H.T. COLEBROOKE AND HISTORIOGRAPHIES OF SCIENCES IN SANSKRIT

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

April 15–16, 2019
9:30 am to 5:30 pm

Venue:
CNRS – University Paris Diderot
Condorcet Building, Room Mondrian 646A,
4 rue Elsa Morante,
75013 Paris

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

Presentation

A bit more than 200 years have elapsed since the publication of Henry Thomas Colebrooke's *Algebra, with Arithmetic and Mensuration, from the Sanscrit of Brahmegupta and Bhàscara*. We grasp this opportunity to organise a two day workshop in Paris.The conference concentrates in part on Colebrooke's historiography of mathematics and astral sciences, and here are some of the general questions that we invite contributions to this workshop to tackle:

In which contexts did Colebrooke's interest in the mathematics and astral sciences of ancient India take shape? What was the ensuing impact, in Europe and beyond, of the 1817 publication for the writing of the history of mathematics not only in India, but also worldwide? What can be said on how Colebrooke translated and worked with Sanskrit sources dealing with mathematics and astral sciences? How can we situate this work by Colebrooke in the larger context of 18th and 19th century interest for "oriental mathematics and astronomy"? Does Colebrooke's early interest for mathematics and astral sciences echo into his other indological studies? Or, reciprocally, does he translate and study texts of history of mathematics and/or astral sciences in continuity with his other indological studies?

Speakers

Nalini BALBIR

(University Paris 3 Sorbonne Nouvelle, France)

Sho HIROSE

(ETH, Zürich, Suisse)

Agathe KELLER

(CNRS, CHSA–SPHERE & University Paris Diderot, France)

Satyanad KICHENASSAMY

(University of Reims)

Minakashi MENON

(Max Planck Institute for the History of Science, Germany)

Rosane ROCHER

(University of Pennsylvania, USA)

Ivahn SMADJA

(University of Nantes, France)

MONDAY, APRIL 15TH, 2019

9:30 – 9:40 am

Introduction by Agathe Keller et Karine Chemla

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Commentator: **Pascale Rabault-Feuerhahn** (CNRS, UMR 8547)

11:15 -11:30 Coffeebreak

11:30 – 13:00

Eric GUREVITCH (University of Chicago):

The Whig interpretation of the Hindu Constitution 8

Commentator: **Claude-0livier Doron** (University Paris Diderot, SPHERE)

Lunch Break

2:00 – 3:30 pm

Minakshi MENON (MPWIG, Berlin):

Henry Thomas Colebrooke, the Amarakośa*, and botanical knowledge making in colonial India, c. 1800*. 9

Commentator: **Florence Bretelle-Establet** (CNRS, CHSA–SPHERE)

3:30 – 4:00 pm Coffeebreak

4:00 – 5:30 pm

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2:00 – 3:30 pm

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4:00 – 5:30 pm

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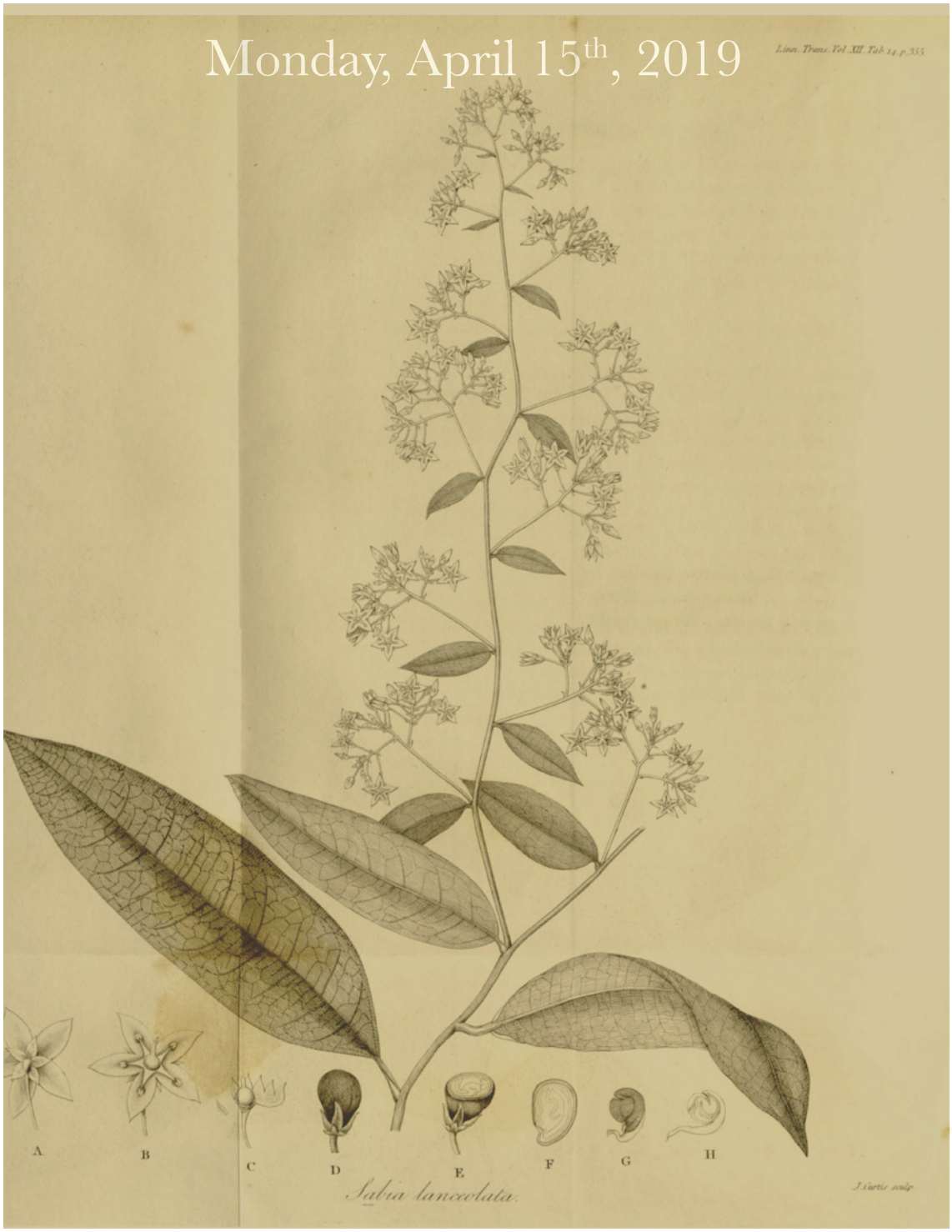
Commentator: **AJ Misra** (MPWIG, Berlin)

Monday, April 15th, 2019



Science in Colebrooke's universe

Rosane ROCHER
University of Pennsylvania, USA

Commentator: Pascale Rabault-Feuerhahn (CNRS, UMR 8547)

The paper focuses on Colebrooke's lifelong engagement with the sciences and traces the arc it followed. After a period of exploration and initiation (1786–1801) came one of intense activity and intervention (1802–1814), leading up to its scholarly pinnacle in 1817 with the publication of *Algebra*. Colebrooke's involvement with the sciences then transitioned to a representational phase. The periodization of Colebrooke's engagement with the sciences is not unrelated to his mundane working circumstances, but it is not entirely conditioned by them. It is also independent –neither in lockstep nor in complementary distribution– from his progression in other branches of scholarship.

The Whig Interpretation of the Hindu Constitution

Eric GUREVITCH
University of Chicago, USA

Commentator: Claude-0livier Doron (University Paris Diderot)

In 1880, Rajkumar Sarvadhikari—a professor of Sanskrit and law—delivered a series of 15 lectures at the University of Calcutta. In these lectures, Sarvadhikari provided a nuanced critique of the legal reasoning of Henry Thomas Colebrooke founded on new philological research, which allowed him to integrate Sanskrit legal texts into the social-evolutionary theory of Herbert Spencer, and which led to his work being taken up by Henry Sumner Maine. The reception of Colebrooke's legal reasoning in the late 19th century helps to show the methods and presumptions contained in Colebrooke's views of history and tradition, and has implications for his scholarship on other genres of Sanskrit text. In particular, Colebrooke's arguments regarding the coherence of legal and philosophic "schools" would be contested and reassessed throughout the 19th century, with new debates over scientific and positivist history emphasizing new aspects of Colebrooke's work. Thinking with Sarvadhikari can help us to situate the complex uptake of Colebrooke's broad-ranging researches in the production of science in the late-Victorian Empire and within India on the eve of the nationalist movement.

Henry Thomas Colebrooke, the *Amarakośa*, and botanical knowledge making in colonial India, c. 1800

Minakshi MENON
Max Planck Institute for the History of Science, Germany

Commentator: Florence Bretelle-Establet (CNRS)

In 1808, the English East India Company published a translation of the famous Sanskrit verse lexicon, the *Amarakośa*. The *Amara* was the best known and most widely used of all Sanskrit lexicons, composed c. 500 CE by Amarasiṃha, a Buddhist, who may have been a minor poet.

The English translation of the *Amara*, was undertaken by Henry Thomas Colebrooke (1765-1837), usually considered the "father of Indology". Colebrooke explained the rationale for the publication in his Preface to the author's edition of the *Amara* thus: "The compilation of a Sanscrit dictionary having been undertaken early after the institution of the College of Fort William, it was at the same time thought advisable to print, in Sanscrit and English, the work which has been chosen for the basis of the compilation… with the view of furnishing an use-ful vocabulary, which might serve until an ampler dictionary could be prepared and published."

In this paper, I examine the *Amara* as an important tool in botanical knowledge making in East India Company India. Whatever its pedagogical uses, Colebrooke himself, as well as other orientalists such as Sir William Jones (1746-1794), used the *Amara* as a source for Sanskrit plant names. Colebrooke worked hard to stabilize such names by linking them to their equivalents in the Indian vernaculars. He used forms of visualizing plant names – lists and tables – which would have been impossible without rectangular

sheets of European paper, marking the imbrication of the material and the epistemic in his knowledge making. I show how Colebrooke's process of translation re-visualized and re-structured the information in the *Amara*, producing new observational and triangulation practices for identifying Indian plants.

An instance of Colebrooke's approach to religious science: the Jain tradition

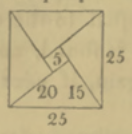
Nalini BALBIR
University Paris 3 Sorbonne Nouvelle & EPHE, France

Commentator: Rosane Rocher (University of Pennsylvania)

In this paper we will try to explain how Colebrooke participated in creating a new scientific object in the beginning of the 19th century, namely knowledge about the Jain tradition. We will focus on the sources he used, his team, his methodology, and the contents of his discourse. His contributions to the *Asiatick Researches* (1807) and the collection of Jain manuscripts he managed to get will form the main basis of our investigation. The case arising, we will compare Colebrooke's scientific approach to Jainism with other contemporary approaches.

Tuesday, April 16th

With four such triangles, another figure having four sides, each equal to the hypotenuse,[1] is constructed for the purpose of finding the hypotenuse. See



Thus another interior quadrilateral is framed; and the difference between the upright and side is the length of its side. Its area is 25. Twice the product of the upright and side is the area of the four triangles, 600. The sum of these is the area of the entire large figure; 625. Equating this with the square of *yávat-távat*, the measure of the hypotenuse is found, 25.[2] If the absolute number, however, be not an exact square, the hypotenuse comes out a surd root.

147. Rule: Twice the product of the upright and side,[3] being added to the square of their difference, is equal to the sum of their squares, just as with two unknown quantities.[4]

Hence, for facility, it is rightly said 'The square-root of the sum of the squares of upright and side, is the hypotenuse?'[5]

[1] The triangles are to be so placed, as that the hypotenuse may be without; and the upright of one be in contact with the side of another: else, by merely joining four rectangular triangles [with the equal sides contiguous,] a quadrilateral having unequal diagonals [that is, a rhomb] is constituted; in which one diagonal is twice the upright; and the other double the side of the triangle; instead of a square comprising five figures (four triangles and a small interior square). But, if the upright and side be equal, a square only is framed, which ever way the side is placed, since there is no difference of the upright and side: and in this case there is no interior square. Crĭshṇ.

[2] In this instance also, Crĭshṇa exhibits the solution by literal symbols: 'Area of the triangle *bhu. co* ½. Multiplied by four, it is the area of four such triangles, *bhu. co* 2. Difference *bhu* 1 *co* 1. Its square *bhu v* 1 *bhu. co* 2 *co v* 1. This, which is the area of the interior square, being added to the area of the four triangles, *bhu. co* 2, makes *bhu v* 1 *co v* 1; the area of the entire square.' Crĭshṇ.

[3] This is not confined to upright and side; but applicable to all quantities. (*Líl.* § 135.) Crĭshṇ.

[4] Let the two quantities be *ya* 1 *ca* 1. The square of their difference will be *ya v* 1 *ya. ca bh* 2 *ca v* 1. To this twice the product *ya. ca bh* 2 being added, the result is the sum of the squares *ya v* 1 *ca v* 1. Crĭshṇ.

[5] See the same rule expressed in other words; *Líl.* § 134.

Origin and observation: Colebrooke on Indian Astronomy

Sho HIROSE
ETH, Zürich, Switzerland

Commentator: Victor Gysembergh (CNRS, Centre Léon Robin)

In his article "On the Indian and Arabian Divisions of the Zodiac", Colebrooke attempts to identify the stars in the Indian lunar mansions with the aim to discuss whether they have a common origin with their Arabic counterparts. Colebrooke's views on Indian astronomy is articulated therein. He assumes that observation played an important role in astronomy and conjectures that the lunar mansions were established in India and probably introduced to the Arabs later. This talk focuses on how Colebrooke's notions on origin and observation in Indian astronomy were formed and how they were received in Europe.

Colebrooke, commentaries and proofs

Agathe KELLER
CNRS, CHSA–SPHERE & University Paris Diderot, France

Commentator: Vincenzo De Risi (CNRS, SPHERE & MPIWG, Berlin)

H.T Colebrooke published in 1817 English translations of mathematical texts by Bhrahmagupta and Bhāskara. Footnotes to these translations included extracts of commentaries by Gaṇeśa, Sūryadāsa, Kṛṣṇadaivajña, Pṛthūdhakasvāmin: Colebrooke translated glosses of technical terms, solved numerical examples and proofs of the rules when he could. In this paper I look at how by fragmenting the commentaries and thus sectioning from them parts devoted to reasonings/proofs, Colebrooke shaped texts corresponding to moments of what he called geometrical proofs and algebraical analysis, overlooking what might have been other values by which commentators were trying to explain a rule. This operation has deeply influenced our perception of reasonings in Sanskrit mathematical texts, but it also opens new questions we can address to them.

Henry Thomas Colebrooke & the nature of Brahmagupta's mathematical discourse

Satyanad KICHENASSAMY
University of Reims, France

Commentator: Karine Chemla (CNRS, SPHERE)

We analyse Colebrooke's study of Brahmagupta's mathematical discourse in the light of recent research, and stress its relevance for current problems. Colebrooke's early and highly influential attempt at a global history of medieval mathematics identified Brahmagupta as the possible initiator of several major advances, whose importance was dimmed by partial breaks in the continuity of tradition. Unfortunately, the only commentary on his work that Colebrooke had access to was flippant; in addition, Bhāskara II, the only other mathematician that Colebrooke translated, had misunderstood Brahmagupta. Colebrooke therefore merely endeavored to establish Brahmagupta's and Āryabhaṭa's priority, implying that they had not obtained any results that were not, in essentials, contained in the mathematics of his time. Now, close reading (2010, 2012) shows that the derivation of the area of a cyclic quadrilateral that Brahmagupta presents differs from all those proposed after him, even in India. It is couched in the form of an apodictic discourse, a discourse that carries conviction without coercion. Other examples are known. This leads to the following conclusions: (i) Colebrooke perceived the originality and importance of Brahmagupta's work, but the lack of a self-reflective knowledge of contemporary mathematics prevented him from identifying a new form of mathematical discourse. (ii) Apodictic discourse is conducive to the production of new knowledge. (iii)

Such knowledge, when partially lost, can apparently not be recovered by deductive means, but only by close reading. This analysis also helps solve open problems in the study of the Euclidean tradition (2015), some of them also alluded to by Colebrooke.

Some aspects of Colebrooke's mathematical reception in 19th century Germany: from ancient sources to new questions

Ivahn SMADJA
University of Nantes, France

Commentator: AJ Misra (MPIWG, Berlin, Germany)