0.1 degrees.

On the first day we over flew the area of Choquequirao and obtained good images of several of its buildings. On the second day, when we flew over Machu Picchu and Llactapata we encountered clouds over the targets.

A preliminary analysis of the findings was used for the investigations by land at Llactapata. The material is being analyzed further.

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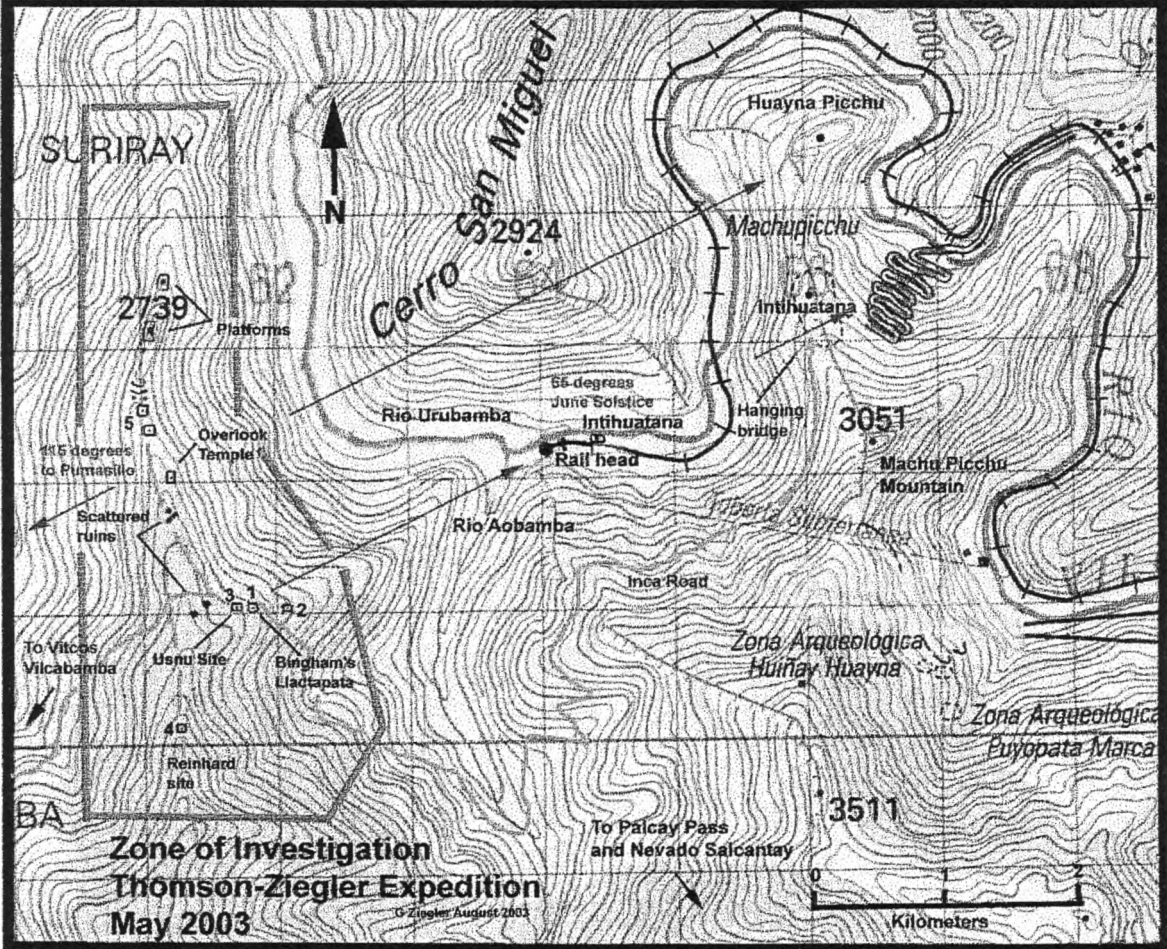
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# Llactapata Maps and Sector Plans





Sector IV

Inca roads

Sector III

Sector V

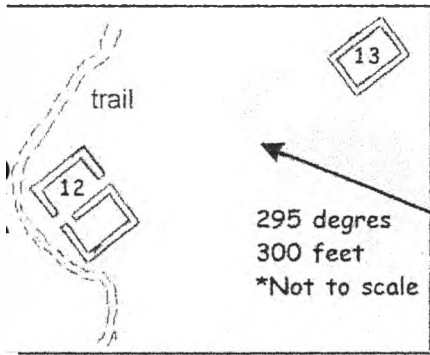
Sector I

Sector II

Llaqtapata Archaeological  
Sanctuary

Thomson-Ziegler  
Expedition 2003

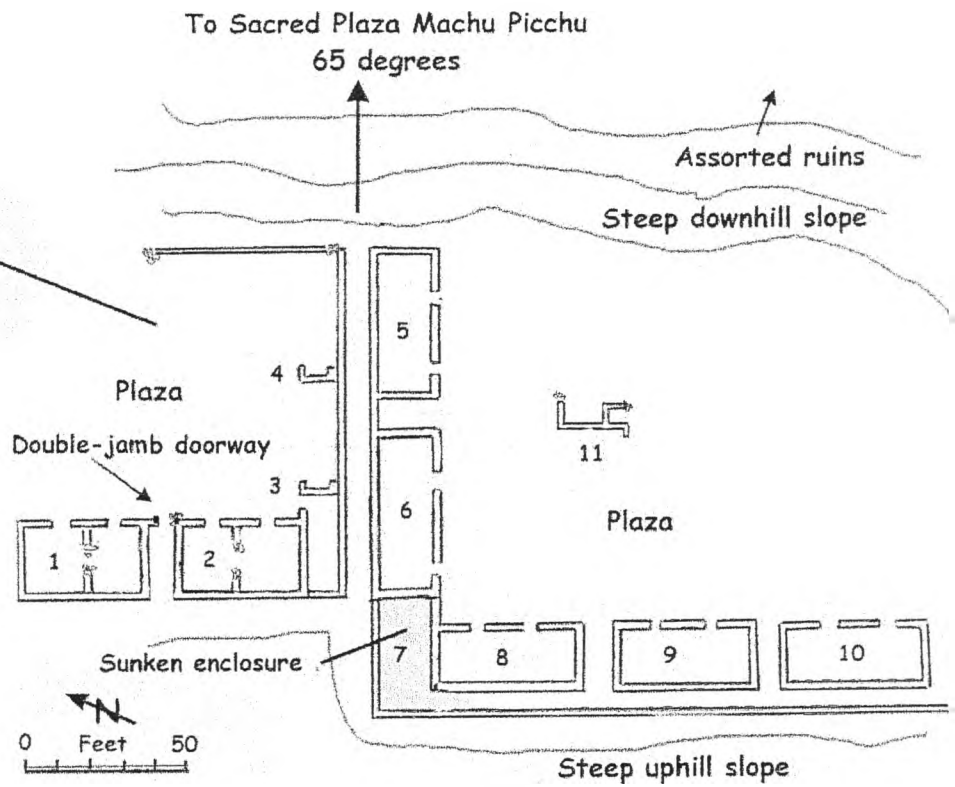
G. Ziegler



**Sector I**  
**Bingham's Llactapata**  
 Thomson-Ziegler Expedition  
 May 2003

Field survey by Amy Finger and Kim Malville  
 All niches and windows not indicated

G. Ziegler October 2003

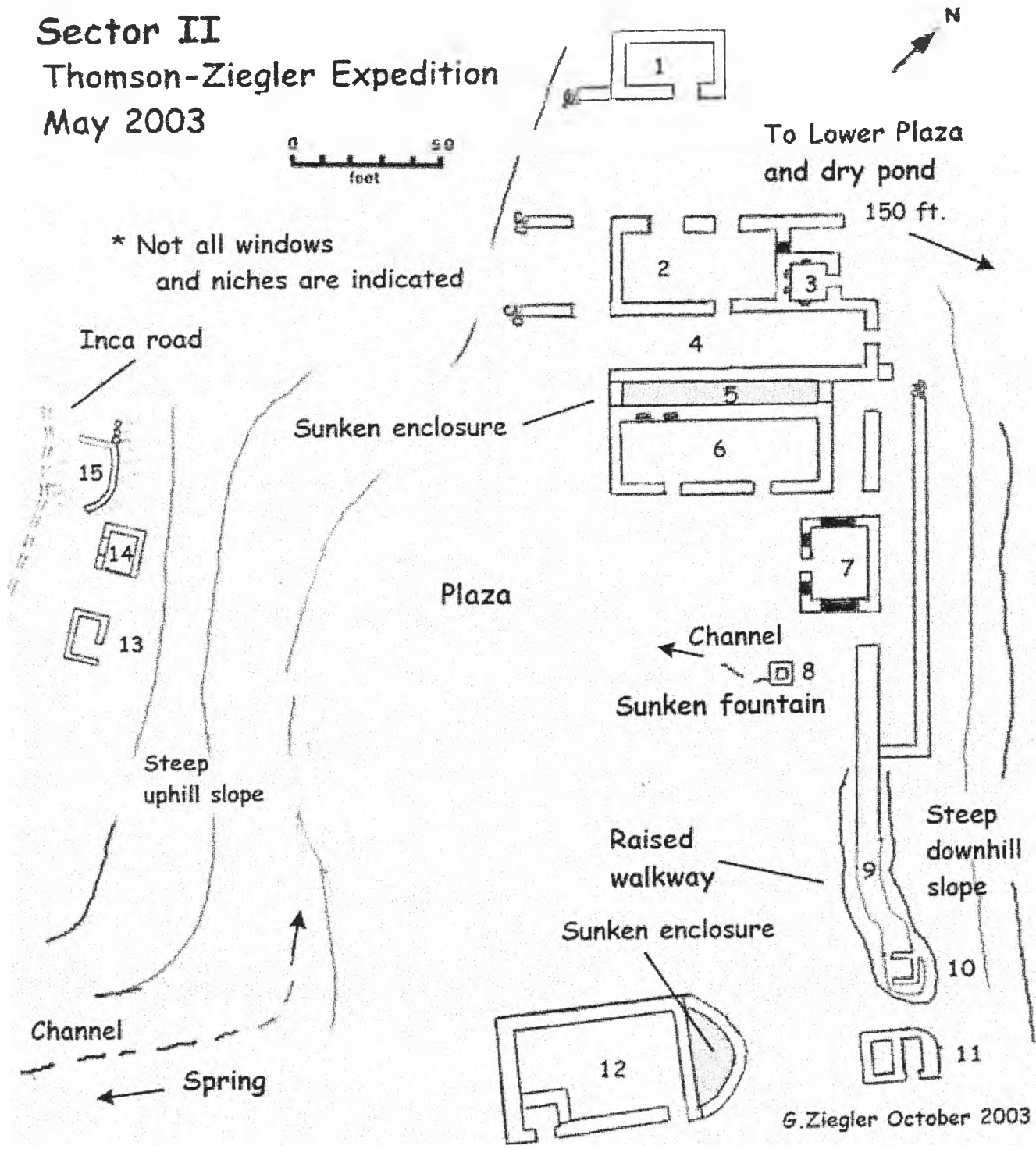


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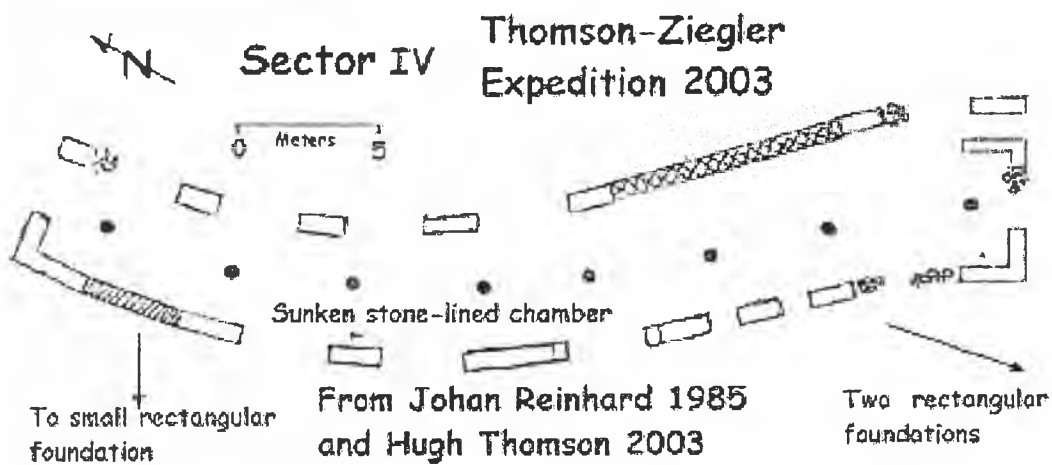
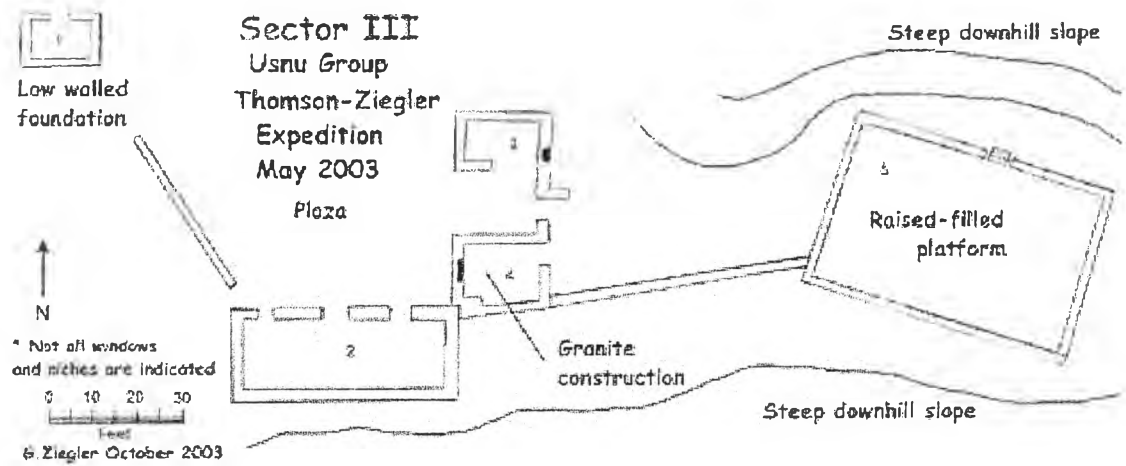
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May 2003

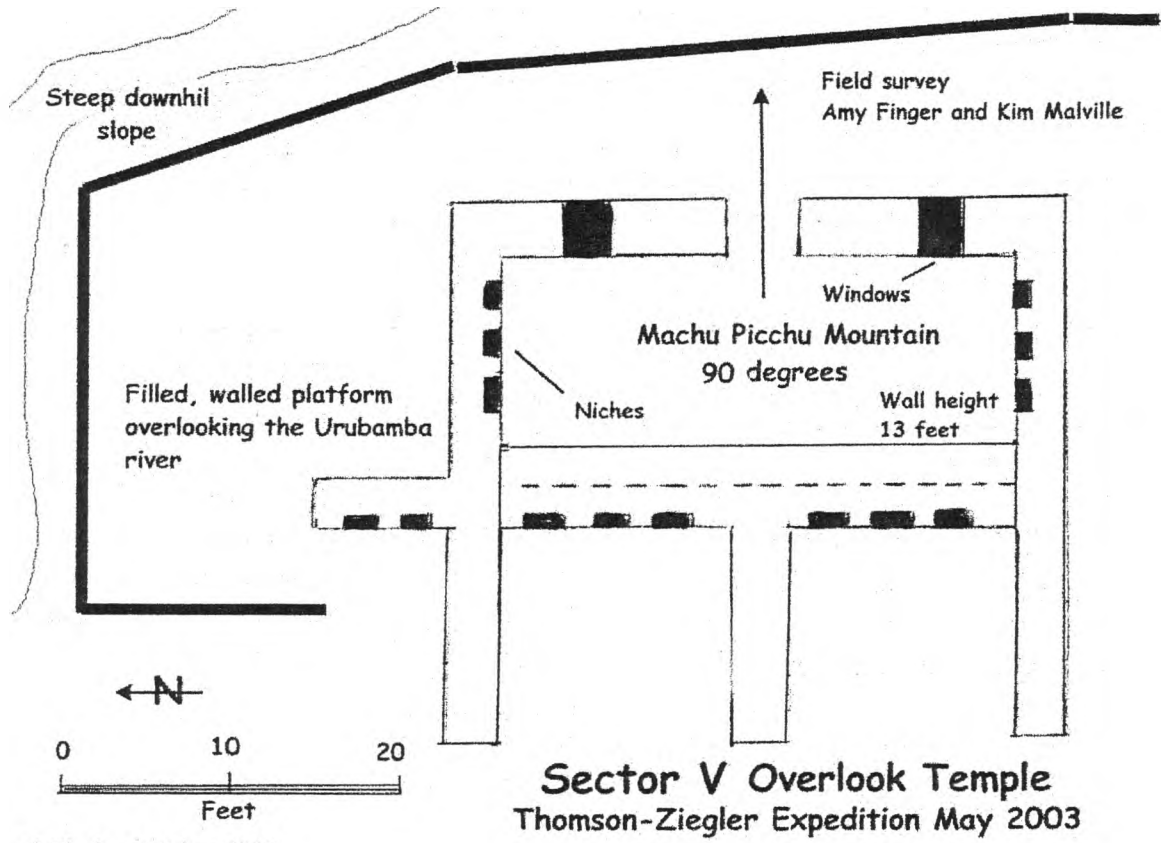


\* Not all windows  
and niches are indicated



G. Ziegler October 2003



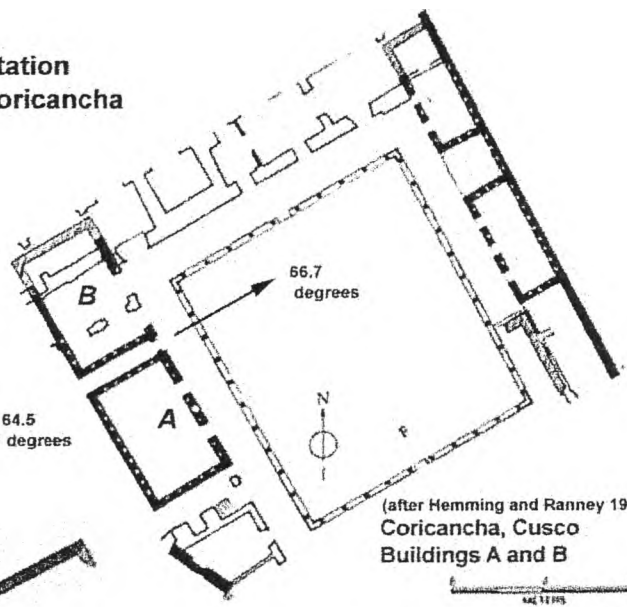
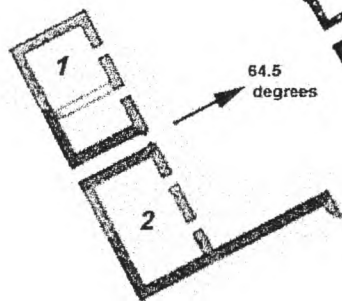


G. Ziegler October 2003

**Sector V Overlook Temple**  
Thomson-Ziegler Expedition May 2003

**Comparison  
of Structures and Orientation  
At Ilactapata and the Coricancha  
in Cusco**

Llactapata  
Buildings 1 and 2  
Bingham 1912



(after Hemming and Ranney 1982)  
Coricancha, Cusco  
Buildings A and B

Ziegler, Malville, Thomson 2003

Llactapata Site Plans  
Bingham 1912  
Drew/Thomson 1982  
Ziegler/Thomson 2002

