A great time gap exists in archaeological sites of Northernmost Thailand. No sites have been found within the time from 3500 years ago (late Neolithic), until 750 years ago (Lan Na Kingdom). Neolithic artifacts are found in the Golden Triangle area, and monuments and artifacts of the Lan Na Kingdom are plentiful. The time gap contains the Bronze and early Iron Ages of Southeast Asia, and the Dvaravati Culture (600-1000 AD). Bronze-age sites and burials dating back to 4000 years ago, as well as sites of the Dvaravati Culture occur in the Mun River valley of northeast Thailand (i.e. Ban Chiang) and in the central plain (i.e. U-Thong and Chansen). Burials containing bronze and iron pieces were excavated from Ban Wang Hai, near Lamphun. Only one radiocarbon analysis was obtained at the excavation, giving and age of 429-657 AD, but archaeologists inferred the oldest burials were perhaps 500 BC. According to the chronicles, the Mon Kingdom of the Dvaravati was established at Lampun in 661 AD. In the region north of Lampun, no cultural sites have been found with datable material within this time gap. Many Chronicles written since the 14th Century AD have legends of civilization in Chiang Saen going back to 78 AD: the Sinhanavati Chronicle being the richest in colorful stories of historical interest. Of particular interest to modern Thais are these early people who may have been early Tai-Lao people from southern Yunaan who migrated into this area since 2000 years ago.

As a geologist I became interested in the legendary great earthquake that destroyed Wiang Yonok Nakkon in 454 AD or 460 or 554, discussed in the paper published by the late Hans Penth in 2006. I was working on the active Mae Chan fault that bounds the south side of the Wiang Nong Lom swamp. This is the swamp into which legends say the city sank, disappeared, and everyone perished except one old widow. Together with colleagues from CMU, Rajabhat-Chiang Rai, and National University of Singapore we have looked for evidence of the lost city – but we have not found it. When archaeological remains cannot be found geologists can look for other evidence of human activity within the time gap in the sediment record of riverbanks and swamps. In searching river banks of the Mekong we have found bronze artifacts and Neolithic pieces lying loose on the shoreline gravels, but nothing in stratigraphic context. One charcoal and bone occurrence, 5-m deep in the riverbank silt gave a radiocarbon age of 1475 AD, and was at the bottom of a filled-in moat of Lan Na time. A new type of luminescence dating (OSL) established that the 10-meter floodplain silt at Chiang Saen Noi into which the moat was dug began building up over river-bed gravel 4000 years ago.

Dan Penny (University of Sydney) and Lisa Kealhofer (Santa Clara University) obtained a 5½-meter core into sediments of Phayao Lake. A huge increase in charcoal particles in the lake sediment occurs just above their radiocarbon date of 200 AD, and then another increase just above a date of 1230 AD. If one can infer that the charcoal was from clearing the forest for agriculture, then this is evidence of an increased agrarian population in the area as implied by the chronicles. We will eventually do a similar study
with more precise radiocarbon dates at Wiang Nong Lom. An exploratory 3-m auger hole at the west end of the swamp in 2006 gave a radiocarbon date of 3615 BC and indicates the charcoal record is there, and perhaps we will also find features from earthquake shaking in the sediments.

I will briefly speak of other sites we have found of Lan Na time near Chiang Saen and across the river in Laos. Just now I am documenting the enigmatic 5-m deep trench earthworks on hillsides, enclosing areas of 0.4 km² that were never moats nor did they encircle ancient villages. Perhaps they were unused defensive earthworks of ambitious Lan Na or Burmese generals, or perhaps they were corrals for their elephants.

References


Slides for lecture: Searching for pre-Lan Na age cities, Golden Triangle
Northern Thai Study Group, Chiang Mai, Feb.28, 2010 – Spencer Wood

1: Spen, Layle, Kapgaow, Surin at the large Buddha, SKK, Laos
2: Recent earthquakes, active faults, location of legendary city of Yonok Nakorn.
3-6: sequence of slides of murals on the Wat Pa Nok temple on the north shore of Wiang Nong Lom, “Widow’s Island”, and quotes relating to the legendary AD 490 earthquake that destroyed and submerged Yonok Nakorn from Notton’s French translation of the Sinhanvati Chronicle.
8-9: Artifacts found along shore—particularly a bronze adz, bronze age materials not previously reported for this area.
10. Example of a palm leaf manuscript, like the Sinhanavati Chronicle that Notton translated. Louis Gabaud (l’Ecole francaise d’Extrem-Orient, Chiang Mai) told me after the meeting that the original manuscripts had been destroyed in a fire, before Japanese occupation.
11: Sketch of Chiang Saen from the 1867, French Garnier expedition up the Mekong.
12: SE Asia Map showing various cultures and kingdoms before AD 1300.
13: Chronological diagram of pre AD 1300 cultures and kingdoms of SE Asia.
14 repeat of 12
15. Geography of the Wiang Nong Lom (WNL) Swamp, and place names: from 1:50k topo map.
16: Ideas on location of Yonok Nakorn (legendary city destroyed in AD 490 earthquake) from Hans Penth’s work shortly before he became ill with brain tumor, and died 2009.
17: Major water courses that could have communicated with “Yonok Nakorn”, 1:50k topo map.
18: Mapping of morphology of the WNL swamp and connection to the Kok and Mekong Rivers
19: NUS Singapore students, 2011, at discovered temple site, north side of WNL.
20: Village guys at site another site on north side of WNL ~2003.
21: inscribed brick from site of 20 above.
22: Ziegler and village guys on way to core the swamp at the warm springs site WNL. ~ March, 2003.
23: coring site, standing on floating grass mat.
24: Coring with auger.
25: Radiocarbon dates on auger samples.
26: Map showing location of lake at Phayao, and distance to Chiang Saen.
27: Phayao lake core work by Penny and Kealhoffer(2005). Particularly fascinating is surge in charcoal abundance, ~AD 370. Their core, unfortunately, is not well constrained by the five C-14 ages.
28. Augering into lake on north shore, 2011 by NUS folks, under difficult conditions, many blood-sucking water leeches! attacking us.
29. Processed sample of auger sample sediment from 1 meter, sample washed into sieves, and this is the 1/16- to 1/8 mm, fine sand, bleached with Clorox, and in a glycerin suspension, under microscope-true color. charcoal is black, organic particles brown, and mineral particles clear and white.
30. Charcoal counts, field notes – with depth. We only got a few auger samples because of difficult conditions described in #28.
31. repeat of 18, to show coring site at warm springs, and the earthworks location of slide 32.
32. Current project on enigmatic ancient earthworks in the area, this one south of the swamp.
33. Photo showing steep bank of ancient earthwork. Serene Ng at top of bank, Cheekian, Rebecca, and Felicia (NUS-2011) at bottom of entrenchment.
34. Location of temple ruins at Souvannakhomkham, Laos, located in 2010.
35. The rectangular earthworks at Souvannakhomkham, Laos. 2010 picture, cleared by burning to plant corn. Alan, GapKaow and I surveyed the trench 2012. The entire area has been taken over by Chinese agrocompanies and planted in bananas.
37. The 7-m Buddha at Souvannakhomkham.
40. Cover page on Notton’s (1926) translations of the chronicles
41. Inconclusive conclusions.
42. Sunset on the Mekong, Souvannakhomkham, Laos.
“Searching for pre- La Na cities in the Golden Triangle”
Northern Thailand Study Group, Feb. 28, 2012
By Spencer Wood
Department of Geosciences
Boise State University
Idaho, USA
Active faults and recent earthquakes in the Golden Triangle region
1003 of the Buddhist era (460 AD), the 7th of the waning moon of the seventh month (April), people having gone in great number on the *Kukanadi*, saw a white eel as wide as the trunk of a palm tree and seven fathoms long.
They all began hitting it until it was no longer moving, at which point they dragged it to be offered to the king, who ordered that the eel be cut up and distributed in pieces throughout the city.
As soon as the meal was finished everywhere in the city and as the sun was at the lowest part of its course, a sound resembling that of an earthquake was heard, as if the city of *Yonaka Nagara Luang* was going to collapse, followed by a moment of calm.
The same phenomenon took place a third time before daybreak, with more intensity.

The Vieng Yonaka Nagara Luang collapsed and was transformed into a large lake. The city-dwellers and the king all drowned miserably. Only the house of an old widow remained.
Artifacts found in beach gravels along the Mekong

- Notched flat cobble net sinkers
- Polished shoulderred axe
- Unglazed shard
- Bronze adz

Scale 10 cm
Chiang Saen, deserted since AD 1802, wild and in ruins as seen by the Francis Garnier Expedition up the Mekong in June, 1867. In 1913 the city lay in ruins covered by Jungle (Le May, 1926)
Various pre-La Na cultures and sites of southeast Asia -- showing how distant are known archaeological sites from the Golden Triangle.
Early Kingdoms that may have influenced the migration of Tai-speaking people from Yunnan into northern Thailand.
Various pre-La Na cultures and sites of southeast Asia -- showing how distant are known archaeological sites from the Golden Triangle.
Location of Yonok Nakhon, according to the Sinhanavati Chronicle (Notton, 1926; Penth, 2006)
Air-photo mapping of the Wiang Nong Lom Swamp – looking for a 2000-yr sedimentary record
Auger Holes at Wiang Nong Lom Swamp and Radiocarbon Dates

Auger Hole #2
- Very soft clay, dark brown with abundant charcoal
- Soft clay, dark brown with charcoal
- Soft clay, gray (2.5Y 4/1 to 5/1)
- Pin-point red speckles
- Pin-point charcoal specks

Auger Hole #3
- Very soft fibrous peat, dark brown
- If you break through the grass mat, you sink through soft clay to about 0.5 m depth
- Firm fibrous peat, dark brown
- Stiff clay, gray-brown (2.5Y 5/1)
- Stiff clay, gray-brown (2.5Y 4/1 to 5/1)

Auger Hole #1
- Water level
  - Floating grass mat on 0.5 m of water.
  - Loose fibers and clay, dark brown
- Soft clay, very dark gray (10YR 3/1), 3 to 5 % fibers, 2 mm long
- Very dark gray band, 2 to 3 mm thick with a 1-cm lamp of charcoal
- Stiff clay, dark gray (10YR 4/1), and mottled darker gray, dark 0.5 mm specks, 1 % reddish brown (5YR 4/8)
- Irregular spots and streaks to 1 cm, about 1 %
- Stiff clay dark gray, very finely or mottled appearing streaks (2.5Y 5/3), 2 % red (5YR 4/8) streaks and patches 1 to 3 mm.
- Stiff clay dark gray as above. All of it is streaked and spotted red (5YR 4/8) and 5 mm by 10 mm. Red clay constitute about 20 %.

Warm Springs

~AD 450?

5600 years

BC 3615

AD 1786 + 94

160 BP

9830 BP

BC 9265
Sediment core from Lake Phayao, radiocarbon age and charcoal particle count

number of charcoal particles/cm$^3$ of sediment (x 10,000)

increase in charcoal in La Na time ~ AD 1270

large increase in charcoal ~ AD 370

June 13, 2011

Wiany Agb Nog Lom - auger hole 1
1 m deep

Number of charcoal particles per cm^3

<table>
<thead>
<tr>
<th>Depth (meters)</th>
<th>0.0</th>
<th>0.5</th>
<th>1.0m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>50</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>50</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph shows charcoal particle distribution with peaks at 0.5 and 1.0 meters.
Peculiar double-trench earthworks that do not encircle villages, nor will they
Hold water? Defense works? or elephant corrals? Age unknown.
(Thai side) stone masonry revetment

(Laos side) rock groins 90-m spacing

temple ruins
brick wall and moat
earthen wall and moat

from Wood et al. 2008, Geomorphology, 101,
Laos riverbank showing 3 flood layers over the ~14th-Century cultural layer

flood layer III
flood layer II
flood layer I

pottery shards and bricks ~ 1400 AD
“Evidence from palm-leaf manuscripts has not been utilized as much as it could. Research opportunities thus remain wide open”
-Sarassawadee Ongsakul (CMU History), 2001
- in the History of Lan Na.

To begin with, a translation of Camille Notton’s works into English would be enormously useful to me and others.

Many other chronicles exist, but they must be compared and evaluated with the academic rigor set forth by Dr. Hans Penth, Profs. David Wyatt, and Arunrut Wichienkeeo.
Conclusion, but many questions remain

We did not find *Yonok Nagara Luang*,

-- Need better geological research on earthquake history of the Mae Chan fault – and the possibility of the big quake ~ AD 490.

-- No clear archaeological evidence for the population of the “Golden Triangle” area by Tai-speaking people, before La Na time (~AD 1260).

– Perhaps people arrived in several waves from BC 100-AD 1100.
-- Perhaps these people did not built brick or stone structures – Wooden structures which would not have survived.
-- Perhaps they cremated their dead and left no burial sites.

– However, they must have used pottery, bronze, and probably iron, but pottery shards in the area have not been studied.

-- Evidence for the kingdom and an agrarian population may lie in the swamp- sediment- charcoal record of Wiang Nong Lom.