

Original Article

Identifying a possible founding date of Chiang Mai by simulating the star positions from Chiang Mai's natal chart using astronomical software

Jaturong Sukonthachat^{1*}, Kasama Somruedee^{1,2}, Pitchaya Pannon^{1,3},
and Gunthamane Ruengratsuntorn^{1,4}

¹ Department of Physics, Faculty of Science,
Srinakharinwirot University, Wattana, Bangkok, 10110 Thailand

² Watdonyor School, Mueang, Nakhon Nayok, 26000 Thailand

³ Watsungwej School, Phra Nakhon, Bangkok, 10200 Thailand

⁴ Sathasamut School, Mueang, Samut Songkhram, 75000 Thailand

Received: 20 April 2022; Revised: 7 February 2023; Accepted: 25 April 2023

Abstract

Chiang Mai's natal chart represented the founding date using an ancient astrological method. It showed the positions of Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, Ascendant, and Rahu within the boundaries of the 12 zodiacal constellations. This study aimed to determine a possible Chiang Mai's founding date by simulating the positions of those stars using the astronomical planetarium software "Stellarium". We first identified the ecliptic longitude of the boundaries of the 12 zodiacal constellations according to the J2000 Astronomical Standard. Then we created a database of the times at which Jupiter and Saturn were in each zodiac throughout the history of Chiang Mai, between the years 1043-2043 B.E. (500-1500 A.D.). From the aforementioned analysis, there were ten possible establishing timelines for Chiang Mai. After adjusting Stellarium software during those timelines, the possible founding date of Chiang Mai was on Thursday 12th of April 1839 B.E., at 3:26 to 5:53 AM according to the Gregorian calendar. The result matches the official Chiang Mai's founding date, with a difference of 7 days. Therefore, this method could help historians estimate the date and time represented in a natal chart for discovering the corresponding historical age.

Keywords: inscriptions, natal chart, Chiang Mai, zodiac, Stellarium

1. Introduction

Chiang Mai's natal chart has been discovered at the top of the 76th main stone inscription from Chiang Man temple (Boonkrong, 1974). The double-sided stone inscription contains 70 lines of text with 34 and 36 lines on the first and the second sides, respectively. The top part of the inscription

records the natal chart of Chiang Mai, while the lower part shows a message written in the Fakkham scripts (Yuttaporn, 2005), an ancient font used in northern and northeastern Thailand, called "Lanna" (Figure 1). The inscription stone contains the detail of Chiang Mai's establishment as follows: "In the year 658 Lanna called Rawaison, the month called Visakha, 8th day of the waxing moon, Thursday, with the name Thai Meng Pao, early morning before sunrise, the ascendant is in Nawank angle of Jupiter, in Pisces. Three kings named Mangrai, Ngam Mueang, and Ruang has begun construction of a tower for sleeping in the palace by forming

*Corresponding author

Email address: sukonthachat@g.swu.ac.th



Figure 1. The natal chart of Chiang Mai, which was found on the 76th inscription at Chiang Man temple (Thai Thonburi-Rattanakosin inscriptions, 2019).

four walls and the construction of the pagoda next to the head of the bed at Ban Chiang Man. Simultaneously, that place was built as a temple dedicated to the three kings called Chiang Man temple ever since” (Thai Thonburi-Rattanakosin inscriptions, 2019).

For Chiang Mai’s natal chart, the characters of Thai characters have been discovered revealing the astrological connotations of the stars as follows: Sun and fixed Mercury - Aries, fixed moon - Cancer, fixed Mars - Aquarius, fixed Jupiter - Sagittarius, Venus and fixed Ascendant - Pisces, and Saturn and fixed Rahu - Taurus. Those star positions were calculated by using the Suriyayatra scripture, which was significant both for calendrical computation and for astrological application in Lanna (na Nagara, 1998) as shown in Figure 1. In addition, astrological information related to the date and time of Chiang Mai establishment was discovered as follows: sakkarat 658, horakhun 2040356, Thai lunation 8139, kammacubala 12221, avoman 434, uccabala 567, tithi 7, roek 7, nadi 13, and nadirks 47 (Tongkamwan, 2019).

In 1994, Chiang Mai officially appointed the inspect astrologer of Chiang Mai to conclude the founding date of Chiang Mai. The most reliable evidence was based on information from the natal chart and the text found on the 76th stone inscription, Chiang Man temple. Officially, the Chiang Mai’s founding date is Thursday 12 April 1839 B.E. on the Julian calendar (Committee for examination and retrieval of Chiang Mai auspicious time and legends, 1994).

In 1996, The first computer analysis of Chiang Mai’s natal chart used the Southeast Asian astrology system, according to the Suriyayatra scripture, to confirm that the Chiang Mai’s founding date was possibly partly on Wednesday 11 April 1839 B.E. that falls on a Thursday 12 April 1839 B.E. on the Julian calendar (Eade, 1996).

In addition, on 22 May 2015, Urban Development Institute Foundation and Social Research Institute, Chiang Mai University held a forum to express their opinions on the founding date of Chiang Mai and concluded by expanding the results from the official conclusion in 3 ways (Social Research Institute of Chiang Mai University, 2016):

1. Adopted 12 April 1839 B.E. as Chiang Mai’s founding date on the Julian calendar, which has been the most widely used calendar system,

2. Adopted 19 April 1839 B.E. as Chiang Mai’s founding date on the Gregorian calendar, which is a current popular calendar system used, and

3. Adopted the 8th day of the waxing moon, Visakha month as Chiang Mai’s founding date according to the lunar calendar. However, Chiang Mai still designated

Thursday 12 April 1839 B.E. as the founding day of Chiang Mai while organizing a merit-making ceremony annually.

The outcome of Chiang Mai’s founding date still needs discussion. Therefore, this study aimed to determine the founding date of Chiang Mai using the position of the stars and ascendant found in Chiang Mai’s natal chart.

2. Methods

The symbols of Thai character appearing in Chiang Mai’s natal chart were designed by the position of sun, moon, planets, and ascendant appear in the zodiac according to an ancient astrology scripture called “Suriyayatra” (Wisandarunkorn, Luang, 1948). The Thai numeral characters’ representations were the following: ☉ - sun, ☾ - moon, ♀ - Mars, ☿ - Mercury, ♃ - Jupiter, ♀ - Venus, ♄ - Saturn, and ♅ - Rahu, which is the intersection of the Moon’s trajectory plane with the Ecliptic (Eade, 1989). However, the Thai character a was Lagna, which means ascendant, which is the intersection of the Ecliptic and eastern horizon. This intersection alters one complete cycle in 24 hours due to the Earth’s rotation. All positions of the symbols were used to indicate the natal chart of Chiang Mai because the information displayed was the position of the stars at the founding date and time at the observer’s position in Chiang Mai (18° 47’ 43” N, 98° 59’ 55” E). This study was to compare the positions of the sun, moon, planets, and ascendant within the boundaries of the 12 constellations found in Chiang Mai’s natal chart with the actual stars’ positions found in a high-precision astronomical planetarium software with a positional error less than 1 arcsecond called “Stellarium” (Stellarium, Version 0.22.0). The process consisted of 2 main steps as follows:

1. Identifying the ecliptic longitude of the 12 zodiacal boundaries of the natal chart with uncertainty according to the J2000 Astronomical Standard. The results are shown in section 3.1.

2. Building a database of the times where Jupiter and Saturn were in each zodiac during the historical period of Chiang Mai to identify a possible founding date and time of Chiang Mai. The work process is schematically represented in Figure 2. The results are shown in section 3.2.

3. Results

3.1 Identifying the ecliptic longitude of the 12 zodiacal boundaries of the natal chart with uncertainty according to the J2000 astronomical standard

The context of Suriyayatra scripture was a sidereal astrology using a sidereal zodiac whose initial point is defined relative to the fixed stars. Since the first point of Aries makes a slow motion relative to the fixed stars, having a precession of about 1° every 71.6 years, the tropical and the sidereal zodiacs slowly drift apart (Koch, 2020). Prior studies found that the coordinates of the first point of Aries or the vernal equinox (♈), which is the epoch of the zero-year of the fixed zodiac according to Suriyayatra scripture, had an ecliptic coordinate on 1st January 1962 at 0:00 of (23° 19’ 34.02”, 0°) (Bandyopadhyay, 2015; Chandra Hari, 1998). We then calibrated the coordinates of the first point of Aries or the

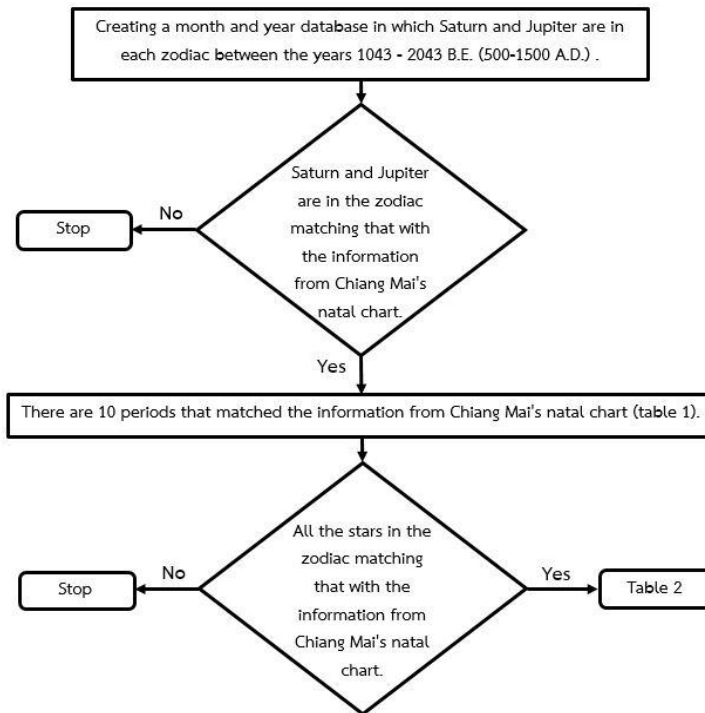


Figure 2. A flowchart illustrating the process for determining a possible founding date of Chiang Mai by comparing the positions of the stars in zodiac with the information from Chiang Mai's natal chart

vernal equinox in Stellarium software referencing the J2000 begin era to match the vernal equinox from Suriyayatra scripture. Firstly, the difference calculation between the vernal equinox on 1st January 2000 at 12:00 and 1st January 1962 at 0:00 is $0^{\circ} 31' 39.90''$ (or $\sim 32'$) as shown in Figure 2. Consequently, the ecliptic longitude of the first point of Aries from Suriyayatra scripture was calculated by using the vernal equinox on 1st January 1962 at 0:00 plus the difference above resulting in $24^{\circ} 19' 34.02'' + 0^{\circ} 3' 39.90'' = 24^{\circ} 51' 13.92''$. Since the auspicious scripture represents the position of the stars on the solar plane, the latitude coordinates of the sky are always equal to 0 degrees; the coordinates of the zodiac are only considered the ecliptic longitude (Roy, 2019).

Since the resolution of measuring of Suriyayatra scripture is in the unit of one arcminute ($1'$) (Eade, 1995), we used the ecliptic longitude of $24^{\circ} 51' \pm 32'$ as the first point of Aries, which is the beginning boundary of Aries constellation. The uncertainty of $32'$ used in determining the boundaries of the zodiac is larger than the resolution of observing the positions of the nine planets according to Suriyayatra scripture, which is less than $10'$ (D'zmura, 2003). Besides, the uncertainty of $32'$ covers the size of the full moon ($31'$), which makes good sense in determining the boundary of the zodiac by naked eye (Nibondh & Jaturong, 2014). Therefore, this study chose $32'$ as the total measurement uncertainty that may occur in the zodiac boundary observation and the position of the stars found in the natal chart, as shown in Figure 3. After receiving the ecliptic longitude of the beginning of Aries, the boundaries of the 12 zodiacal groups were based on the size of each zodiac sign, which is the same size as 30° according to Suriyayatra scripture (Figure 2). However, the zodiac boundary used in the calculation of lunar

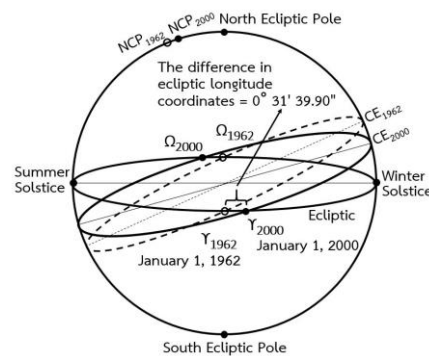


Figure 3. The difference in ecliptic longitude coordinates of the first point of Aries (not actual scale) between 1st January 1962 and 1st January 2000 referencing the J2000 begin era according to the Earth's precession

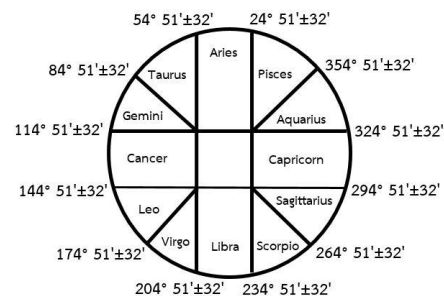


Figure 4. The natal chart presents the ecliptic longitude of 12 zodiacal boundaries from Suriyayatra scripture at the beginning of J2000 era

calendar was defined slightly differently in size for each zodiac to be more similar to the constellations in the sky (Davis, 1976). The natal chart with the ecliptic longitude of 12 zodiacal boundaries can be used to provide astrological data for the 12 zodiac constellations according to Suriyayatra scripture.

3.2 Building a database of the times where Jupiter and Saturn were in each zodiac during the historical period of Chiang Mai to identify a possible founding date and time of Chiang Mai

Considering Chiang Mai’s natal chart, astrological data indicated the positions of the stars that reside in the 12 constellations as follows: Sun and Mercury in Aries; Moon in Cancer; Mars in Aquarius; Jupiter in Sagittarius; Venus and Lagna in Pisces; and Saturn in Taurus. In fact, the historical period of Chiang Mai covers the period between the years 1043 - 2043 B.E. (500-1500 A.D.) on the Gregorian calendar. As a result, thus, finding a possible date and time of Chiang Mai establishment should consider the range of search period in a span of a thousand years for a systematic search. Consequently, we created a month and year database in which Saturn (taking 29.46 years to orbit the Sun) and Jupiter (11.86 years) are in each zodiac during the historical period of Chiang Mai. Then, we selected the specific period that Saturn and Jupiter are in the zodiac matching the information from Chiang Mai’s natal chart, for further consideration. From the database of the time periods during which Jupiter and Saturn are in each zodiac sign, there were 10 periods of overlap for Jupiter in Sagittarius with Saturn in Taurus, as shown in Table 2. However, considering all the stars in the zodiac that match with data in the natal chart, it was found that there is only one slot, between January-May 1839 B.E. such that matches all. Hence, we will search for the founding date of Chiang Mai in detail only in this time slot.

After retrieving the possible time period, we searched for the founding date and time of Chiang Mai with Stellarium software. First, we adjusted the position of the observer to Chiang Man temple, (18 ° 47 ‘37.4 “N, 98 ° 59’

21.3” E), and set the date/time display to Julian date, which is a popular format for astronomy. Afterward, we started the search for the period that the stars and Lagna arise in the zodiac region corresponding to Chiang Mai’s natal chart. The result was Julian day at 2194524.46, which corresponds to Friday 12 April 1839 B.E. from 3:26 to 5:53 AM according to the Gregorian calendar. Because sunrise on that day was at 6:15, the time from 3:26 to 5:53 was the period of “Tae-Rung” following the Lanna calendar’s motto. This date was also the 8th day of the waxing moon called Rawaison within the Chunla Sakkarat 658, matching with the details of the founding date and time of Chiang Mai, written in the 76th stone inscriptions of Wat Chiang Man temple. Finally, the results of the study suggest that the founding date of Chiang Mai was on Thursday 12 April 1839, B.E. in the Gregorian calendar, or Thursday 5 April 1839 B.E. in the Julian calendar, during the time before sunrise.

3. Discussion

The obtained result suggests that the founding date of Chiang Mai was Thursday 12th of April 1839, B.E., during the time before sunrise according to the Gregorian calendar. The results corresponded very well with the details of Chiang Mai’s founding date found in the 76th inscription from Chiang Man temple. This is also consistent with the official results and the 1st computer analysis on Thursday April 12, 1839 B.E., in the Julian calendar. Since the inscription stone contained the detail of Chiang Mai’s establishment as “Thursday, with the name Thai Meng Pao, early morning before sunrise”, all results match with the written text. The slightly different dates could be possibly due to the uncertainty of each method used for examining Chiang Mai’s natal chart. The official inspect astrologer of Chiang Mai used the Billiard table, which was the Suriyayatra scriptures’ calculations for the New Year according to Lanna calendar, examined the founding date of Chiang Mai. The 1st computer analysis used the Southeast Asian astrology system, also following Suriyayatra scripture, to examine the founding date.

Table 1. Periods of overlap with Jupiter in Sagittarius and Saturn in Taurus, as in Chiang Mai’s natal chart during 1043–2043 B.E. and the stars that mismatched with the data

No.	Period of overlap (B.E.)	Stars mismatched	No.	Period of overlap (B.E.)	Stars mismatched
1	April 1365 – December 1365	Mars	6	January 1661 - June 1662	Saturn
2	April 1424 – September 1425	Mars	7	February 1720 - June 1721	Mars and Venus
3	January 1438 - September 1439	Mars and Venus	8	December 1779 - May 1780	Mars
4	March 1542 - October 1543	Mercury Venus and Saturn	9	January 1839 - May 1839	none
5	December 1601 - January 1603	Mars	10	February 1898. - May 1898	Mars

Table 2. The ecliptic longitude and the zodiac of the stars and ascendant were found on Thursday 12 April 1839, B.E. in the Gregorian calendar, from 3:26 to 5:53 AM.

Star	Ecliptic longitude	Zodiac	Star	Ecliptic longitude	Zodiac
Lagna	26° 50' 50.0"	Pisces	Venus	1° 28' 56.6"	Pisces
Sun	40° 22' 49.4"	Aries	Mars	341° 25' 41.2"	Aquarius
Moon	136° 47' 33.7"	Cancer	Jupiter	282° 21' 58.3"	Sagittarius
Mercury	23° 23' 32.1"	Aries	Saturn	86° 46' 9.1"	Taurus

Since the Suriyayatra scripture was based on the ancient astronomical texts of India, especially the Suryasiddhanta scripture (Burgess, 1935), their results in calculations presented the position of stars found in the sky during that time. This study directly determined the position of the stars that appeared in the sky during the time of Chiang Mai's establishment by using a high-precision astronomical planetarium software. Since the method presented in this study gave the corresponding result to previous result with an error of about 7 days during the historical time scale of 700 years of Chiang Mai, we believe that the method has demonstrated its efficiency for helping historians estimate the date and time found in a natal chart and for discovering a possible historical age.

4. Conclusions

We calculated the ecliptic longitude with the J2000 standard of the 12 groups of the zodiacal boundaries in the natal chart according to Suriyayatra scripture. We built a database of the times when Jupiter and Saturn were in each zodiac between 1043-2043 B.E. (AD 500-1500) to find the possible founding date of Chiang Mai's establishment throughout the history of Chiang Mai. From the aforementioned analysis of the Jupiter and Saturn databases, there were ten possible establishing timelines for Chiang Mai. After adjusting Stellarium software so that the positions of stars' matched with the stars in Chiang Mai's natal chart, the result was Friday 12th of April 1839 B.E. at 3:26 to 5:53, in the Gregorian calendar. Additionally, this date had been adjusted to agree with the new day from the ancient Lanna's belief starting as the sun rises from the horizon. The result of a possible Chiang Mai's founding date was Thursday 12th of April 1839 B.E. according to the Lanna calendar. The result corresponds to the day that Chiang Mai celebrates the founding day of Chiang Mai City every 12th of April annually. Therefore, this method can help historians to estimate the date and time shown in a natal chart to find the corresponding historical age by adjusting the planetarium program in the computer, which is easier and faster than the astrological method.

References

- Bandyopadhyay, A. (2015). The zero-point of the zodiac of the Hindu astronomers in ancient India. *Indian Journal of History of Science*, 33, 257-266. Retrieved from <https://www.koreascience.or.kr/article/JAKO201530861234827.page>
- Boonkrong, P. (1974). *Inscriptions meeting, Part 6*. Bangkok, Thailand: The Prime Minister's office.
- Burgess, E. (1935). *Translation of the Surya Siddhanta*. Calcutta, India: University of Calcutta. Retrieved from https://classicalastrologer.files.wordpress.com/2018/04/surya_siddhanta_english.pdf
- Chandra Hari, K. (1998). On the origin of sidereal zodiac and astronomy. *Indian Journal of History of Science*, 33(4), 257-266. Retrieved from http://library.mibckerala.org/lms_frame/eBook/Zodiac%20and%20Astronomy.pdf
- Committee for Examination and Retrieval of Chiang Mai Auspicious Time and Legends. (1994). Archives for examination and retrieval of the city Nop Buri Srinakhonping Chiang Mai, Chiang Mai.
- Davis, R. (1976). The northern Thai calendar and its uses. *Anthropos*, 71(1/2), 3-32. Retrieved from <http://www.jstor.org/stable/40458880>
- D'zmura, D. A. (2003). Publication of EP1234294A1, European Patent Office. Retrieved from <https://patents.google.com/patent/EP1234294A1>
- Eade, J. C. (1989). *Southeast Asian ephemeris solar and planetary positions A.D. 638-2000, Southeast Asia program*. Ithaca, NY: Cornell University. Retrieved from <https://www.degruyter.com/document/doi/10.7591/9781501719103-fm/pdf>
- Eade, J. C. (1995). *The calendrical systems of mainland South-East Asia*. Leiden, NY: E. J. Brill.
- Eade, J. C. (1996). *The Thai historical record – A computer analysis*. Tokyo, Japan: The Centre for East Asian Cultural Studies for Unesco, The Toyo Bunko.
- Koch, D. (2020). Ayanamshas in sidereal astrology. Retrieved from https://www.astro.com/astrology/in_ayanamsha_e.htm
- na Nagara, P. (1998). *Wisdom of science by Lanna people* (Doctoral dissertation, Kasetsart University, Bangkok, Thailand).
- Nibondh, S., & Jaturong, S. (2014). Lunar calendar: Effects that may be caused by errors in the Thai lunar calendar and a development of lunar data using astronomy knowledge. *The Journal of the Royal Institute of Thailand*, 39, 27-48. Retrieved from <https://www.orst.go.th/FILEROOM/CABROYINWEB/DRAWER004/GENERAL/DATA0000/00000617.FLP/html/34/>
- Roy, R. R. M. (2019). Sidereal ecliptic coordinate system of Sūrya Siddhānta. *Indian Journal of History of Science*, 54(3), 286–303.
- Social Research Institute of Chiang Mai University. (2016). Conference on the various historical records of the founding day of Chiang Mai, Northern Thailand. Munnithi Sathaban Phatthana, Chiang Mai.
- Stellarium (Version 0.22.0) [Computer software]. Free open source 3D planetarium software. Retrieved from <http://stellarium.org/>
- Thai Thonburi-Rattanakosin inscriptions. (2019). The princess maha chakri sirindhorn anthropology centre. Retrieved from <https://db.sac.or.th/inscriptions/inscribe/detail/723>
- Tongkamwan, C. (2019). The 76th stone inscription of Chiang Man temple, the princess maha chakri sirindhorn anthropology centre. Retrieved from https://db.sac.or.th/inscriptions/inscribe/image_detail/21296
- Wisandarunkorn, L. (1948). Kamphi Horasastr Thai - Sarump scripture, Book of Thai horoscope Volume 11, Bangkok, Thailand. Retrieved from <https://www.orst.go.th/FILEROOM/CABROYINWEB/DRAWER004/GENERAL/DATA0000/00000617.FLP/html/54/>
- Yuttaporn, N. (2005). *An analytical study of the Thai, Lanna, and Lue versions of the Suriyayatra texts* (Master's thesis, Silpakorn University, Bangkok, Thailand). Retrieved from <http://www.sure.su.ac.th/xmlui/handle/123456789/2009?attempt=2>