

## 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

### Varieties of mathematical knowledge and practices used to read ancient texts

Tuesday October 25<sup>th</sup>, 2016

**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.