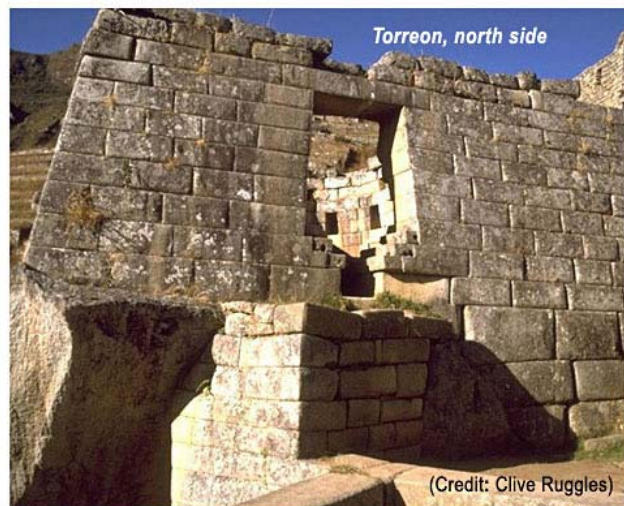
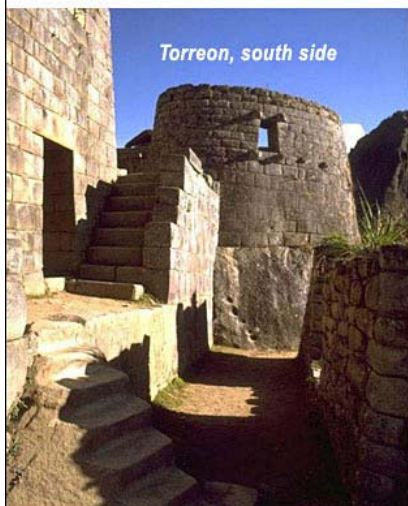
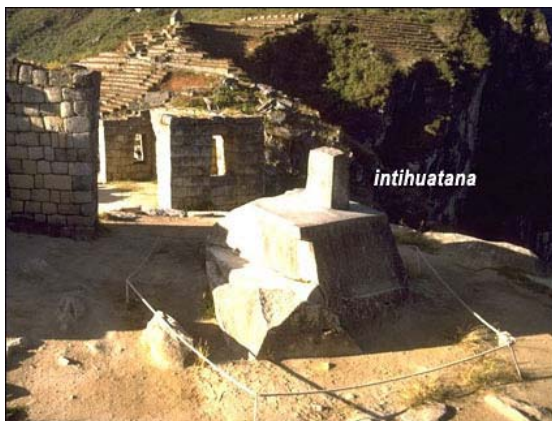


## Archaeoastronomy in Machu Picchu

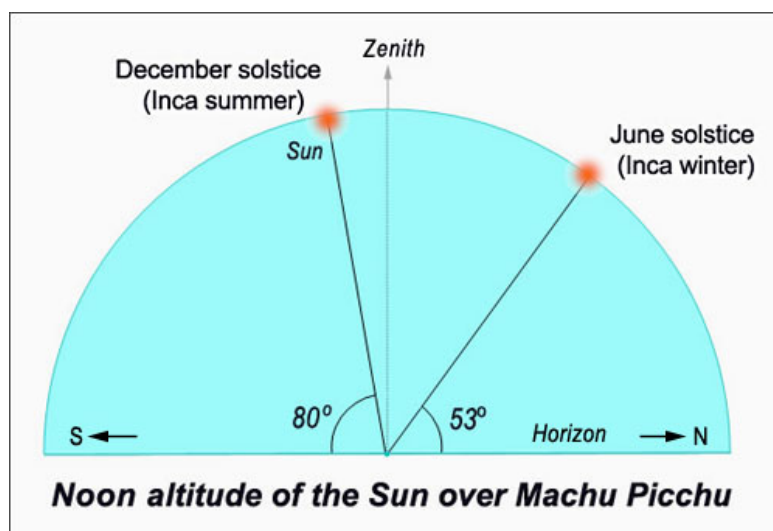


This website gives 28 slides about Machu Picchu 馬丘比丘, a lost city of the Incas discovered in 1911: [http://www.le.ac.uk/cgi-bin/tab\\_int/server/docs/ar/image\\_collection/images.tab?operation=psearch&max=200&s1=Machu+Picchu](http://www.le.ac.uk/cgi-bin/tab_int/server/docs/ar/image_collection/images.tab?operation=psearch&max=200&s1=Machu+Picchu).

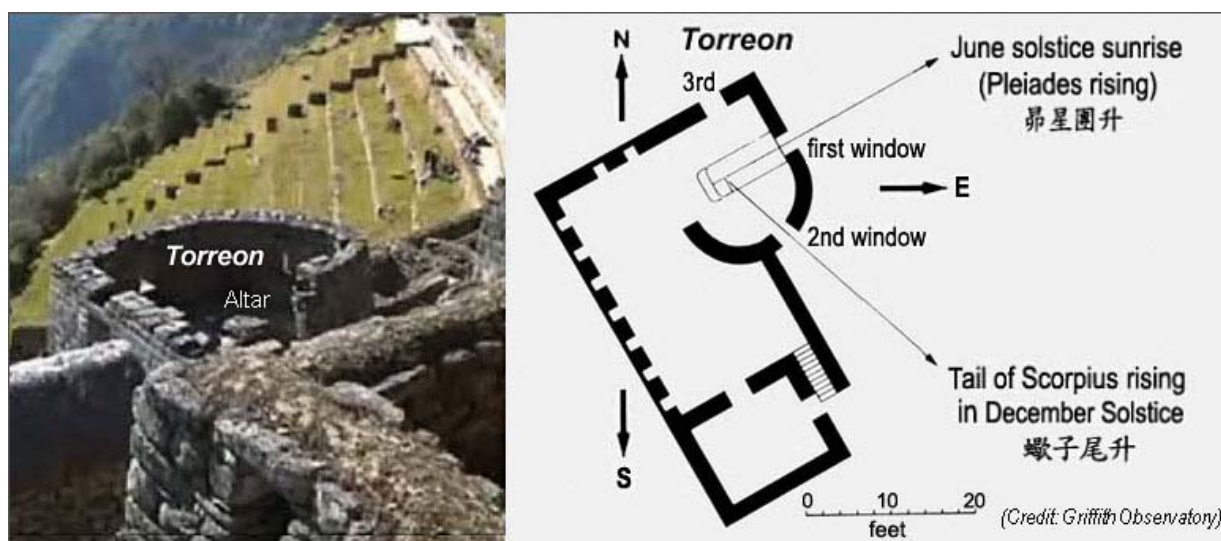
The slide owner is Clive Ruggles in the University of Leicester, also the vice president of IAU History of Astronomy Committee. From his slides, we can see an outstanding stone pillar that the Incas called *intihuatana* or the “hitching post of the Sun” (拴住太陽的石柱). We also see a semicircular structure known as *Torreón* or the “Temple of the Sun” (太陽廟) built on a natural mass of rock. Both of them are speculated to carry some sort of astronomical importance.

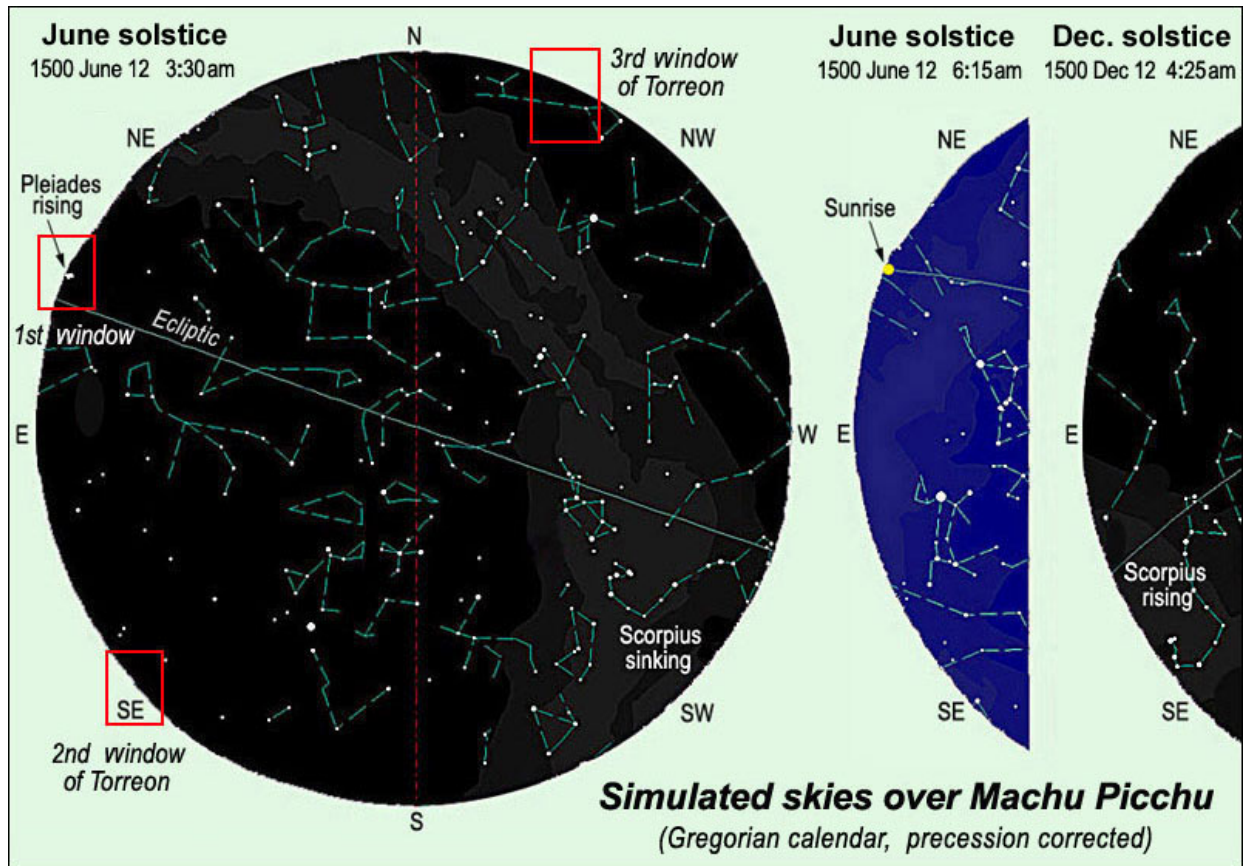


Why intiuhuatana in the first place? Well, the Incas worshipped the Sun but were displeased to see it getting lower and lower in the sky, and showing itself less and less time each day. The intiuhuatana probably represents a ceremony to hitch (tie) the Sun in June solstice (Inca winter) so that it would return to its high place in the sky. Factually the Sun did, for its noon altitude have reached minimum in June solstice and it shall return high in mid-days afterwards. The intiuhuatana corners were oriented to N-S-E-W. This suggests that the pillar could have other aims apart from hitching the Sun.

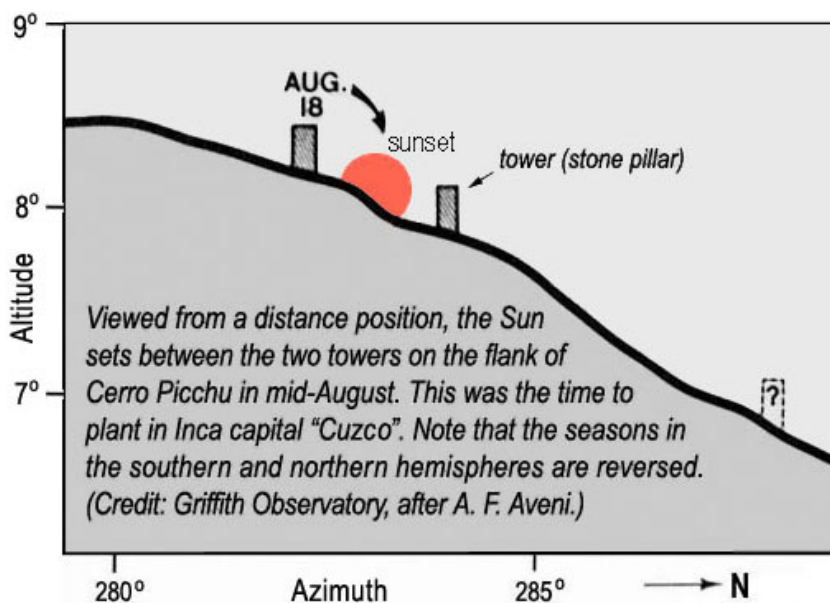


Next the Torreón. It appears to be a primitive observatory more than the altar in the temple central. It has 3 windows as shown below. The first window faces northeast-east. According to Krupp’s book “Echoes of the Ancient Skies”, this window sees the rising of Pleiades and later the Sun in the early morning of June solstice (Inca winter). The second window is about 70° south of the first. Interestingly it sees the rising of the tail of Scorpius in the early morning of December solstice (Inca summer). Both Pleiades and the tail of Scorpius had been natively known as Collca or “storehouse”; they could be a token to remind Incas for certain work in the “storehouse” or other deeds not yet explored by archeologists. The third window, in which the opening is larger than the other two, faces roughly north where no celestial event was identified. It has an additional notch towards the bottom; so far this window remains mysterious.





Krupp also mentioned that Machu Picchu is not the only city with intihuatana. Other Incan cities are known to have had intihuatanas, but they were destroyed in wars during the 16<sup>th</sup> century. Stone pillars bigger than intihuatana were found on Cerro Picchu next to the Inca capital Cuzco. Cerro means “mountain”. Those pillars on Cerro Picchu do serve real practical purposes. For example in the following illustration, the Incas used the setting Sun between two pillars as a time reminder to begin crop planting.



## Video Links

- Virtual Tour to Machu Picchu. Need Java Viewer Plug-in. [http://www.mp360.com/index\\_eng.php](http://www.mp360.com/index_eng.php)
- Sunrise over Machu Picchu. <http://www.youtube.com/watch?v=TBuX9egOyjM&mode=related&search>
- The legendary lost city of Machu Picchu. <http://www.youtube.com/watch?v=zLK3dA74SAI&mode=related&search>  
(Pause to see *intihuatana* at time 01:10 and the *Temple of the Sun* at 02:19.)
- El Condor Pasa 老鷹之歌 (秘魯民歌) <http://www.youtube.com/watch?v=hchTdQVAig8&feature=related>

*I recalled that during the 1970's, Simon & Garfunkel sang the pop of El Condor Pasa. This is a folk melody originally arranged by the Peruvian composer Daniel Alomias Robles around 1913. Its English version can be heard in <http://www.youtube.com/watch?v=VeqlBuHiGd0&feature=fvw>.*

Noted by Alan Chu, 2007 July, revised 2010 Nov.