RITUAL, MATHEMATICS & ASTRAL SCIENCES

June 7 & 8 2016
Université Paris Diderot

conference organized

by HIROSE S., D. P. MORGAN, A. KELLER, M. HUSSON & K. CHEMLA

in the framework of the ERC project

"MATHEMATICAL SCIENCES IN THE ANCIENT WORLD" (SAW)

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RITUAL,
MATHEMATICS *&* THE ASTRAL SCIENCES

Conference organized by
HIROSE Sho, Daniel P. MORGAN, Agathe KELLER, Karine CHEMLA
(CNRS – University Paris Diderot, SPHERE, *&* SAW*)*
& Matthieu HUSSON
(SYRTE−Observatoire de Paris)

in the framework of the ERC project
"MATHEMATICAL SCIENCES IN THE ANCIENT WORLD" (SAW)

June 7–8, 2016
&
March 19–20, 2015

Venue:
CNRS – Université Paris Diderot
Condorcet Building, Room 646A,
10 rue Alice Domon et Léonie Duquet,
75013 Paris

Presentation

Ritual is a science of precision. Like any proper performance or game, ritual choreographs action to the beat and bounds of time, and it manipulates symbols with rigorous rules of accounting. The calendar, the time-piece, the tokens, the altars, the counts —to mathematics and the astral sciences are owed the rigor of ritual, one might say, and to ritual, one of the very meanings of these sciences. In this workshop, we will reflect upon the interdependence of ritual, mathematics, and astronomy, giving special attention to the question of astronomical and computational practices unique to the context of ritual.

Building off of an exploratory workshop held on March 19–20, 2015 (http://www.sphere.univ-paris-diderot.fr/spip.php?article794&lang=en), this conference will treat Chinese, Sanskrit, and Latin sources for ritual mathematics running from ancient times to the modern day, pairing historians of science with cultural historians, anthropologists, and historians of religion to supply a pluricultural and pluridisciplinary lens through which to reflect upon the topic.

At the forefront of this conference is the matter of time —the calculation of liturgical calendars and the selection of propitious moments for ritual action therein. It is here where caricatures of "science" and "religion" collapse as we watch actors approach problems of a fundamentally

theological/occult nature with observation, data, mathematical proof, and evolving theories of nature. In the papers of Michio YANO and Philipp NOTHAFT, we see this pursuit play out in second-millennium Sanskrit and Latin sources, respectively, as concerns the scientific religious timing of sacrifice and resurrection. What was at stake in the timing of these events? How did those stakes inform the methods and rigor of the astral and mathematical sciences employed to this end? What relation did *praxa* in such cases bear to the *doxa* informed by those stakes? How did this change, and how was such change negotiated over the course of time?

The matter of science, liturgical calendars, and change brings us to the papers of WU Yan and Béatrice DAVID, which explore the efforts of the twentieth-century Chinese state's top-down efforts to reconcile tradition and local festival calendars with Western "scientific" norms of modernity. The former will take us through how the KMT Nationalist Party, at the turn of the century, sought to construct a Chinese national identity by canonizing and harmonizing traditional festivals with the Gregorian calendar, while the latter will explore how the Communist Party, in turn, has attempted to enforce this globalized, hegemonic calendar onto ethnic minorities such as the Sui. How do governments decide things like the exact date of Confucius' birth? How might their determinations differ from those of individual scholars and local communities? What resistance do such efforts meet from the latter, and how does that resistance play out vis-à-vis the paradoxical demands of plurinational nationalism?

The control of time, in this case, speaks directly to the control over space, which brings us, lastly, to the use of mathematics in the construction of ritual space. For sacrifice to be effective, it depends as much on the altar and implements of sacrifice than it does the selection of the right moment, and it is to this end that Hideki TESHIMA will take us through the arithmetic/geometric prescriptions of altar-construction in the context of first-millennium Vedic ritual manuals. Coming to first-millennium China, we then move into the construction of space in the more abstract and as relates, specifically, to questions of proof. In the paper by ZHU Yiwen, we will explore how seventh-century writers treated classical prescriptions on the construction of mourning garments, bringing mathematical proof into

classical commentary, and ancient ritual into mathematical treatises. Beginning with seventh-century commentary on target geometry, the joint paper of Alan LEVINOVITZ and Daniel MORGAN will furthermore examine mathematics of ritual archery contests in the centuries prior, discussing the metric of shooting came to inform the idea of testing in an astronomical and scholastic context. How do the mathematics of scientific altar, mourning garment, and target construction differ from those we might encounter in more abstract realms like astronomy? What relation to liturgical manuals and scholastic commentary bear to real world practice, and what, if anything, do measuring units tell us about such a divide?

These are the topics and the questions that we will consider over the course of our two-day conference, at the heart of which, however, is one question of singular importance to the history of mathematics: How number-manipulation, as present in cultural practices as diverse as those examined here, may speak to the diversity of mathematical cultures within a given historical time and geographic place.

Program

Morning session

9:30 – 11:00

Alan LEVINOVITZ (James Madison University, USA) & **Daniel P. MORGAN** (CNRS, SPHERE & SAW project, Paris):

Virtue on trial: ritual archery competitions
& astronomical testing in early China ➤

Commentator: **Pascal BRIOIST** (CNRS, CESR, Université de Tours)

Break

11:30 – 13:00

YANO Michio (Kyoto Sangyo University, Japan):

Astrology & rituals in India
—with special references to the Muhūrtacintāmaṇi ➤

Commentator: **Caterina GUENZI** (CEIAS, EHESS, Paris)

Lunch Break

Afternoon session

14:30 – 16:00

Philipp NOTHAFT (All Souls College, Oxford, England):

Calendar reform in the fourteenth & fifteenth centuries:
problems & perspectives ➤

Commentator: **Matthieu HUSSON** (CNRS, SYRTE, & SAW project, Paris)

WEDNESDAY, JUNE 8, 2016

Morning session

9:30 – 10:30

ZHU Yiwen (Sun Yatsen University, China, & SAW project)**:**

Commentaries on numbers of ritual through different
mathematical knowledges in seventh century China ➤

Commentator: **Béatrice L'HARIDON** (CRCAO, Université Paris Diderot, Paris)

Break

11:30 – 13:00

TESHIMA Hideki (Kyoto Bunkyo University, Japan)**:**

Vedic measure system & its application in the ritual field ➤

Commentators: **HIROSE Sho** (Univ. Paris Diderot, SPHERE, & SAW project, Paris)
& **Agathe KELLER** (CNRS, SPHERE & SAW project, Paris)

Lunch Break

Afternoon session

14:30 – 16:00

WU Yan (Inner Mongolia Normal University, China)**:**

The replacement of traditional ceremonies in the process
of the movement for "Abolishing the traditional calendar
& promoting the national calendar":
focusing on the memorial day of the birth of Confucius ➤

Commentator: **YANO Michio** (Kyoto Sangyo University, Japan)

16:00 – 17:30

Béatrice DAVID (Université Paris 8, Paris)**:**

A preliminary investigation of the ritual use of the calendar
& the oracular script of the Sui (Guizhou, Southwest China) ➤

Commentator: **YANO Michio** (Kyoto Sangyo University, Japan)

Tuesday, June 7, 2016

Virtue on trial: ritual archery competitions & astronomical testing in early China

Alan LEVINOVITZ
| James Madison University, USA
Daniel P. MORGAN
| CNRS, SPHERE, & SAW project,
Paris

Commentator: Pascal BRIOIST (CNRS, CESR, Université de Tours)

In this talk, we will analyze written sources for the "Big Shoot" 大射, a ritual archery contest held at court for the purpose of selecting officers to participate in the royal sacrifices. The key to the "observation of virtue" in sport and/as ritual, we argue, is its quantification and the observed assurance of exact, reproducible benchmarks, and it is there, as concerns scoring and target geometry, where later commentaries spill the most amount of ink. This begs the question of whether the "Big Shoot" represents historical practice or scholastic fantasy, which we address with a survey of historical records from the third century BCE to the ninth century CE. Having explored the transferability of this model of ritualized, meritocratic testing over time, we then turn in the second half to an exploration of how the "shoot" 射 came to inform other forms of testing at the core of the history of science and thought in early Imperial China. The institution of the live trial for making policy decisions as concerns *li* 曆 calendroastronomy, it turns out, operates on the same model and same rules of scoring, appealing to the vocabulary of archery to conceptualize accuracy, which comes as little surprise considering as how it was the grand clerk, or astronomer royale, who presided over both competitions. But, we argue, there is more than a bureaucratic connection at stake here. The archery competition reveals to the observers (觀 者) the virtue of the participants, and,
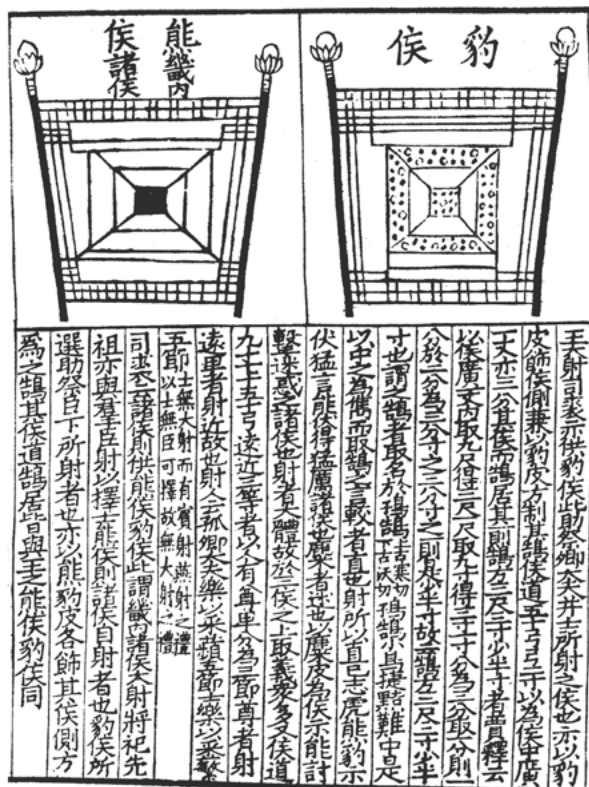
Classical archery targets
as reconstructed
by Nie Chongyi 聶崇義,
San li tu 三禮圖
(edition 1175)

in turn, the virtue of the commander who chose them. Hitting the targets reveals broader capabilities of those involved —just as the participants aim at targets to reveal their archery prowess, the "target" system aimed at by the competition is not archery prowess but rather the virtuousness of the participants. The same archetypal testing system transfers neatly over to testing *li*, where a competition limited to specified targets (heliacal rising, etc.) serve to reveal the adequacy of *li* to an entire target system, namely the heavens. The accuracy of *li*, in turn, serves to reveal the "virtue" of its author and the ruler who possesses it. We will discuss these archetypes by building on recent work in philosophy of scientific modeling, looking at the correspondence between a competition and iconic modeling, and considering competition as a widespread but undertheorized form of idealization, the structure of which helps to illuminate foundational epistemic virtues of science.

King's horoscope of 200 years ago,
owned by Dr. Mahesh Pant
Photo: by courtesy
of Mr YANO Michio,
Kathmandu, Nepal,
2015

Astrology and rituals in India
– with special references to the *Muhūrtacintāmaṇi*

YANO Michio

| Kyoto Sangyo University, Japan

Commentator: Caterina GUENZI (CEIAS, EHESS, Paris)

Astrology played an important role in India since the Vedic period. Out of the many elements of astrology I would like to focus on the *muhūrta* and its significance in rituals. In the old texts, the *muhūrta* is a time unit of 1/30 of a day, there being 15 *muhūrtas* of day and 15 *muhūrtas* of night, each with its own name. In ritual texts, the *muhūrta* is mentioned in the context of good or bad moment for sacrificial rites. The word *muhūrta* gained a general meaning after the establishment of the five elements (*pañcāṅga*) of the calendar, namely, the *nakṣatra* (lunar mansion), *tithi* (lunar day), *karaṇa* (half of *tithi*), *yoga* (based on the sum of solar and lunar longitudes), and *vāra* (weekday). Astrologers were expected to foretell auspicious and inauspicious *muhūrta* based on the combination of all the time units beginning with the year, namely, the half-year, season, month, half-month and the *pañcāṅga* elements. The planetary weekday was a new element of astrology introduced from the west with the 12 *rāśis* (zodiacal signs) and the 12 *bhāvas* (houses). These new elements contributed to the further sophistication of the *muhūrta* theory. From the beginning of the second millennium CE, texts dealing exclusively with *muhūrta* appear and begin to form a new genre of astrological literature, *muhūrta-śāstra*. The most popular text of this genre is the *Muhūrtacintāmaṇi* composed by Rāma in 1600 CE. This text was commented upon by the author himself, and it was only three years later (1603 CE) that Rama's nephew Govinda wrote a very detailed

and useful commentary called *Pīyūṣadhsadhārā* which contains numerous and valuable citations from astrological as well as *dharmaśāstra* texts. In my presentation, I would like to show the structure of the *Muhūrtacintāmaṇi* and discuss the chapters on rituals.

Calendar reform in the fourteenth & fifteenth centuries: problems & perspectives

Philipp NOTHAFT

| All Souls College, Oxford, England

Commentator:
Matthieu HUSSON (CNRS, SYRTE, & SAW project, Paris)

For most of its history in medieval and early modern Europe, the issue of calendar improvement and reform was closely tied to the celebration of Easter and the structure of the liturgical year. A fixed point in most debates of this kind were the writings of the church fathers and the decrees of the late antique church councils, which had established a firm link between the date of Easter and astronomical criteria – the full moon and the vernal equinox. Astronomical accuracy thus became a fundamental requirement, which the medieval ecclesiastical calendar was supposed to fulfil in theory, but failed to meet in practice. My talk will use the theological and legal background of Easter reckoning as a starting point to analyze the parameters and constraints that shaped the debate surrounding the ecclesiastical calendar in the late Middle Ages, focusing in particular on sources produced at the court of Pope Clement VI in Avignon (1344/45) and at the Council of Basel (1434-43). Special attention will be paid to the way these sources frame the relationship between religious ritual, on the one hand, and astronomical data, on the other, as well as to the general points of intersection between the Easter problem and the history of astronomy in this period. It will be argued that the criteria established in the course of these late medieval debates remained normative throughout the subsequent history leading up to the Gregorian calendar reform of 1582.

Excerpt of the Très Riches Heures
du duc de Berry, *month of June.*
Art: Limbourg Brothers,
Dated between 1411 −1416,
Musée de Condé
Photo.: R.M.N.,
R.-G. Ojéda

Wednesday, June 8, 2016

Stone exacted from an ancient tomb dated Eastern Han dynasty; in the center of this picture, two people are playing a game, called «thrown pot». This game was a ritual in the high rank family in ancient China, showing the host's respect to the guest, so two people should be the host and his guest.

Commentaries on numbers of ritual through different mathematical knowledges in seventh century China.

ZHU Yiwen

| Sun Yatsen University, China, & SAW project

Commentator:
Béatrice L'HARIDON (CRCAO, Univ. Paris Diderot, Paris)

Numbers of ritual (*Lishu* 禮數) is a key part of ritual in ancient China. Some studies have been done on it based on ritual texts. On the other hand, Liu Hui 劉徽, who commented on the *Nine Chapters on Mathematical Procedures* (*Jiuzhang suanshu* 九章算術), understood this book as a derivative of the *Rites of Zhou* (*Zhouli* 周禮), and further as a part of Confucianism (*Ruxue* 儒學). This fact points to the relationship between ritual and mathematics in general. However, it is as yet unclear how scholars in the past understood this relationship in relation to numbers of ritual. On the basis of analyzing different commentaries on numbers of ritual respectively in a mathematical book, called *Mathematical Procedures on Five Canons* (*Wujing suanshu* 五經算術), and in Confucian canons, this talk aims at revealing different relationships between numbers of ritual and mathematical knowledges established by different scholars in seventh century China. Furthermore, the special role of numbers of ritual compared to other kind of numbers within the interdependence of ritual and mathematics will be discussed.

Fire altar built
for the Agnicayana *ritual*
in Kerala, India, 2011
Photo: by courtesy
of Mr TESHIMA Hideki

Vedic measure system
& its application in the ritual field

TESHIMA Hideki

| Kyoto Bunkyo University, Japan

Commentators:
HIROSE Sho (Univ. Paris Diderot & SAW project, Paris)
& Agathe KELLER (CNRS, SPHERE & SAW project, Paris)

The *Kalpa-Sūtras* (compiled sometimes after the 6th century BC.) are vedic ritual manuals that contain explanations of how to set up the site where a sacrifice is to be held. In these texts we find mention of various measures used in the preparation of the ritual grounds, the sacred altar, the hearth of divine fire and the other elements of sacrifice. I will begin by summarizing the vedic system of measure, then examining its application in large-scale kingship rituals such as the *Rājasūya* (the Royal Consecration) or the *Aśvamedha* (the Horse Sacrifice). Through this examination we will try to understand the way that vedic ritualists integrate arithmetical/geometrical knowledge with magical procedures designed to realize the wishes of the supplicant king.

The replacement of traditional ceremonies in the process of the movement for "Abolishing the traditional calendar & promoting the national calendar": focusing on the Memorial Day of the birth of Confucius

WU Yan

| Inner Mongolia Normal University, China

Commentator: YANO Michio (Kyoto Sangyo University, Japan)

On January 1st, 1912, the Republic of China was founded. At the presidential inauguration, SunYat-sen, the temporary President, announced the adoption of a calendar counted from the founding of the Republic and based on the principles of the Gregorian calendar, the argument being that a calendar of this type had been adopted by "advanced" western countries. However, because of the close relation between the calendar and everyday life and customs, the new calendar did not immediately replace the common one upon its promulgation. In 1927, the Nationalist Government took power in Nanjing; in the following year, the government initiated a movement named "abolishing the traditional calendar and promoting the national calendar" aimed at forcing the transition. At the time, the dates of festivals and commemorations were officially transferred from the traditional calendar to fixed days in the Gregorian calendar. For instance, the government established the Memorial Day of the Birth of Confucius as a national holiday and fixed its date August 27, rejecting contemporary scholars' proposal to calculate the date each year via the traditional luni-solar calendar. This difference of opinions sheds light on two different notions of ritual time. The way in which the government reconstructed an ancient tradition according to modern usages is typical of the period. By replacing the date and regulating the ritual, the government re-interpreted

the cultural meaning of Confucius and this commemorative day while at once rejecting the "abolished calendar" on the charge that "the fact that one continues to use the old calendar means he carries out the calendar promulgated by Tsing Dynasty, so that he would be the rebel of the Republic of China." The interment of the traditional calendar and resurrection of Confucius would seem to be contradictory; in essence, however, their common aim is to reconstruct the order of time, through which the government aimed to legitimize and distinguish itself from the previous dynasty. By doing so, the Gregorian calendar, as an element of a foreign culture, offered a solution to establish a new order of time and reconstruct a tradition. Meanwhile, by placing the "tradition" into the new order of time, foreign culture became a part of local culture.

*The master of the Sui manuscripts
process a divination using an egg
and the manuscripts*

Professor PAN Zhaolin

*Recent stele engraved with characters sui.
This stele participates of new uses of sui writing
in the process of its patrimonialisation.
Sui specialists researchers are behind this initiative
Photos: by courtesy of B. David*

A preliminary investigation of the ritual use of the calendar & the oracular script of the Sui (Guizhou, Southwest China)

Béatrice DAVID
| Université Paris 8, France

Commentator: YANO Michio (Kyoto Sangyo University, Japan)

The Sui (Shui in Chinese) live in Southeastern Guizhou. They are speakers of a dialect belonging to the Kam-Sui branch of the Tai-Kadai language family. They are one of the 55 official "ethnic groups" labeled as "national minorities". Sui possess their own calendar and oracular script mainly used for divination purposes. The Sui script and manuscripts (*le-sui*) entered in the Chinese historiography in the late 19th century but research, mainly carried by Sui researchers, have been largely ignored outside China and even within China. The recent and on-going "development" of their mountainous region opened up for tourism and leisure activities has however brought a new kind of interest on this script in both official and academic circles, which led to its registration in 2006 in the national list of "intangible heritage" and the conservation of the manuscripts (owned by the specialists.

The political and tourism use of the Sui scripts is transforming what has become a "cultural heritage" into a major marker of the Sui ethnicity and some selected specialists as its official ambassador are asked to perform in festivals designed for the official spectacle of ethnicity offered for visitors. However, outside this arena, the specialists of the Sui script, who distinguished themselves from other specialists playing a role in the interactions between the human-beings and their spiritual counterparts such as the

spirit-mediums, do continue to perform the ritual activities requiring their specific intervention as "master of the Sui manuscripts". The Sui writing, around 300 characters, is an oracular script. It is mainly used at the domestic level to perform divination and rituals such as home setting, wedding and funerals, and at the collective level to perform at territorial rituals such as the Dor and the Mau festivals. These collective rituals take place in the specific time frame of the Sui calendar.

Based on preliminary fieldwork research in the Sui autonomous district of Sandu and exploration of the fertile academic work mainly produced by Sui researchers who have played a major role in the protection of the manuscripts and its official recognition as "a Sui intangible heritage", the present talk will present the main characteristic of the Sui scripture and calendar. The role of the "master of the *le-sui*" will be placed in the ritual context of the territorial lineage festival Dor which marks the beginning of the Sui year.

Although the collective ritual has undergone major transformations since the last century, attempts by the "communist" authorities during the time of collectivism in the 1960 and 1970 to change the date of the festival and have it coincide with the celebration of the national day on October 1st, have failed. The "traditional" Sui calendar provides a "time of the self" as Sui, while the festivals of "traditional" luni-solar calendar of the Han nongli contributes in many ways to their sense of Chineseness as members of the Chinese pluri-national nation self-defined as Zhonghua. And the Gregorian calendar, or "Western calendar", yangli, provides the time of the Chinese nation within the rest of the globalized world.

2015

Program

THURSDAY, MARCH 19, 2015

9:30 – 11:00

YANO Michio (Kyoto Sangyo University, Japan):

Astral sciences & rituals in India with reference to ayana ➤

11:30 – 13:00

Bill MAK (Kyoto University, Japan):

Ritualistic cyclicity in Indo-Greek astral science –
Expressions for various modes of time measurement
in the Yavanajātaka ➤

Commentator: **Daniel P. MORGAN** (CNRS, SPHERE, & SAW project, Paris)

FRIDAY, MARCH 20, 2015

9:30 – 11:00

ZHU Yiwen (Sun Yatsen University, China, & SAW project):

Commentaries on numbers of ritual
through different mathematical knowledges
in seventh century China ➤

11:30 – 13:00

IKEYAMA Setsuro (Kyoto Sangyo University, Japan):

The calculation of Vyatipata, *an astrological*
phenomenon in Indian astrology ➤

Commentator: **HIROSE Sho** (Univ. Paris Diderot, SPHERE, & SAW project, Paris)

Thursday, March 19, 2015

Astral sciences & rituals in India
with reference to *ayana*

YANO Michio

| Kyoto Sangyo University, Japan

Commentator:
Daniel P. MORGAN (CNRS, SPHERE, & SAW project, Paris)

The very primitive system of the *Jyotiṣavedāṅga* turned to a well-established branch of science, namely, *jyotiḥśāstra* ("science of stars"), and it made remarkable progress, especially after the introduction of western astronomy and astrology. We see a drastic change of Indian astrology after the *Yavanajātaka* was translated into Sanskrit some time around the 3rd or 4th century CE. Moreover, after the *Āryabhaṭīya* of *Āryabhaṭa* numerous texts on mathematical astronomy were produced until a quite recent time. Although the five year cycle (*yuga*) of the *Jyotiṣavedāṅga* was very crude, basic units of time were defined, namely, year, half year (*ayana*), month, half month (*pakṣa*), *tithi*, *muhūrta* (1/30 of a day), and *nāḍikā* (1/60 of a day). The meaning of *ayana* in the context of ritualism, astronomy and astrology changed in history. At the time of *Jyotiṣavedāṅga* the word ayana only meant 'a half year', a year being divided into two, *uttara-ayaṇa* ('sun's northern course') and *dakṣina-ayana* ('sun's southern course'). With time, however, the change of the position of the solstices became known to Indian astronomers, and *ayanāṣśa* (degrees of motion of solstices) became an important topic. In the *nirayaṇa* (sidereal) system, planetary longitudes are counted from the fixed ecliptic point *meṣādi* (the beginning of *Meṣa*) while according to the *sāyana* (tropical) system, the starting point of reference is the true vernal equinox. When one wants to compute the astronomical elements called *vyatīpāta* and *vaidhṛta* which are defined by the true decli-

Measuring the sacrificial
ground by ropes (śulba),
Kerala, India, 2011
Photo: by courtesy
of Mr YANO Michio

nation of the sun and the moon, one must use the *sāyana* coordinates, while the yoga, as one of the five astrological elements, is computed by the *nirayaṇa* system. The majority of traditional Indian calendars (*pañcāṅga*) give the planetary position in the *nirayaṇa* system.

Whether Indian calendars should continue to use the *nirayaṇa* system or switch to the *sāyana* system is a big issue among the traditional calendar makers and ritualists.
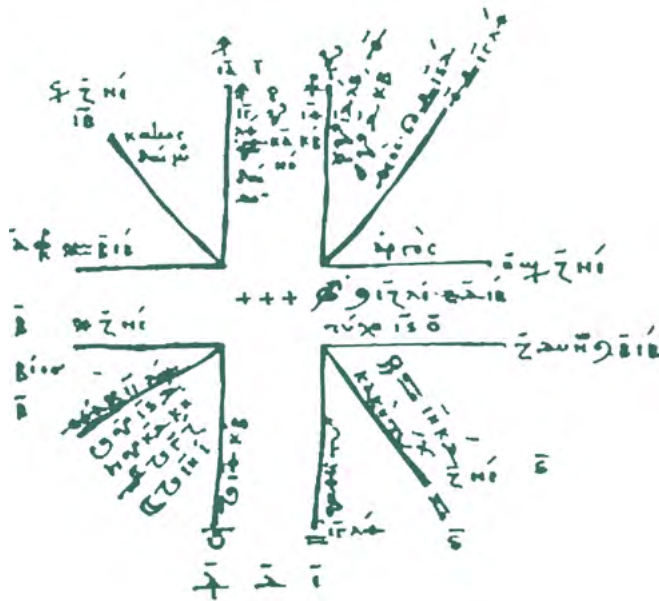
Byzantine Greek horoscope

& Thai horoscope (at Wat Pho)
by courtesy of Mr Bill Mak

Ritualistic cyclicity in Indo-Greek astral science – Expressions for various modes of time measurement in the *Yavanajātaka*

Bill MAK

| Kyoto Sangyo University, Japan

Commentator:
Daniel P. MORGAN (CNRS, SPHERE, & SAW project, Paris)

As a prototypical work of Greco-Indian astral science, the *Yavanajātaka*, in particular, its last chapter (Ch. 79) on mathematical astronomy, encapsulates some key concepts on time measurements which would later became the mainstream elements in the Indian tradition of *jyotiṣa*. Some of these key concepts include the large astronomical cycle known as *yuga*, the smaller cycles of year, season, month, planetary week, day and *tithi*. What distinguishes the *Yavanajātaka* from other extant treatises of the first millennium CE, however, is the fluidity of expression of these astronomical cycles in the text, which suggests the ambivalence of the author in his attempt to blend a heterogeneous body of Greek and Indian astronomical and astral concepts, and to express them in a sound, mathematical manner. Two features of this important chapter which have been overlooked in past studies are: 1) The Indian elements as exemplified by the close resemblance of *tithi*-based astronomical algorithm and the description of the water clock to those of the *Vedāṅgajyotiṣa* and the *Arthaśāstra* respectively; 2) The description of the Lords of year, *ayana*, season, month, week, day and hour which conclude the chapter before the colophon. In this presentation, I would like to suggest the expressions of cyclical time-measures in the text have an unexpressed ritualistic character, which lies beyond the scope of the Greco-Indian genethliacal astrology of the preceding 78 chapters. Beside his concern for comprehensiveness, its author Sphujidhvaja was clearly

exposed to the ritualistic significance of these various time-measures from different traditions. While the computation of planetary longitude would be essential to the casting of horoscope, the reckoning of days (*ahargaṇa*) and various "Lords" suggests a synthesis of Greek and Indian rituals which focus on astral worship.

¹ Based on readings from new manuscript [Mak 2013]

Friday, March 20, 2015

Diagram of funeral rites
from 馬王堆
馬王堆漢墓文物

Commentaries on ritual numbers
through different mathematical knowledges
in seventh century China

ZHU Yiwen

| Sun Yatsen University, China, & SAW Project

Commentator:
HIROSE Sho (Université Paris Diderot, SPHERE, & SAW Project, Paris)

Numbers of ritual (*Lishu* 禮數) is a key part of ritual in ancient China. Some studies have been done on it based on ritual texts. On the other hand, Liu Hui 劉徽, who commented on the *Nine Chapters on Mathematical Procedures* (*Jiuzhang suanshu* 九章筭術), understood this book as a derivative of the *Rites of Zhou* (*Zhouli* 周禮), and further as a part of Confucianism (*Ruxue* 儒學). This fact points to the relationship between ritual and mathematics in general. However, it is as yet unclear how scholars in the past understood this relationship in relation to numbers of ritual. On the basis of analyzing different commentaries on numbers of ritual respectively in a mathematical book, called *Mathematical Procedures on Five Canons* (*Wujing suanshu* 五經筭術), and in Confucian canons, this talk aims at revealing different relationships between numbers of ritual and mathematical knowledges established by different scholars in seventh century China. Furthermore, the special role of numbers of ritual compared to other kind of numbers within the interdependence of ritual and mathematics will be discussed.

The calculation of *Vyatipata*, an astrological phenomenon in Indian astrology

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Commentator:
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Vyatipata is a special, basically bad, moment in Indian astrology. It is defined in relatively later treatises as the moment when the magnitudes of the declinations of the sun and moon become equal. I will introduce the explanation and calculation of *Vyatipata* described in the *Grahalāghava* and *Pāṭasāraṇī* both composed by Gaṇeśa, a 16th century Indian astronomer.

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