

SAW Conference on Writing histories of ancient mathematics – Reflecting on past practices and opening the future, 18th-21st centuries

24-28 Octobre, 2016

organized by

Karine Chemla, Agathe Keller, Christine Proust and the SAW group
Université Paris Diderot, Condorcet Building room 366A Klimt- 9:30 am to 5:30 pm

Presentation

The aim of this conference is to explore various facets of historical approaches to ancient mathematical sciences between the 18th and 21st centuries, especially those attested to by sources written in Chinese, the languages of the Indian subcontinent and cuneiform script. We focus on diverse milieus who wrote about ancient mathematics (orientalists, Confucian scholars, Indian pandits, mathematicians, philologists, missionaries, philosophers, teachers, etc), analyzing the issues and sources they privileged, their methods of inquiry and interpretation, the values and images of mathematics they prized, the networks and the institutions to which they belonged and the contexts in which they carried out their historical work. The various types of uses of history of mathematics in specific communities will be equally at the center of our interest.

Ce colloque a pour objectif d'explorer diverses facettes d'histoires des mathématiques anciennes produites entre le XVIII^e et le XXI^e siècles, en particulier de celles de ces histoires qui ont pris pour objet des sources écrites en chinois, dans les langues du sous-continent indien ou en cunéiforme. Nous nous pencherons sur différents milieux qui se sont intéressés à ces mathématiques (orientalistes, érudits confucéens, pandits, mathématiciens, philologues, missionnaires, philosophes, enseignants, etc). Nos analyses porteront sur les questions et les documents qu'ils ont choisi de retenir, sur leurs méthodes d'enquête et d'interprétation, sur les valeurs et les images des mathématiques que ces acteurs privilégiaient, sur les réseaux et les institutions auxquels ils appartenaient et, enfin, sur les contextes dans lesquels ils ont mené leurs travaux historiques. Nous nous intéresserons également aux différents types d'usage de ces histoires des mathématiques.

Programme

Monday October 24th, 2016 - Condorcet Building room 366A Klimt

Uses of histories of mathematics

9:30 – 9:40 - Introduction

9:40 – 11:10 - Chair : Tian Miao

GUO Jinhai (Institute for the History of Natural Sciences, CAS, Beijing 100190, China)

The Use of Ancient Chinese Mathematical Texts in the New Schools established during the Late Qing Dynasty

Abstract – Mathematics was unprecedentedly appreciated by the Qing government, and mathematical education became an important component of scientific education after the rise of the Self-Strengthening Movement in the 1860s. At that time, in the context of a second phase of importation of knowledge coming from the West, modern mathematical knowledge including analytic geometry and calculus were introduced into China. Ancient Chinese mathematics was inferior in level by comparison with Western mathematics. However, although much Western mathematical knowledge that became known at that time in China was incorporated into mathematical courses in new schools, ancient Chinese mathematics was also included in these courses as well. In this paper, the author examines how ancient Chinese mathematical texts were used in the teaching of new schools and how the use of these texts was combined with the use of Western mathematics. At the same time, the author analyses the reasons why ancient Chinese mathematics was included in the teaching of new schools and what was the aim of teachers in using these texts. Furthermore, the author shows the close relations between the adoption of ancient Chinese mathematics in the teaching of new schools and the cultural circles' thought and educational system and teachers' level and other factors of the late Qing Dynasty, and establishes that westernization of mathematical education was an irresistible historical trend at that time.

Commentators: **Christine Proust, Hirose Sho**

11:30 -13:00 - Chair : Tian Miao

Dhruv Raina (Jawaharlal Nehru University, Delhi, India & SAW Project)

The Translation of Sanskrit and English Mathematical Works: The Relationship between the History and Contemporaneity of Mathematics in Nineteenth Century India and England

Abstract – Towards the end of the eighteenth century British Indology, in part guided by the reflections of mathematicians associated with the Scottish Enlightenment such as John Playfair, began exploring the traditions of Indian astronomy and mathematics. These explorations and search for Sanskrit manuscripts did not commence de nouveau but were informed by the imaginaries invented by several Indological traditions that preceded this effort. These early efforts culminated in the invention of a canon that was said to characterise the Indian mathematical tradition and set of the collection and translation of Sanskrit manuscripts. It could be argued that with the publication of Colebrooke's *Algebra*, a phase of British Indology comes to an end. In the next phase tropes and memes concerning the Indian mathematical tradition that appeared in Colebrooke's opus circulated amongst networks of European mathematicians and stabilised in their writings. 'The Analytics' amongst whom we could count George Peacock and August De Morgan engaged historically with these histories of the Indian mathematical tradition for a variety of reasons. This paper attempts to show the close relationship between their efforts to find a place for mathematics teaching in a liberal curriculum in England, their explorations into the history of mathematics in order to bring some clarity into mathematics teaching and the practice of mathematics and their own scientific research. In India on the other hand, this paper attempts to argue that East India Company officials, involved in education in India, drawing inspiration from the works of Colebrooke, sought to employ algebra as a bridge between the British mathematics curriculum and the multiplicity of South Asian mathematical curricula. In particular, I shall attempt to discuss the efforts of George Jervis Ritso who commissioned the translation of De Morgan's *Elements of Algebra* and the *Elements of Arithmetic* into Marathi and Gujarati.

Commentators: **Chen Zhihui Alfred, Justin Smith**

14:15 -15:45 – Chair : Florence Hsia

Jiří Hudeček (International Sinological Centre, Praha, Czech Republic)

History of mathematics in the service of modernization in 20th century China

Abstract – Throughout the twentieth century, Chinese elites strived to establish a new culture suitable for the modern age. Radical Westernizers and cultural conservatives had different visions of what this new culture should be like, but everyone agreed on the central role of mathematization and mathematics as a

defining feature of modernization. History of mathematics was to the Chinese consequently always much more than just an account of the development of a discipline and its internal structure. It was at the same time a narrative of modernization, a gauge of the relative merits and deficiencies of Chinese traditional society and culture, and a link connecting modernization and these said traditions, to name but a few types of appropriation of history of mathematics. This paper exemplifies these strategies of appropriation on the cases of the historian of mathematics Qian Baocong (1892-1974), and mathematicians Hua Loo-Keng (1910-1985) and Wu Wen-Tsun (1919-). Qian Baocong was one of the creators of history of Chinese mathematics, which he linked with the strength and fortunes of Chinese civilization as a whole. In the 1930s and 40s, he became especially interested in comparative history, which underscored China's mathematical creativity and questioned the thesis that China only ever prospered due to cultural transmission from abroad. Hua Loo-Keng, for more than thirty years the Director of the Institute of Mathematics, Chinese Academy of Sciences, used history of Chinese mathematics to promote confidence of Chinese youth in their ability to excel in mathematics, and thus to promote its popularization as a key part of Chinese modernization. His commitment to popularization first surfaced in late 1950s and early 1960 through his involvement in the establishment of a mathematical competition for secondary schools, for which he wrote several brochures laying out important branches of mathematics as expansion of problems historically treated by Chinese mathematics. Finally, the erstwhile algebraic topologist Wu Wen-Tsun combined Qian Baocong's comparative approach with Hua's way of starting from Chinese mathematical history to develop a modern mathematical theory when designing and, crucially, defending his "mechanization of mathematics" in the late 1970s and 1980s. The juxtaposition of these three stories, spanning almost six decades, highlights how modernization, in various forms and through various channels, informed the interests of Chinese professional historians of mathematics and elite mathematicians looking at their discipline in particular historical circumstances.

Commentators: **Agathe Keller, Pierre Chaigneau**

15:45 -17:30 – Chair : Florence Hsia

Ksenia Tatarchenko (Université de Genève, Suisse)

Old Truths for Tomorrow: Cold War Computing, Disciplinary Myth-making, and the Histories of Ancient Mathematics in the Soviet Union

Abstract – Volume no. 122 of Springer Lecture Notes in Computer Science appeared in 1981, in the established form of post-proceedings, that is to say, reporting the latest original research results described at a scientific meeting. However, its rather conventional title, *Algorithms in Modern Mathematics and Computer Science*, does not speak to the most puzzling facts about the meeting and the resulting publication. The pair of editors and meeting organizers behind the

publication were none other than Donald Knuth and Andrei Ershov, the latter being a Soviet scientist and the former his American counterpart who were collaborating despite the outset of the war in Afghanistan. The meeting itself was held in the fall of 1979 in the Uzbek city of Urgench. What is more, history held a prominent place at this scientific gathering. The 80-pages long contribution that opens the proceedings is devoted to al-Kwarizmi, a medieval mathematician whose name was at the origin of the word of “algorithm.” In the foreword, the editors partially solved the puzzling choice of the meeting’s location by calling their gathering a “pilgrimage.” They explained their usage of history as a unique feature that distinguished the gathering from what they called “ordinary” symposiums: “We believe that the desert setting and the atmosphere of history ... should help inspire us to thoughts of a more penetrating, far-sighted, and philosophical nature.” Thus, thanks to such extraordinary choices, Urgench was transformed into a symbolic location, tying the deepness of ancient past to scientific insight, and, as a consequence, connecting Central Asian history with the future development of computer science. Hidden beneath the generic, grey cover of the Springer volume, these discursive strategies and usages of the history of ancient mathematics demand a systematic analysis to inform the connections between the making of communities and the political stakes of mathematical universalism. In this paper, I study the Urgench gathering based on the materials preserved in the Ershov electronic archive and aim to account for the memory construction and high stakes associated with the historicization of scientific legitimacy. First, I contextualize the conference’s origins in the Soviet tradition for teaching the history of mathematics. Next, I elucidate how the narratives about the ancient history of mathematics were mobilized for the creation of a new Cold War discipline, computer science. Finally, I focus on the afterlife of the conference materials in 1983, when the Soviet Union was celebrating the 1200th anniversary of al-Kwarizmi to interrogate the links between international disciplinary myth-making, Soviet scientific popularization, and emerging nationalist discourses.

Commentators: **Baptiste Méléès, Dhruv Raina**

Tuesday October 25th, 2016 - Condorcet Building room 366A Klimt

Varieties of mathematical knowledge and practices used to read ancient texts

9:30 – 11:00 - Chair : Ksenia Tatarchenko

Zhou Xiaohan (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot)

Diverse scholars' Ways of dealing with the "Method Duoji" (Duoji Shu) in 19th and 20th China

Abstract – *Siyuan Yujian* (Jade Mirror of the Four Unknowns), which was completed by Zhu Shijie in 1303, is a mathematical monograph mainly devoted to the "method of *Siyuan*" (use of four unknowns to solve questions with higher degree algebraic equations). Three sections of this book deal with a specific type of questions, that is, knowing the sum of a series of numbers of hay bales, one asks the number of layers of the haystack. Analogical questions were also given like recruiting troops with an increasing amount of days and calculating the layers of different shapes of fruit piles. However, in his 1303 book, Zhu only gave the first step and the last step of the solution (one question has a simple note by Zhu). Later mathematicians and historians studied this book, attempting to restore its author's procedures. In 1922, Qian Baocong (1892-1974) published a paper on this topic, using modern mathematical series symbols to prove the correctness of several theorems about mathematical series. He stated that Zhu has used these "theorems" in his book. In later studies by Tang Tiandong (1926), Li Yan (1929), and Fang Zhushu (1939), modern symbols and formulas for mathematical series are usually used for interpreting these three sections in Zhu's work, but they are used in diverse ways. I will address how the historians in 1920s and 1930s used modern symbols and formulas to interpret Zhu's questions.

On the other hand, several Qing dynasty scholars also studied this topic, and I focus on two of the earliest ones. They all wrote commentaries on these sections without using modern mathematical symbols, formulas or equations. For example, Luo Shilin (1789-1853) listed the numbers of different layers of the pile and used multiplications of two lists of numbers to disclose how a new series of numbers was constructed. Shen Qinpei (fl. 1820) used the figure of series of numbers to interpret the meaning of "*Luoyi*" (fall one), a term whose semantic meaning was also noticed by former 20th century historians. My paper will use a few case studies to compare these 19th and 20th century scholars's ways of expressing and interpreting the text.

Commentators: **Catherine Morice-Singh, Adeline Reynaud**

11:30 -13:00 - Chair : Ksenia Tatarchenko

Chaigneau, Pierre (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot, France)
& **Mélès, Baptiste** (Archives Henri Poincaré, Paris)

On formulas for computing both the volume of a truncated pyramid and the circumference of hermeneutic circles

Abstract – If translating ancient mathematical texts into a sequence of modern algebraic formulas can no longer be assumed to be a transparent operation, isn't it precisely because such operation conveys special information on the resources and beliefs engaged by a commentator when reading an ancient text in this way? In this talk we account for a first step undertaken in order to circumvent how special and rich this information can be for historiographical investigations. What is the meaning behind a particular choice of symbols and algebraic expressions in order to account for the so-called "mathematical content" of an ancient text? Is a formula at the beginning or at the end of the interpretation process? How various types of formulas given by commentators can be correlated with what they actually say about the ancient text? Such issues are addressed through the study of a small group of commentaries from the 1930's all focused on a particular mathematical Old Babylonian problem dealing with the volume of a truncated pyramid.

Commentators: **David Rabouin, Alexis Trouillot**

14:15 -15:45 – Chair : Guo Jinhai

Smadja, Ivahn (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot)

Making Sense of Brahmagupta: European Selves in the Mirror of Ancient Sanskrit Mathematical Sources

Abstract – As a result of Colebrooke's 1817 English translations of Brahmagupta's and Bhaskara's mathematical works spreading across Europe among scholarly circles, the French geometer Michel Chasles pointed out the importance of a group of so-called *sutras* within the mathematical chapters of Brahmagupta's *Brahmasphuta-siddhanta*, viz. XII 21-38. He argued that in spite of the *sutras* being mere statements unsupported by individual proofs, the whole system of them made sense as providing a unified geometrical theory which, in his view, would solve completely, with precision and in all its generality, one single question, viz. how to construct a cyclic quadrilateral whose sides, diagonals, perpendiculars, segments and area, as well as the diameter of the circumscribed circle, may be expressed in rational numbers.

A few years later, this interpretive puzzle and Chasles' purported solution to it aroused renewed interest in Germany. At about the same time he developed his theory of ideal numbers, E. E. Kummer fell under the spell of Brahmagupta's

quadrilaterals. In connecting the problem of rational quadrilaterals – suitably transposed into an algebraic Framework – with Eulerian techniques in Diophantine analysis, Kummer decisively established – through reconstructing Brahmagupta's methods – that Chasles had wrongly imputed full generality to Brahmagupta's theory. Kummer also tackled the problem anew with new tools so as to achieve the very generality presumably inaccessible to ancient methods. In so doing, he launched a new topic – « rational quadrilaterals » – leading up to results by L. J. Mordell in 1960. Kummer's main arguments against Chasles' claim interestingly pertained to the compared strength of ancient and modern methods.

Eventually, more than two decades later, by virtue of his conjoining philological precision and mathematical expertise, Hermann Hankel outlined an alternative interpretation of Brahmagupta's quadrilateral theory, XII 21-38 – an interpretation which happened to do justice to Chasles' main insight, though in a minor key, while taking into account Kummer's welcome rectification. One will unfold this reading against the backdrop of Chasles' and Kummer's previous attempts, thereby showing how it also qualifies as the cornerstone of Hankel's characterization of so-called Indian intuitive 'proofs', by contrast to Greek deductive ones.

Commentators: **Karine Chemla, Eric Vandendriessche**

15:45 -17:30 – Chair : Guo Jinhai

Agathe Keller (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot)

A Historiographical Exploration of Āryabhaṭa's verses on Indeterminate Problems of the First Degree

Abstract – In 1874, H. Kern (1833-1917) published an edition of the *Āryabhaṭīya* with Parameśvara's commentary on it, providing a source-text for the oldest known testimony of indeterminate problems of the first degree in the Indian subcontinent. Léon Rodet (1832?-1895) followed by G. R. Kaye (1866-1929) subsequently discussed Āryabhaṭa's contributions to the *kuṭṭaka* ("pulveriser" a method of resolution of problems of indeterminate analysis of the first degree) which soon became the object of a debate. Sarada Kanta Ganguli (b. 1881) and Bibhutibhusan Datta (1881-1958) in their wider endeavor to show that India had an authentic valuable mathematical past, also wrote articles to explain how they understood Āryabhaṭa's rules. This paper will compare the mathematical tools employed to describe Āryabhaṭa's *kuṭṭaka*, how each author inserted this topic within wider narratives of history of mathematics and specific conceptions of what a mathematical text should be. Finally, how these points of view impacted the research on this topic in the 20th century will also be discussed.

Commentators: **Emilie Villey, Ksenia Tatarchenko**

Wednesday October 26th, 2016 - Condorcet Building room 366A Klimt

Actors in early histories of mathematics and astral sciences

9:30 – 11:00 - Chair : Francesca Rochberg

Han Qi (IHNS, Chinese Academy of Sciences, Beijing, China)

Creating a New Paradigm: Mei Juecheng (1681-1764) and His Use of European Algebra in the Interpretation of Chinese Traditional Mathematics

Abstract – Mei Juecheng (1681-1763), the grandson of Qing mathematician Mei Wending (1633–1721), was a renowned mathematician and astronomer during the Kangxi reign. In 1712 he was recruited to the court as a mathematician and in the following year joined the Mengyangzhai (an imperial bureau created to synthesize Western and Chinese scientific knowledge) as one of the chief editors of *Lüli yuanyuan* (1713-1722), a compendium on music, mathematics, and astronomy. Studying European algebra enabled Mei Juecheng to decipher older Chinese mathematical treatises from the Song (960–1279) and Yuan (1271–1368) dynasties whose methods had been lost. This led him to expound a theory of the Chinese origin of Western knowledge, which was proposed by the Kangxi emperor in 1703. Mei Juecheng's way in appropriating European algebra created a new paradigm and helped to revive interest in traditional Chinese mathematics and remained highly influential for many decades.

Commentators: Agathe Keller, Charlotte de Varent

11:30 -13:00 - Chair : Francesca Rochberg

Florence Hsia (University of Wisconsin, USA)

How to talk about Chinese astronomy?

Abstract – At the beginning of the eighteenth century, most members of the European Republic of Letters curious about Chinese astronomy had two kinds of resources at their collective disposal. First-hand experience of contemporary Chinese astronomical practices and concepts could be drawn from Jesuit testimonies principally told to highlight and sustain the recent triumph of missionary-authored texts and tables within the imperial Astronomical Bureau; glimpses of older ideas about the stars could be gleaned from annalistic presentations of China's millenia-long history. In neither case was Chinese astronomy itself the object of inquiry. With the publication of Antoine Gaubil's studies as part of the *Observations mathématiques, astronomiques, géographiques, chronologiques, et physiques, tirées des anciens livres chinois, ou faites*

nouvellement aux Indes et à la Chine par les pères de la compagnie de Jésus (1729–1732), however, this was no longer the case. But how did Gaubil write about astronomy as thought and practiced within the historically fluctuating boundaries of ‘China’? Were there any precedents for his analysis, and what relevance do his studies have for the contours and emphases of later scholarship? This paper uses Gaubil’s Observations as a retrospective and prospective lens onto how the discursive formation denominated as Chinese astronomy comes into being.

Commentators: **Daniel Morgan, Martina Schneider**

Thursday October 27th, 2016 - Condorcet Building room 366A Klimt

Making sense of the diversity of mathematics

9:30 – 11:00 - Chair : Han Qi

Tian Miao (IHNS, Chinese Academy of Sciences, Beijing, China)

Historical study and the Practices of mathematics in 18th and 19th century China

Abstract – In the context of the research of intellectual history in the 17th century, and with the process of the rediscovery and revival of ancient mathematical texts, historical study of mathematics in China became a fruitful field in 19th century China. In this paper, through a detailed study of works by Li Rui and Jiao Xun, two leading Chinese mathematicians in that period of time, I will focus on the following aspects:

- 1) The purpose of their study of history of mathematics;
- 2) The method they used in their work;
- 3) The relationship between their historical research and mathematical research.

I will also provide an introduction about historical and cultural context of the history of mathematics in the 19th century, and analyze how political and cultural factors played a role in the shaping of historiography of mathematics in 19th century.

Commentators: **Hiromi Mizuno, Jiří Hudeček**

11:30 -13:00 - Chair : Han Qi

Chen Zhihui (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot)

Shifting to sinological tradition and science: Alexander Wylie's study on the history of astral sciences in China, with a comparison with his historiography of mathematics

Abstract – In 1867, Wylie published an annotated catalogue of Chinese books entitled *Notes on Chinese Literature*. Different from the catalogues of Chinese books compiled by the previous European sinologists on the basis of the collections in the libraries to which they had access, Wylie followed the suggestion by Abel-Rémusat and catalogued Chinese books in terms of the divisions and subdivisions system in the *Siku quanshu zongmu* (Catalogue of the Complete library of the four branches). The subdivision “Astronomy and Mathematics” in the *Notes on Chinese Literature*, which introduces 108 books, is a much more complete catalogue of Chinese books on mathematics and astral sciences in a Western language than anything previously published. On the other hand, Wylie collected over one thousand eclipses records from ancient Chinese books by using the knowledge included in his bibliography. His study on Chinese eclipses records continued and developed the tradition of Chinese astronomical records study established from French sinologists Antoine Gaubil and the Biot father and son, for the purpose of contributing the study of history and of science.

With respect to the sources used, the approach adopted, the features of his translations and the purpose, Wylie's study of the history of astral sciences in China is conspicuously different from his writing of the history of mathematics in the 1850s. The latter relies on interpretations of ancient mathematical works given by Chinese scholars, and uses the comparative method, through translating Chinese terms into corresponding mathematical English words. Moreover, his historiography of mathematics leads him to the conclusion that the Chinese had the same scientific spirit as the European people did. This conclusion was strongly linked with the Christian idea that “all people are equal in the eyes of the God” and it became the theoretical foundation of the British missionaries' strategy, which was to introduce the advanced sciences from Europe and thereby preach Christianity. By contrast with this comparative and theology-oriented historiography of mathematics to which his early works attest, Wylie's study of the eclipses records—his representative work in the history of astral sciences— shifts to collecting scientific data from ancient Chinese works. It thus presents some continuity with a historiography developed by an earlier European sinological tradition and also a scientific orientation.

Commentators: **Dhruv Raina, Florence Hsia**

14:15 -15:45 - Chair : Jiří Hudeček

Martina Schneider (ERC Project SAW & Mainz Universität, Germany) & **Karine Chemla** (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot, France)

The reception of Alexander Wylie's Jottings on the science of the Chinese. Arithmetic in Europe in the 19th century

Abstract – The publication in 1852 of Alexander Wylie's *Jottings on the science of the Chinese. Arithmetic* marked a shift in the European knowledge and understanding about the history of mathematics in China. This long article was reprinted several times in the subsequent decades. However, as Ulrich Libbrecht established it in his *Chinese Mathematics in the Thirteenth Century : The Shu-shu Chiu-Chang of Ch'in Chiu-Shao* (MIT Press, 1973), it was rather through its “translations” and reviews that the new knowledge Wylie presented on the topic was received in Europe in the second half of the 19th century.

Indeed, Wylie's *Jottings* was “translated” into German by K. L. Biernatzki in 1856, under the title 'Die Arithmetik der Chinesen' (*Journal für die reine und angewandte Mathematik*). Moreover, it was the latter version, and not Wylie's original text, that was in turn “translated” into French by Olry Terquem (1782-1862), and published in two parts (respectively, 1862 and 1863) in the context of the *Nouvelles annales de mathématiques, journal des candidats aux écoles polytechnique et normale*. It was also Biernatzki's article that was the object of Joseph Bertrand's (1822-1900) two-part review published in the *Journal des Savants* in 1869. In addition, several German publications, by Moritz Cantor (1858, 1880), Hermann Hankel (1874), and Ludwig Matthiessen (the latter published in fact a set of articles on related issues between 1874 and 1881), testify to a reception through Biernatzki's article. Ulrich Libbrecht has already shown the impact of the mistakes committed by Biernatzki in his translation on the European appreciation and interpretation of the mathematics from ancient China.

In our article, we would like to examine in greater detail the contexts in which the original publication, and its various receptions were produced, and we will in particular shed light on these authors' motivations for being interested in this topic. Our purpose is to explore how these contexts and motivations can help account for the ways in which Wylie's text was transformed by each of these actors, and for how in the end it was received. One of our main foci will be on the different representations of the history of mathematics in China that were shaped in these accounts.

Commentators: **Ivahn Smadja, Wang Xiaofei**

14:15 -15:45 - Chair : Jiří Hudeček

Christine Proust (SAW Project & SPHERE - CNRS & Université Paris Diderot)

David Eugene Smith and the writing of the history of mathematics: number stories

Abstract – David Eugene Smith (Cortland 1860 – New-York 1944) was a key actor in an international network in which the history of mathematics took shape in the early 20th century. A great traveler and an avid collector, he was involved in the main programs in the United States for popularizing “oriental mathematics”, to use his own words. At the same time, he was in charge of the education of mathematics teachers in various institutions, including Columbia University. His first and main concern was the improvement of mathematics education. At the core of Smith's interests for collections, for the history of mathematics, and for teaching, was his predilection for arithmetic, and more specifically, for numbers. This paper analyses Smith's specific way of writing the history of mathematics. It examines how his history writing draws on his collections of books and instruments, how this history is dependent on the mathematical curricula practiced in North American high schools in the early 20th century, and how his discourses incorporated the new mathematical sources imported through translations from various parts of the world. This analysis is based on one of the most popular among Smith's books, that is, *History of Mathematics* (volume I, 1923, volume II, 1925). A specific attention is devoted to the way in which Smith deals with classifications of numbers in his book. The particular case of cuneiform sources is considered in detail.

Commentators: **Carlos Gonçalves, David Rabouin**

Friday October 28th, 2016 - Condorcet Building room 366A Klimt

Cultural histories of mathematics

9:30 – 11:00 - Chair : Dhruv Raina

Hiromi Mizuno (University of Minnesota, USA) & **Karine Chemla** (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot, France)

Mikami Yoshio: From the philosophy of mathematics to cultural history of mathematics, and finally scholarly history of mathematics in China

Abstract – In 1913, the historian and philosopher of mathematics Mikami Yoshio (1875-1950) published in Germany the first book-long treatment of the history of mathematics in China ever written in an European language: *The development of mathematics in China and Japan*. One year later, in 1914, the publishing house Open Court at Chicago printed a joint book by David Eugene Smith and Mikami Yoshio (in this order), entitled *A history of Japanese mathematics*.

To begin with, this article explores the contexts and the circumstances in which these two books were written. This requires paying attention to the ways in which, after the Meiji restoration of 1868, the mathematical education provided in Japanese schools abruptly changed, mathematics imported from the West (later referred to as *yosan*) swiftly replacing the knowledge and practices previously developed and taught in Japan (by contrast, referred to as *wasan*). It seems that in this context, the young Mikami studied precisely the “new” mathematics and also English. He further developed an interest in the philosophy of mathematics, in relation to which he entered in contact with milieus in the United States dealing with newly developed geometries (like non-Euclidean geometries), and the philosophical discussion to which they had given rise. Among these milieus, were those active around the journal *The Monist*, in particular the chief editor, Paul Carus (who had established the publishing house Open Court and also had an interest in Japan), and George Bruce Halsted (1853-1922). Mikami seems to have taken part in the effort of translating key texts on the new geometries into Japanese, among which texts by Halsted himself. During the same years, the mathematical practices and knowledge that had been developed in Japan in the previous decades (*wasan*), and that had been eliminated from the official curricula, shifted from being a practice of mathematics into becoming a topic of historical inquiries, as is demonstrated by the book the *wasan* practitioner Endo Toshisada (1843-1915) published in 1897, under the title *Dai-Nippon Sugakushi* (A history of mathematics in Great Japan). It seems that it was Halsted who in 1905 encouraged Mikami to introduce *wasan* to the West, which led Mikami to become interested in *wasan* and caused a radical reorientation of Mikami’s interests. The first part of our article will thus examine how in this first part of his life, Mikami mingled interest

in mathematics from the West and from Japan, and established contacts with actors involved in all these types of mathematical activity.

Next, our article puts forward the thesis that one can distinguish at least three phases in the types of historiography of mathematics in China and Japan that Mikami produced. The first phase extends between his first article on the topic, apparently in 1905, and 1918, when he published a revised and expanded edition of Endo's opus magnum. This phase is marked by the fact that Mikami seems to write extensively (and perhaps almost exclusively?) in English. This phase is also characterized by the fact that Mikami concentrates on mathematics *stricto sensu*. His historiography *at the time* is one that places its main emphasis on a comparison between East and West, and attempts to identify the main features characterizing the East in opposition to the West. In carrying out this comparison, Mikami displays an extensive knowledge about the history of mathematics in Europe. In these years, China is moreover treated in continuity with Japan, and mathematical books produced in these languages are read and assessed, using modern concepts and ideas, including historiographic ideas widespread in Western countries at the time (e.g., calculation is an activity inferior to proof). We will examine how the opposition between East and West is shaped.

Even though the theme that mathematics was an art in Japan is already present in these publications, it plays a minor role in Mikami's history of mathematics. The end of the 1910s and the 1920s constitutes the second phase we distinguish. These years seem to testify to a shift in Mikami's historiography, which goes along with the fact that he now publishes extensively (and perhaps even exclusively) in Japanese. In a context in which cultural history seems to develop actively in Japan, Mikami appears to have produced one of the earliest cultural histories in Japanese, one dealing precisely with mathematics (*Japanese mathematics as seen from cultural history*, 1922), followed by a *The Characteristics of mathematics in China* (1926, translated into Chinese under the title 中國算學之特色 in 1929). He now embraces a view of Japan as an entity separate from China, and having specificities in and of itself, which leave their hallmark on every domain of cultural activity (music, etc), including mathematics. As a result, he claims, the mathematics, music, etc, of Japan are different from those of other nations, and, moreover, they should not be considered separately, independently from other domains of the culture. In this phase of his historiography, we will argue that Mikami puts forward the idea that the operation of "remoulding" is one that characterizes Japanese cultural productions in every domain in which one observes them, including mathematics. We will analyze how he highlights this operation and thereby brings various domains into relation.

Lastly, the third phase we suggest distinguishing in Mikami's historiography of mathematics includes his later life, especially the 1930s and the wartime period. During this phase, Mikami focuses almost exclusively on empirical examinations of mathematics in China, at a time when, in Japan, "Japanese science" was in vogue. How to interpret this turn? We argue that this turn might have been caused by the fact that Mikami's cultural history was hijacked by the nationalistic mobilization of science/technology during wartime, despite his intention. We will point out elements of a reception of his ideas in discourses of this kind in the 1930s. In any

event, Mikami's focus on Chinese mathematics at the time was unique, since there were not many who so seriously studied Chinese science/mathematics when China was regarded in Japan with much arrogance and colonial paternalism, and considered as backward. Moreover, Mikami did not join the chorus of "Japanese science" like Saigusa Hiroto and others. Taking Japanese premodern science seriously functioned as a critique of Japanese fascism in the 1930s. Could it be that taking Chinese premodern mathematics seriously could be interpreted as a critique of Japanese scientific nationalism in the 1940s? The hypothesis we will explore is that Mikami respected Chinese mathematics and disliked how the government and radical-right discourse positioned Japan as the only scientific Asian power during wartime. Could this account for Mikami's isolation from the world in his later life? We will conclude on this question.

Commentators: **Christine Proust, Tian Miao**

11:30 -13:00 - Chair : Dhruv Raina

Eric Vandendriessche (SPHERE - CNRS & Université Paris Diderot, France)

Lévy-Bruhl's theory on 'prelogical mentality' and its influence on the field of history and philosophy of science

Abstract – Over the first decades of the 20th century, French philosopher and sociologist Lucien Lévy-Bruhl developed the theory of a "prelogical mentality", which he attributed to members of "inferior/primitive" societies. In particular, he argued that these peoples had a lesser ability to abstract and generalize, and that their way of thinking was not governed by the same logical principles than ours. In this paper, we shall evaluate to what extent this theory of a "primitive mind" has significantly influenced scholarly discussions/studies in the field of history and philosophy of science (Léon Brunschvicg 1912, Abel Rey 1937...), when comparing – between "civilizations"– the emergence and the development of "science" (and of mathematics in particular).

Commentators: **Karine Chemla, Ivahn Smadja**

The historiographic effects of categorizing knowledge

14:15 -15:45 - Chair : Hiromi Mizuno

Daniel Morgan (ERC Project SAW & SPHERE - CNRS & Université Paris Diderot)

Shu shu 數術 : When an actor's category became an observer's category, why, and what we can do about it

Abstract – *Shu shu* (lit. 'numbers & procedures'), as it appears in Asian- and Western-language sinology alike, is a modern academic field that has arisen since 1993 around excavated divinatory and magico-religious manuscripts, primarily clustered in the fourth to second century bce. The term itself originates from early bibliographic classification, circa 26 bce – 92 ce, which placed the astral and mathematical sciences (*tianwen* 天文 'heaven's form' omenology, *li* 曆 mathematical astronomy, and *suan* 算 mathematics) alongside a variety of divinatory arts (e.g. hemerology, pyromancy, and phrenology). Arguing that *shu shu* constitutes a singular and uniquely Chinese intellectual whole within which 'science' and 'superstition' were as yet undifferentiated, scholars have promoted the use of this actor's category to justify the publication and study of manuscript sources once suppressed and derided as 'superstitious'. As much as these sources do obviously merit study, it is important to reflect critically on their modern justificatory apparatus and its implications. The problem, in brief, is that *shu shu*, in its post-1993 instantiation, excludes the very 'scientific' sources upon which it relies for its justification, presenting an alternative history of science from which contemporaneous astronomy, mathematics, cosmology, and optics have either been either excised or recast in a mystical light. The theoretical framework behind this purportedly progressive move, ironically, goes back to the nineteenth- and early-twentieth-century anthropology of the 'primitive', which, among other things, denies non-Western man a quantitative relationship with numbers. In this paper I will deconstruct the modern category of *shu shu* as it has thus far been applied and suggest why and how we might begin actually moving forward with the interdisciplinary study of divination and the astral and mathematical sciences in pre-modern China.

Commentators: Zhou Xiaohan Célestin, Carlos Gonçalves

15:45 -17:30 - Chair : Hiromi Mizuno

Francesca Rochberg (University of California, Berkeley, USA)

The Historiography of Ancient Exact Sciences and the Demarcation Problem

Abstract – Two exemplary works in the history of the exact sciences, namely Otto Neugebauer’s *The Exact Sciences in Antiquity* (Dover Press, 1957, 1969 2nd ed) and Olaf Pedersen’s *Early Physics and Astronomy* (Cambridge University Press, 1974, 1993 2nd ed), represent different approaches to the history of science, in particular, how historical evidence of the mathematical sciences on both sides of the Mediterranean was to be read and understood. Whereas they differed on the role of the Greeks in the “invention” of science, as well as on the question of rationality in Near Eastern science, at the heart of both presentations lies an image of science’s identity and purpose across history and culture. Neugebauer and Pedersen’s historiographies of science were, therefore, in different respects both implicated in the so-called demarcation problem, which, in the course of 20th century philosophy of science, aimed to define and differentiate science from other forms of knowledge. This paper will trace the significance of ancient Near Eastern evidence in the context of this debate in the historiography of science, and especially, how the opposition between Greek and Babylonian science manifested a 20th century emphasis on the demarcation problem.

Commentators: **Florence Bretelle-Establet, Michael Nylan**