INTERNATIONAL CONGRESS

300 ANNIVERSARY GOTTFRIED WILHELM LEIBNIZ

(Leipzig,1646 - Hannover,1716)

21 - 22th January 2016

Organization

Grup de Recerca d'Història de la Ciència i de la Tècnica (Proyecto HAR2013-44643-R)

Departament de Matemàtiques de la Universitat Politècnica de Catalunya

Collaborating Entities

Societat Catalana d'Història de la Ciència i de la Tècnica

Societat Catalana de Matemàtiques

Real Sociedad Matemática Española

Dijous 21 de gener de 2016

Escola Tècnica Superior d'Enginyeria Industrial de Barcelona. Aula Capella

11: 15 h: Benvinguda

11: 30 h: **Presentació del Congrés**

Guillermo Lusa (UPC, Barcelona)

12: 00 h: **Generality in Leibniz's mathematics**

Eberhard Knobloch (Berlin University of Technology, Berlin)

Abstract: To find the general laws, the general theorems, the rules, the methods, means to discover the universal harmony in mathematics and elsewhere. This was the origin of Leibniz's wish for such methods, theorems, rules, laws, objects, notations, disciplines, and problems. For that reason the lecture will deal with six aspects of the subject:

1. Generality and harmonies: every harmony implies a general theorem, implies generality.

2. Generality and beauty: Five examples illustrate that the generality of a theorem, of a method, is accompanied by its beauty.

3. Generality and conciseness / simplicity: if one really and completely penetrates the structure of the facts of a case, its description has to become concise, simple.

4. Generality and notation: In Leibniz's opinion the most concise notation expresses the intimate nature of things and is essential for the art of invention. The differential calculus, determinants, power sums are examples in this respect.

5. Generality and utility / fecundity: the great value of generality is based on its utility, its fecundity.

6. Generality and the laws of formation: the structure of an expression, the order of a series, and the generality of a solution is mirrored by the general of formation.

13: 30 h: Dinar

16: 00 h: **The correspondence between Leibniz and the Marquis de L'Hospital: on some questions regarding the Leibnizian calculus**

Mònica Blanco (UPC, Barcelona)

Abstract: In 1696 the Marquis de L'Hospital (1661-1704) published the *Analyse des infiniment petits pour l'intelligence des lignes courbes*, the first systematic work on differential calculus. The *Analyse* largely relied upon the lectures that Johann Bernoulli (1667-1748) gave L'Hospital between 1691 and 1692 during the former's stay in France. After Bernoulli left France, the instruction continued in his subsequent correspondence with L'Hospital until 1701. In the same period of time (1692-1701), L'Hospital also corresponded with Gottfried W. Leibniz (1646-1716). In his first letter to Leibniz (14 December 14 1692), L'Hospital pointed out that, while the differential calculus and its applications had been sufficiently studied so far, there was still much work to be done in the field of the "inverse of this calculus". Hence, the correspondence between Leibniz and the Marquis de L'Hospital focused mainly, though not exclusively, on the inverse of the differential calculus. In some cases, L'Hospital even discussed a certain problem

with both Leibniz and Johann Bernoulli. The aim of this contribution is to analyse some of the questions addressed in the letters between Leibniz and the Marquis de L'Hospital, such as the rectification of the logarithmic curve or the problem of finding the envelope of a family of parabolas.

16: 30 h: **On Leibniz' *characteristica universalis* --considered as a thinking mood--** Sebastià Xambó (UPC, Barcelona)

Abstract: Leibniz' idea of a *characteristica universalis* will be presented in a historical perspective and illustrated in the realm of geometric algebra and geometric calculus with a sample of applications to geometry and physics. The main thread will be that Leibniz idea can be regarded as a productive *thinking mood*. The talk will end with some reflections aimed at highlighting the wide scope and generality of Leibniz' idea.

17: 00 h: **Simpson and Cerdà: erasing borders between Leibniz and Newton**

Joaquim Berenguer (UPC, Barcelona)

Abstract: Since the eighteenth century, an increasing number of historians of science have pointed to the major role played by textbooks in the circulation of the scientific knowledge in Europe. These textbooks played an important role in the formation of several scientific disciplines which were emerging at that time. The role of the undervalued popularisers in shaping a discipline was crucial.

It is still necessary to analyse several aspects of the communication process and the circulation of Differential Calculus as a new discipline in the eighteenth century, but at this moment a detailed analysis of this process, as many historians of science have emphasized, overturns the cliché regarding the history of the origin of Differential Calculus based in the Leibniz-Newton controversy. The borders between the two approaches often become blurred, and every actor involved in this process, like the follower of any vision, crosses these borders.

Tomàs Cerdà was a Jesuit, mathematician, and teacher who lived and worked in Barcelona and Madrid in the late eighteenth century. Our project is focused on Cerdà's contribution to the introduction of Differential and Integral Calculus in Spain as well as on Cerdà's appropriation of Thomas Simpson's work.

Our aim, firstly, is to analyse this appropriation as an example of how teachers helped to shape a new discipline, and secondly as an example of the permeability between the Newtonian and Leibnizian visions.

With a few examples taken from Cerdà's *Tratado de Fluxiones* and Simpson's *The Doctrine and Application of fluxions,* we will first analyse the similarities and differences between the two works; secondly, we will assess the contributions of these two teachers, not only to the popularization process of the scientific knowledge, but also to the production process of this scientific knowledge; and, finally, we will consider the "heterodoxy" of some of the approaches of these Newtonian authors.

17: 30 h: **Concepciones sobre la matemática, su enseñanza y su aprendizaje en el *Compendio Mathematico* de Thomas Vicente Tosca**

Antonio M. Oller Marcén (Centro Universitario de la Defensa de Zaragoza, Zaragoza)

José María Muñoz Escolano (Departamento de Matemáticas Universidad de Zaragoza, Zaragoza)

Abstract: Gérard Genette (1997) denomina *paratexto* a los diversos acompañamientos de un texto escrito que hacen, en palabras de este autor, que dicho texto "se convierta en un libro". Así, ejemplos de *paratextos* son el título, las ilustraciones, las notas al pie, etc.

Un importante ejemplo viene dado por el prólogo del autor. Cuando existe, un prólogo puede proporcionarnos información muy diversa sobre múltiples aspectos como las motivaciones e intenciones del autor a la hora de escribir el texto, la génesis o el origen de las ideas que se presentan, el público al que se dirige, etc. En el caso concreto de un texto matemático destinado a la enseñanza, el prólogo puede proporcionar interesante información respecto a las concepciones y creencias del autor respecto a las matemáticas, su enseñanza y su aprendizaje (Flores, 1998).

En este trabajo abordamos un análisis del prólogo del *Compendio Mathematico* de Thomas Vicente Tosca. Este autor, prácticamente coetáneo de Leibniz, fue uno de los miembros más destacados del movimiento "novator" en lo relativo a las Matemáticas. De hecho, en el momento de su aparición en 1707, esta obra supuso (Navarro, 1987, p. 8) "un acontecimiento importante".

Su intensa labor didáctica, llegó a crear una "escuela de Matemáticas" en dos periodos de su vida, hace interesante analizar el modo en que Tosca concebía la matemática, su enseñanza y su aprendizaje. Esta aproximación nos permitirá tener una visión, siquiera parcial, del modo en que estos fenómenos ce concebían en la pre-ilustración española.

Referencias

Flores, P. (1998). *Concepciones y creencias de los futuros profesores sobre las matemáticas, su enseñanza y aprendizaje. Investigación durante las prácticas de enseñanza*. Granada: Comares.

Genette, G. (1997). *Paratexts: thresholds of interpretation*. Cambridge: Cambridge University Press.

Navarro, V. (1987). La personalidad científica de Thomas Vicente Tosca (1651-1723). *Boletín informativo de la fundación Juan March*, 37, pp. 3-14.

18: 00 h: **The development of some Mathematical Ideas from Mengoli to Leibniz**

Mª Rosa Massa Esteve (UPC, Barcelona)

Abstract: In the seventeenth century many changes occurred in the practice of mathematics. An essential change was the establishment of a symbolic language as a formal language in mathematics, so that the new language of symbols and techniques could be used in operations to obtain new results and procedures in several parts of mathematics.

Pietro Mengoli (1626/7–1686), pupil of Bonaventura Cavalieri, considers essential the utility of algebraic procedures for solving all kind of problems. Mengoli, following the algebraic research of Viète, constructs a geometry of species, *Geometriae Speciosae Elementa* (1659), which allows him to use algebra in geometry in complementary ways to solve quadrature problems [3] and later, to compute the quadrature of the circle in his *Circolo* (1672) [4]. Mengoli has computed such integrals for natural and half-integer exponents and has displayed the results in triangular tables as the, now known as, harmonic triangle.

Gottfried Wilhelm Leibniz (1646-1716) is already interested in Mengoli's works in a letter to Oldenburg, in 1673, and later, in 1676, we can examine how Leibniz describes and comments these Mengoli's arithmetic quadrature of the circle, in some excerpts [1 ; 2 ; 5]. The aim of this communication is to analyze Leibniz's excerpts on Mengoli's *Circolo* in order to show Leibniz's mathematical interpretations and comments. These analyses provide evidences in which way Mengoli's mathematical ideas about algebra and geometry could perhaps have inspired Leibniz in some aspects of his proper arithmetic quadrature.

References

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2. LEIBNIZ G. W. 1673-1676. *Sämtliche Schriften und Briefe*, series VII: *Mathematische Schriften*, vol. VII: *Arithmetische Kreisquadratur*, Berlin, 2012, 113-131.

3. MASSA-ESTEVE, Ma. R., 2006. "Algebra and Geometry in Pietro Mengoli (1625–1686)". *Historia Mathematica* 33, 82–112.

4. MASSA-ESTEVE, Ma. R. and DELSHAMS, A., 2009."Euler's beta integral in Pietro Mengoli's works". *Archive for History of Exact Sciences* 63, 325-356.

5. PROBST, S., 2015. Leibniz as Reader and Second Inventor: The Cases of Barrow and Mengoli, in: N. B. Goethe et al. (eds.), *G. W. Leibniz, Interrelations between Mathematics and Philosophy*, Archimedes 41, 111-134.

Divendres 22 de gener de 2016

Facultat de Matemàtiques i Estadística. Sala d'Actes

10: 45 h: Benvinguda

11: 00 h: **Leibniz crítico de Euclides. El método del *Analisis Situs***

Mary Sol de Mora (UPV/EHU, San Sebastián)

Abstract: Es bien sabido que Leibniz leyó con atención la mayor parte de las ediciones de Euclides, si nos fijamos en las notas marginales a algunos ejemplares de los Elementos conservados en Hannover y en Wolfenbüttel, así como en sus manuscritos. En ellos proponía correcciones al texto de los Elementos y demostraciones alternativas a las originales e incluso señalaba que algunos axiomas no estaban demostrados.

Leibniz conocía bien las críticas a los Elementos que se planteaban en su época. No obstante, su posición al respecto es muy singular: la tarea que emprende consiste en revisar cada uno de los axiomas, postulados y demostraciones así como las definiciones principalmente del Libro I. En el resumen adjunto a su carta a Huygens de septiembre de 1679, se muestra entusiasmado ante este nuevo descubrimiento: He encontrado algunos Elementos de Geometría totalmente nuevos y completamente diferentes del Algebra, pues ésta sería una característica de los números indeterminados o magnitudes, no expresa directamente la situación, los ángulos y el movimiento. El Álgebra está obligada a suponer los Elementos de Geometría, mientras que esta Característica "empuja el análisis hasta el final". Los caracteres utilizados en el Álgebra y en la Geometría no expresan todo lo que se debe considerar en el espacio. Por lo que resulta muy

difícil expresar mediante el cálculo lo que la figura muestra y más difícil todavía producir en la figura lo que el cálculo obtiene.
El proyecto de Leibniz apunta a la construcción de una nueva Geometría, y no al perfeccionamiento de la estructura deductiva o racional de los Elementos. El proyecto leibniziano no admite ninguna comparación en su época, y probablemente habría que llegar hasta los Grundlagen der Geometrie de Hilbert para encontrar algo semejante en la Historia de la Geometría.

12: 00 h: Pausa i cafè

12: 30 h: **Leibniz as a Universal Mathematician**

David Rabouin (Laboratoire SPHERE, CNRS-Université Paris Diderot, Paris)

Abstract: Throughout his work, Leibniz undertook several times to write a *Mathesis Universalis* or 'Universal Mathematics'. In the mid 1690's he gave to this project the title of 'Logica Mathematica' – a striking characterization for the modern reader, although rarely understood in its proper context. In this talk, I will describe the corpus on *Mathesis universalis* in Leibniz, which a group of French scholars undertook to give a complete edition and translation ("Mathesis" group, *Centre d'Etudes Leibniziennes*). I shall present several discoveries that we made during this editorial enterprise and detail the new picture which emerges today from the sources.

References:

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Rabouin, D. (2011). "Interpretations of Leibniz's Mathesis universalis at the Beginning of the XXth Century". In: Krömer, R. and Chin-Drian, Y (eds.). New essays on Leibniz reception in philosophy of science 1800-2000. Basel. Birkhäuser. 187-201.

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Grosholz, E., and Yakira, E. (1998*). Leibniz's science of the rational*. Studia leibnitiana Sonderhefte 26. Stuttgart. Franz Steiner Verlag

13: 30 h: Debat i fi del congrés