ON CULTURES OF SCIENTIFIC PRACTICE IN ANCIENT MATHEMATICAL SCIENCES – 2019
Historical and historiographic approaches

Conference organized by
Karine CHEMLA, Agathe KELLER, Christine PROUST,
(SPHERE, CNRS – University Paris Diderot)

April 10–13, 2019
9:30 am to 5:30 pm

Venue:
CNRS – University Paris Diderot
Building Olympe de Gouges, room Laplanche 576,
Université Paris Diderot, 8 place Paul Ricoeur
(rue Albert Einstein), 75013 Paris
Access to the 5th floor will be given in exchange for an ID document (passport, etc) at the security counter at the entrance of the building
(map on p. 37)

Research Laboratory SPHERE
(UMR 7219 – CNRS, Universities Paris Diderot & Paris Panthéon-Sorbonne)

Presentation

At the end of the European Research Concil Project SAW (Mathematical Sciences in the Ancient World), we formed the project of gathering in Paris colleagues who are close to the SAW project roughly speaking every two years, as long as this is possible.

Our idea is to hear talks on issues that are at the core of the SAW project: mathematical cultures, in the various social contexts in which mathematical practices can be documented (including economic activities and activities in the astral sciences), on the one hand, and the history of the historiographies of ancient mathematics, on the other. In this way, we hope to maintain our network and push forward research on topics that appear as essential to us.

Program

WEDNESDAY, APRIL 10TH, 2019

9:30 – 9:40 am

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Household numeracy in Graeco-Roman antiquity 9

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11:30 am – 1:00 pm

Zhu YIWEN (Sun Yat-sen University, Guangzhou):

How do we understand mathematical practices in non-mathematical fields? 10

Commentator: **Matthieu Husson** (CNRS, SYRTE, Observatoire de Paris)

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Economizing mathematical practice in economic texts 11

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Camille LECOMPTE (Arscan-Vepmo, University Paris-Ouest-Nanterre) & **Christine PROUST** (CNRS, SPHERE & University Paris Diderot):
Coordinating units of surface with units of length, a mathematical work accomplished by communities of scribes? Discussion based on some archaic tablets from Mesopotamia (ca 3500 to 2500 BCE). 16

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HISTORY AND HISTORIOGRAPHY OF MATHEMATICS

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Karine CHEMLA (SPHERE, CNRS & University Paris Diderot):

Elements of the history and the historiography of positioning
on a calculating surface. Qin Jiushao's 秦九韶 Writings on mathematics in Nine Chapters 數書九章 *as a case study* 24

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On the shaping of the ancient Chinese Ta-yen rule by 19th century German scholars. 25

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CIRCULATIONS AND ENCOUNTERS

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AJ MISRA (MPIWG, Berlin, Germany):

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2:00 – 3:30 pm

PAN Shuyuan (IHNS, Chinese Academy of Science, Beijing):

Commentator: **David Rabouin** (CNRS, SPHERE & University Paris Diderot)

3:30 – 4:00 pm Break

4:00 – 5:30 pm

Li Liang (IHNS, Chinese Academy of Science, Beijing):

Commentator: **Eric Gurevitch** (University of Chicago)

Wednesday, April 10th, 2019

Diversification of Sources

Household numeracy in Graeco-Roman antiquity

Serafina CUOMO
Durham University

Commentator: ZHU Yiwen (Sun-Yatsen University, Guangzhou)

This paper will look at mathematical practices (in particular counting, calculating and measuring) in domestic contexts in Graeco-Roman antiquity. I will consider education, the household economy, and the web of financial relationships that connected the household to the wider contexts of the town or the state. Most of the material I will be looking at will be papyrological, and I will try to shed light on the intersections between household mathematical practices, cultural identity, gender, and social status.

How do we understand mathematical practices in non-mathematical fields?

ZHU Yiwen
Sun Yat-sen University, Guangzhou

Commentator: Matthieu Husson (CNRS, SYRTE, Observatoire de Paris)

Recent studies, in particular the studies carried out in the context of the project ‘SAW’, have shed light on the diversity of mathematical practices in the ancient world. These results require a deeper philosophical understanding of mathematics on one hand; they raise a key question of how we understand and interpret the mathematical practices in those non-mathematical fields on the other hand. In this article, based on my researches on mathematics in Confucian canonical literature, I intend to address the key question from two perspectives. Firstly, I will analyze different mathematical tools used in different practices in Song dynasty (960-1279): mathematical study (*suan xue*), Calendric computation (*li suan*), Confucian ritual study (*li xue*), Confucian study on *Book of Changes* (*Zhou yi*). In these different contexts, I will show how different tools relate to different mathematical practices. Secondly, through carefully analyzing the history of Confucian mathematical methods from the Han dynasty (202 BCE – 220 CE) to the Song dynasty, I will argue that there existed two types of mathematical problems: those that could be revealed and those that were hidden. Moreover, this distinction between mathematical problems will help us to understand different textual contexts in relation to different mathematical practices. In conclusion, I will summarize other factors accounting for the diversity of mathematical practices, such as the terminology and the historical, political and social backgrounds, in order to contribute to shaping a research framework that will allow us to study mathematical practices in different activities.

Economizing mathematical practice in economic texts

Robert MIDDEKE-CONLIN
MPIWG, Berlin

Commentator: Alexis Trouillot (University Paris Diderot, SPHERE)

Economic texts often appear as if they were constructed using mathematical processes that must have been learned in the course of a scribe's education. This can be suggested with texts such as A.26371, a loan of grain that was probably produced with a mathematical procedure, such as those witnessed for silver and grain loans on the mathematical text VAT 08521, in mind. Yet this is not always the case. Taxes, such as is seen on AO 08493, projected grain yields such as those seen on Ashm 1923-340, and sample measurements like that witnessed on YBC 04265 do not seem to refer to any mathematical practices witnessed in the scribal curriculum. This paper asks why this may be the case. It surveys mathematical processes witnessed on or suggested by economic texts as well as those witnessed in the extant mathematical tradition to propose how and where these missing mathematical processes were learned.

Wednesday, April 10th

& Thursday, April 11th, 2019

Diversity of Practices

Mapping Regional Traditions in Chinese Astronomy and Mathematics, 311–618 CE

Daniel Patrick MORGAN
SPHERE, CNRS & University Paris Diderot

Commentator: Serafina Cuomo (Durham University)

The period of disunion from 311 to 589 CE saw the territories of the former Han Empire (206 BCE–220 CE) carved up into as many as twelve contemporaneous states ruled by a tumultuous succession of some forty different bloodlines, the majority of which were 'barbarian' in origin. As it happens, this was also one of the most fruitful periods in the history of Chinese-language astronomy and mathematics. Experts were divided, working on the same problems in rival capitals, increasingly disconnected in written and oral tradition except as punctuated by violent redistributions of human and material resources by invading armies. If ever there were a place and time to go looking for 'different mathematical cultures' in early imperial China (Chemla 2009; 2016; 2017a; 2017b; Zhu Yiwen 2016), these 278 years are it. Catering to this particular mission of the SAW Project, this paper will break the history of astronomy and mathematics in this period into that of four distinct regional networks, between which we can effectively divide more than a dozen received texts and what we know of many more that have not survived in full. Grounding our sources in their immediate geopolitical and interpersonal context, this paper will argue that the dividing lines between regional traditions is often stronger than those between genres of mathematics within *li* 曆 and *suan* 筭.

Thursday, April 11th, 2019

Diversity of Practices (continued)

Coordinating units of surface with units of length, a mathematical work accomplished by communities of scribes? Discussion based on some archaic tablets from Mesopotamia (ca 3500 to 2500 BCE)

Camille LECOMPTE & Christine PROUST
Arscan-Vepmo, University of Nanterre
& SPHERE, CNRS & University Paris Diderot

Commentator: Catherine Morice-Singh (SPHERE, Paris)

Among the oldest clay tablets that came down to us, some contain signs related to the quantification of surfaces. Other tablets, maybe a little later, contain signs related to the quantification of lengths. To which material realities, or to which calculation practices, do these notations refer? Do they reflect stable metrological systems? To what extent, and in which contexts, would these possible systems have been coordinated with each other? To answer these questions, the presentation discusses a small corpus of archaic tablets containing estimations of lengths or surfaces from Uruk and other cities.

Examining small variations in the problems of the section about rectangle in *Yang Hui's Mathematical Methods*: exploring clues of a pedagogical role in a treatise

Charlotte de VARENT
SPHERE & University Paris Diderot

Commentator: Robert Middeke-Conlin (MPIWG, Berlin)

The section about the rectangle of the first chapter of *Yang Hui's Mathematical Methods* (Book I) shows the use of similar numerical values in the multiplication of different quantities (lengths, weight, money …). By relating this chapter with the previous one which deals with an algorithm for multiplication, I will try to reconstruct the tasks that the reader had to perform in order to answer the problems raised in the treatise. This will lead me to explore the hypothesis that a link between the choice of numerical values, quantities, and possible pedagogical intentions can be established.

The paradigm for expressing mathematical methods relating to the right-angled triangle in the 13th-century *Mathematical Methods* and its influence on the 15th-century *Great Compendium*

ZHOU Xiaohan Célestin
IHNS, Chinese Academy of Science, Beijing

Commentator: Christine Proust (CNRS, SPHERE & University Paris Diderot)

The Nine Chapters on Mathematical Procedures (thereafter, *The Nine Chapters*) represented a very influential work during the period from the 13th century to the 15th century. Yang Hui's *Mathematical Methods Explaining in Detail The Nine Chapters*, (thereafter, *Mathematical Methods*, 1261 CE) and Wu Jing's *Great Compendium of Mathematical Methods of The Nine Chapters with Analogies* (thereafter, *Great Compendium*, 1450 CE) are extant precious mathematical writings in this period, which were based on *The Nine Chapters* and its former commentaries.

This research focuses on the chapter "Base and Height (*gougu*)" in these two books respectively. The chapters "Base and Height" contain problems relating to the right-angled triangle. On the basis of my comparison between the texts of the two chapters, I found the ways in which Wu Jing extracted texts from *Mathematical Methods* to compile the texts of *Great Compendium*. However, beyond the inheritance of mathematical text, did Wu Jing inherit and modify the way of expressing a mathematical method in *Mathematical Methods*?

To answer this question, I first show that in *Mathematical Methods*, the "explanation of the problem (*jieti*)" and the "diagram of the problem", together with the "method (*fa*)" and the "procedure of calculation (*cao*)", formed a paradigm for expressing a mathematical method, which did differ from the "procedure (*shu*)" in *The Nine Chapters*. This paradigm was mainly composed of verbal elements. However, some non-verbal elements, such as a diagram (*tu*) and the size of the printed character, were also crucial elements of this paradigm for expressing a mathematical method.

This paradigm first transforms concrete items of a problem into the items of a right-angled triangle. Then the paradigm gives a general method in the context of the right-angled triangle using big characters. Between sentences written in big characters, the inserted small characters and the diagram give the meaning of the operations written in big characters placed immediately before them. At last, the "procedure of calculation" applies the general method to the concrete problem, using small characters to present the concrete items and values.

Wu Jing took up this paradigm for expressing a procedure. In *Great Compendium*, the small characters placed directly after the expression "the method says" work with the diagrams placed after the expression "the answer says", and they transform the concrete problem into one that can be solved by a "method" in *Great Compendium*. In these "methods", Wu Jing first gave the items of a right-angled triangle, then he gave the items from the concrete problem, and, eventually, he gave the values of these items in the concrete problem or the result of this step of the calculation. The order for giving the three items is the same as in Yang Hui's writing.

I also show that Wu Jing made several small modifications to this paradigm. Wu Jing has partly changed the use of big characters, and the positions of the small characters in the "method" of *Great Compendium* are different from those in the "procedure of calculation" of *Mathematical Methods*. After modifying the paradigm for expressing a mathematical method in Yang Hui's work, the text under the expression "the method says" in *Great Compendium* presented a rudimentary form of formula and the process of using the formula to solve a concrete problem.

Justifying the applications of mathematics – a case-study with a one-liter vessel

Carlos GONÇALVES
University of São Paulo

Commentator: Daniel P. Morgan (SPHERE, CNRS & University Paris Diderot)

The mathematical cuneiform corpus contains several references to activities that have been described in the historiography of cuneiform mathematics as daily, practical, empirical and utilitarian, in opposition to the strictly mathematical contents of these texts. Usually, these texts are read as mere applications of mathematics to daily activities, and the reason why this can be done is simply taken from granted.

In this presentation, I will advance a complementary point of view, namely, that some cuneiform mathematical texts were also efforts to persuade their users that mathematics could be efficiently used to represent the world.

In order to exemplify this claim, I will analyze Problem 4 of mathematical tablet Haddad 104, an Old Babylonian text from the Diyala region. In this problem, the scribe works on data about a vessel, successively showing that each piece of information can be obtained from the remaining ones. I propose that this succession of almost redundant problems is aimed at showing that the more theoretical metrological volume and the more practical capacity, if appropriately dealt with, always match. As a consequence, texts such as this would not only be mathematical exercises in the traditional sense, but also arguments in favor of the utility of mathematics.

Friday, April 12th, 2019

Mathematical Practices in Astral Sciences

Testing calculations using observations in Babylonian astronomy

John STEELE
Brown University, Rhode Island

Commentator: Guillaume Toucas (University Paris-Sud)

The relationship between observation and the various systems of calculating lunar and planetary phenomena developed in Babylonia during the last four centuries BCE is never made explicit in the cuneiform texts themselves. The procedure texts simply present the various systems of mathematical astronomy in their final form, providing instructions for how to calculate with them with no indication of how the systems were developed or the role of observational data in their construction not any indication of how accurate the systems were believed to be. Indeed, alternate systems for calculating the same phenomena are often presented side-by-side in the procedure texts without any comment on which one is assumed to be better when they produce different results. In this talk I will present a newly identified, and apparently unique, exception to this general picture: a text which compares phenomena of Saturn calculated according to a simple system of mathematic astronomy with observations of those same phenomena. I will then discuss the implications of this discovery for our understanding of the relationship between observation and calculation in Babylonian astronomy and for the history of the development of Babylonian mathematical astronomy.

Shaping an astronomical computation: determining syzygies in Paris 1320-1340

Matthieu HUSSON
SYRTE, Observatoire de Paris

Commentator: Adeline Reynaud (University Paris Diderot, SPHERE)

Computing the exact time of new or full moon is, in many mathematical astronomy traditions, an important concern for astronomers especially as a first step to eclipses prediction. The luminaries' changing speed makes it also a difficult problem to solve. Around Paris, in between 1320 and 1340, a group of astronomers addressed this problem in about a dozen works that settled the question of this particular computation in Europe almost for the next two hundred years.

Their works rely on earlier traditions to create and explore various combinations of tables and procedures iterative or not. This corpus attests to a deep and original reflection both on the way this computation can be organized and of its astronomical meaning that we will seek to unravel in this presentation. The research that I will present here results from an ongoing collaboration with Richard Kremer and will be published in one of the SAW collective books.

Friday, April 12th, 2019

History & Historiography of mathematics

Elements of the history and the historiography of positioning on a calculating surface. Qin Jiushao's 秦九韶 *Writings on mathematics in Nine Chapters* 數書九章 as a case study

Karine CHEMLA
| SPHERE, CNRS & University Paris Diderot

Commentator: Sho Hirose (ETH Zürich)

Thanks to Zhu Yiwen's contribution to the SAW project, a mathematical culture different from the one to which *The Ten Canonical Texts of Mathematics* (*Suanjing shishu* 算經十書) attest has been identified. Zhu Yiwen uncovered the sources that reflect this other mathematical culture in the 7th century commentaries on Confucian classical texts. A key element of contrast between these two mathematical cultures lies in the fact that positioning on a surface on which computations are carried out plays a key part in the context of *The Ten Canonical Texts of Mathematics*, whereas in their mathematical practice, commentators on Confucian texts do not refer to any positioning of numerical values in the processes of computation. I have long argued that ways of positioning numbers on a calculating surface as attested in *The Ten Canonical Texts of Mathematics* were not simply meant to ease computations, but that they also conveyed meanings. Moreover, the persistence of this practice with the calculating surface is, in my view, a key marker of traditions that took *The Ten Canonical Texts of Mathematics* as their main reference. In this talk, my aim is to observe how historians of the past have dealt with "positions" to which Chinese mathematical sources attest. In other words, I want to focus on the historiography of a mathematical practice. My second aim is to show how paying attention to this practice when interpreting Qin Jiushao's 秦九韶

Writings on mathematics in Nine Chapters 數書九章, completed in 1247, reveals layers of meaning that have remained unnoticed. In other words, one cannot neatly separate knowledge and practice: this case study shows how they are in fact intertwined.

The shaping of the ancient Chinese Ta-yen rule by 19th century German scholars

Martina SCHNEIDER
Johannes Gutenberg University of Mainz

Commentator: Ivahn Smadja (University of Nantes)

In early 19th century Europe there was hardly any knowledge of ancient Chinese mathematics that was based on sources. This changed in 1856 when K. Biernatzki published a paper on Chinese arithmetic that was based on a paper by the missionary A. Wylie in Shanghai. Wylie had access to ancient Chinese sources. Biernatzki's paper was taken up quickly by many scholars in Europe during the second half of the 19th century.
In my talk I will focus on the reception of the Ta-yen rule in Germany. I will show in which ways Biernatzki adapted Wylie's paper, and how – on the basis of Biernatzki's work – M. Cantor, H. Hankel and L. Matthiessen came to quite different conclusions about the Ta-yen rule and Chinese mathematical skills in general.

Saturday, April 13th, 2019

Circulations and encounters

Fibonacci's *Liber Abaci* as a Cultural Mixture

ZHENG Fanglei
Qinghua University, Beijing

Commentator: Agathe Keller (CNRS, SPHERE & University Paris Diderot)

This presentation is a report on how I am trying to read Fibonacci's *Liber Abaci* from the perspective of mathematical cultures. I must admit that "mathematical culture" is an obscure term to me and I feel it doubtful. Nevertheless, it is still interesting to take certain generally accepted assumptions on mathematical cultures as the tools for the analysis of the *Liber Abaci*. It is assumed that one can distinguish between different scientific cultures and it is suggested that the distinction can be made on the basis of the bodies of knowledge actors uphold and the scientific practices they adopt; and also on the basis of epistemological facets of the knowledge. When we carry out this suggestion upon the *Liber Abaci*, it is obvious that this work of Fibonacci does not belong to any single culture, but several. According to different criteria, it includes "Indian" and "Arabic" and "Greek" bodies of mathematical knowledges, some of which are "practical" while the others are "theoretical" or both; it involves in arithmetic and geometry and algebra; much of the knowledge is introduced with its application in business, but there are also many "pure" "academic" contents. It seems that in general, Fibonacci just copied from different sources and put them in a single book in spite of their cultural heterogeneity, although this point remains to be confirmed by thorough comparison. While I can't see any consequences on these different contents after they are putting together in the *Liber Abaci*, this famous work is rather a mixture than a compound. If this is the fact, which means lack of innovation, we might have to ponder the significance of this way of compilation for the mathematics.

How long is the shadow of a gnomon? Lengthy discussions from the 'chapter of shadow lengths' (chāyādhikāra) of Kamalākara's *Siddhāntatattvaviveka* (1658 CE)

AJ MISRA
MPIWG, Berlin

Commentator: John Steele (Brown University)

The seventeenth century milieu of mathematical astronomy in Mughal India saw two families of immigrant Kāśī Brahmins vehemently debate the validity of Ptolemaic (Islamic) astronomy in their works. Munīśvara (belonging to the family of Devarātra Brahmins who emigrated from Dadhigrāma on the Payoṣṇī) and Kamalākara (belonging to the family of Bhāradvāja Brahmins who emigrated from Golagrāma on the Godāvarī) were two prominent astronomers from these families who held rather different views on the doctrines of the Pārasīkas (Persians).

Munīśvara (in his *Siddhāntasārvabhauma* 'Ground of all Treatise', 1646 CE) accepted certain Islamic trigonometric concepts but he maintained a strong aversion to the Islamic theory of precession of the equinoxes. On the other hand, Kamalākara was far more accepting of the Islamic astronomy of Ulugh Beg and the Samarqand school. In his canonical treatise, the *Siddhāntatattvaviveka* ('Investigation into the Truth of Treatises', 1658 CE), he offers his arguments in support of Islamic (Ptolemaic) planetary theory on several occasions. Of particular interest is his willingness to not only criticise Munīśvara but also take on more established astronomers like Bhāskara II (author of *Siddhāntaśiromaṇi* 'Jewel of all Treatises', 1150 CE) when he found an error in their methods.

In this talk, I will discuss Kamalākara's arguments against the methods of

Munīśvara and Bhāskara II for computing visible shadow length (*dṛṣṭa-bhā*) of a gnomon with respect to a planet's position in the sky. In essence, Kamalākara draws the readers'attention to the subtle trigonometric error in his predecessor's works, and by doing so, attempts to validate the acuity of his own method of computation. While we currently do not know if Kamalākara's method was the product of his own ingenuity or if its inspiration rests in some Islamic texts on the subject, nevertheless, Kamalākara's attempt to refute, reshape, and reconcile ideas of mixed origins certainly fits the culture of mathematical astronomy in Mughal India.

Inventing classics: CHEN Jinmo's mathematical practices in interpreting *Mathematical Canon on the Gnomon of the Zhou* (*Zhoubi suanjing*) in relation to his reception of knowledge about the geometric square introduced from Europe into late Ming China

PAN Shuyuan
IHNS, Chinese Academy of Science, Beijing

Commentator: David Rabouin (CNRS, SPHERE & University Paris Diderot)

In the late 16th and early 17th century, a vast amount of mathematical knowledge was brought by Jesuits from Europe to China, and this knowledge elicited diverse responses. The geometric square, named as *judu* (矩度, lit. 'Square for Measuring') in Chinese, in the translated works *Methods and Explanations of Measurement* (*Celiang fa yi* (測量法義, 1607-1610) and *Complete Explanations of Measurement* (*Celiang fa yi* (測量全義, 1631), was one of the main surveying instruments introduced that time. On account of some similarity between the principle of its use and that of the knowledge of the right-angled triangle (*gou-gu* 句股, lit. 'base and height') for surveying in ancient and medieval China, the geometric square was accepted by some Chinese scholars without delay. The Confucian CHEN Jinmo 陳藎謨 (1597-ca. 1692) was one of those whose swift adoption of the geometric square is documented.

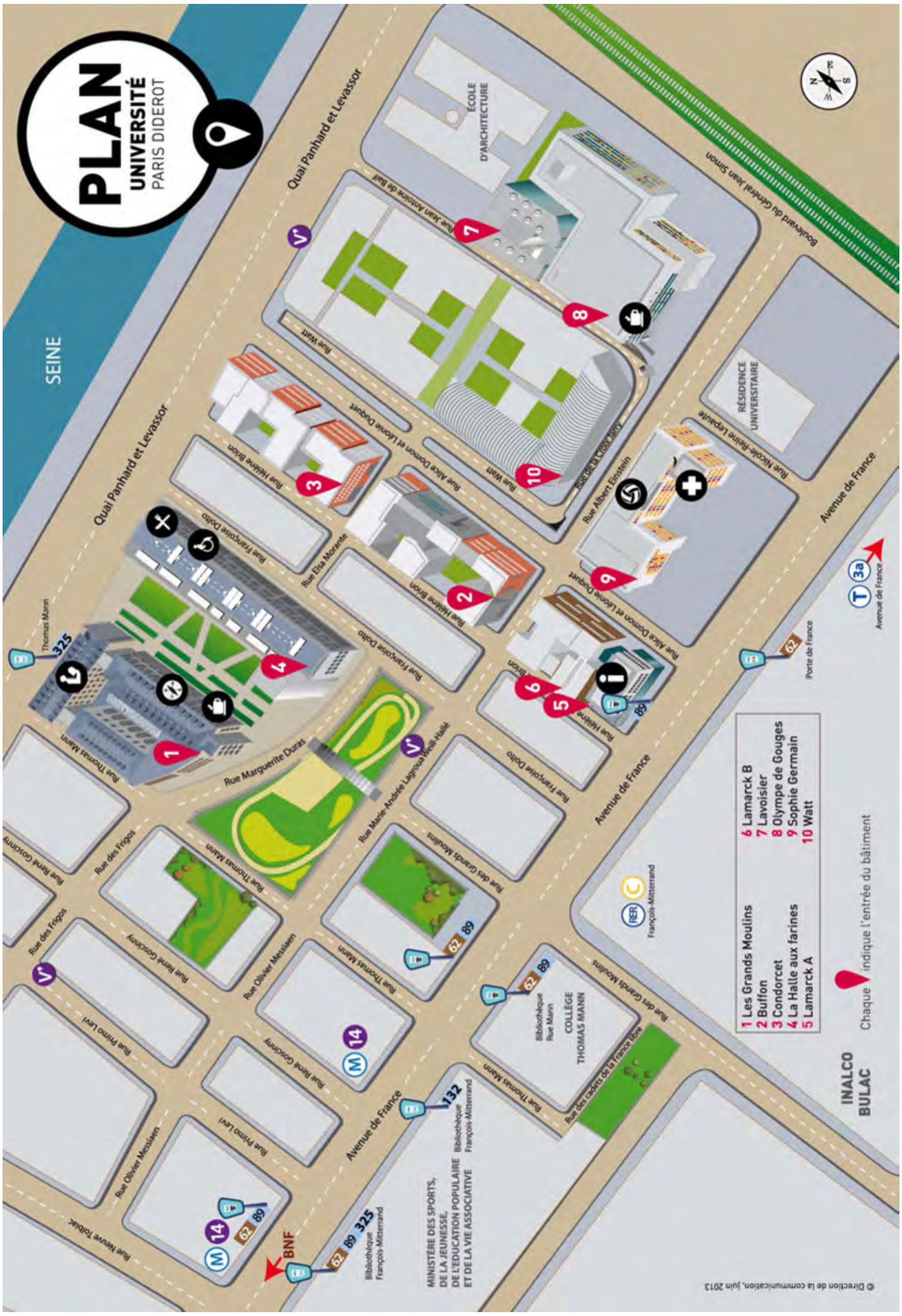
In CHEN's treatise *Surveying by [Ju]du* (*Du ce* 度測 ca.1614), the knowledge about the geometric square is mainly presented on the basis of the *Celiang fa yi*, on the one hand, and it is compiled and discussed entirely in the context of *Mathematical Canon on the Gnomon of the Zhou* (*Zhoubi suanjing* (周髀算經, hereafter *The Gnomon of the Zhou*), the ancient Chinese Classic dealing mainly with astronomical measurement, on the other. In fact, CHEN considered *The Gnomon of the Zhou* as the canon of the right-angled triangle, and viewed *Celiang fayi* as its commentary and interpretation (*shu zhuan* 疏傳). At the beginning of *Surveying by* [*Ju*]*du* , CHEN added explanatory notes (*quan* 詮) to the first part of *The Gnomon of the Zhou* sentence by sentence, in order to reveal that the very classic is the basis and origin of the geometric square, and to draw the conclusion that the "Western" surveying method is reliable. These explanatory notes show how, in the culture of classics and commentaries, CHEN understood the original words of the *The Gnomon of the Zhou* according to the shape and use of the geometric square, and how also he disagreed with the ancient commentary by Zhao Shuang 趙爽 (c. 3rd century). Through his interpretation, CHEN made a version of the *The Gnomon of the Zhou* on his own terms, and achieved conformity between the classic and the knowledge about the geometric square. In this regard, CHEN's work is remarkably and particularly significant in order to investigate Chinese scholars' approach to integrating the mathematics introduced from Europe into the related tradition in China.

Astral science practices of Philippe de La Hire in early modern China

LI Liang
Institute for the History of Natural Sciences, CAS

Commentator: Eric Gurevitch (University of Chicago)

Philippe de La Hire (1640-1718) was a mathematician and an observational astronomer, and he was also a key figure in the Académie royale des sciences. In 1702, La Hire published a set of astronomical tables named *Tabulæ astronomicæ* in Latin text, which was reprinted in 1727 and translated into French in 1735. Unlike his contemporaneous and former astronomers, he paid more attention to the astronomical practices than to theories. *Tabulæ astronomicæ* describes how to use tables for solving astronomical problems, and this book was introduced to China and India by Jesuits not long after its publication. Most astronomical tables of La Hire in this book were explained in a Chinese manuscript *Lifa wenda* (*Dialogue on mathematical astronomy*, finished ca. 1713-1716) by a Burgundy French Jesuit Jean-François Foucquet (1665-1741), who was active in the Jesuit China missions for two decades. This presentation will discuss how the tables of La Hire were used for the calculations of eclipses and planetary motions in early modern China. I will also address the differences in operation between the tables of La Hire and Chinese traditional ones, and the impact of the new knowledge of La Hire on Chinese astronomy.



Venue:
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Access to the 5th floor will be given in exchange for an ID document (passport, etc) at the security counter at the entrance of the building,

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