Report on the ICHM Co-Sponsored Symposia at the 24th International Congress of History of Science, Technology and Medicine (ICHSTM)
Manchester, UK; July 22-28, 2013

Six of the symposia at ICHSTM13 were co-sponsored by the ICHM. These symposia are listed below with the names of their organizers, descriptions of their purpose, as well as the names of speakers, with titles of their papers.

SYMPOSIUM S114 "MATHEMATICS AND PATRONAGE"

Organizers: June Barrow-Green (Open University, UK)
Reinhard Siegmund-Schultze (University of Agder, Norway)

There was a total of 12 speakers, and the talks were evenly distributed over three sessions on Monday, 22 July 2013. The three sessions were ordered roughly chronologically and chaired by June Barrow-Green, Niccolò Guicciardini, and Reinhard Siegmund-Schultze. 9 out of the 12 speakers were women, and of them 5 are under forty, 2 of whom are preparing their PhDs. All sessions were well attended with an average of about 25 listeners. Discussion was lively and the response after the sessions enthusiastic, with the topic being considered stimulating for further research. In at least one case we know of collaboration of two participants (R. Meyer-Spasche and R. Nossum) resulting from our symposium which will lead to the publication of an article on Oscar Buneman (1913-1993), the mathematician and physicist.

The younger participants considered their presentations as valuable steps in their careers. Thanks to the financial support of the ICHM two particularly successful contributions—Dagmar Mrozik "The depiction of patronage in Jesuit mathematical frontispieces" and Eileen Magnello "Patronage from the Drapers' Company and Karl Pearson's establishment of mathematical statistics (1903-1933)"— could be secured. Both participants received the full support of 800 US dollars. In each case, participation would have been impossible without the financial support of the ICHM. In the first case, there was the problem of youth and insufficient income; while in the second case, there were health problems and financial difficulties connected to partial retirement

Abstract

The symposium will examine the influence of patronage on the production of mathematics from the seventeenth to the twentieth centuries. We shall consider the role and motivation of the patron (individual or institutional), the benefit for the recipient and for the benefactor, and the overall effect on the development of mathematics and its relations to bordering disciplines. We shall also be concerned with the extent to which patronage broadened accessibility to mathematical knowledge, and its effect on the mathematical community at large. Among the more general topics to be discussed are historical shifts between private and public patronage of mathematics. Considering stimuli for knowledge production outside mathematics and science proper (such as patronage) allows for a better understanding of the processes of application, i.e. for "knowledge at work" in a broad sense.

Speakers (in alphabetical order)

June Barrow-Green (Open University, Milton Keynes, UK)
The role of patronage in the development of applied mathematics in Britain, 1860-1920

Monicà Blanco (Universitat Politècnica de Catalunya, Barcelona, Spain)
Edmund Stone and the knowledge of practical mathematics: a case study of patronage in eighteenth-century Britain

Anna Carlsson-Hyslop (Lancaster University, UK)
Patronage and statistical work on storm surge science at the Liverpool Tidal Institute, 1919-1959

Rosanna Cretney (Open University, Milton Keynes, UK)
Anything but brilliant: Euler's experience of patronage under Frederick the Great

Niccolò Guicciardini (Università degli Studi di Bergamo, Italy)
Johann Bernoulli and his relationship as an acolyte of Leibniz

Deborah Kent (Drake University, Des Moines, USA)
Patronage and Publication: Mathematical Journals in America, 1804-1876

Eileen Magnello (University College London, UK)
Patronage from the Drapers' Company and Karl Pearson's establishment of mathematical statistics (1903-1933)

Rita Meyer-Spasche (Max-Planck-Institut für Plasmaphysik, Greifswald, Germany)
Oscar Buneman (1913-1993), persecutions and patronages: a case study of political impact on research

Dagmar Mrozik (Universität Wuppertal, Germany)
The depiction of patronage in Jesuit mathematical frontispieces

Rolf Nossum (University of Agder, Kristiansand, Norway)
The Society for the Protection of Science and Learning as a patron of mathematical refugees from Nazi Germany

Reinhard Siegmund-Schultze (University of Agder, Kristiansand, Norway)
Rockefeller patronage of international mathematics before WWII

Renate Tobies (Friedrich-Schiller-Universität, Jena, Germany)
Research Directors and Patronage in the Electrical Industry: The Case of the Mathematical Consultant Iris Runge

SYMPOSIUM S115 "MATHEMATICAL KNOWLEDGE AT WORK IN ANCIENT CHINA"

Organizers: J.W. Dauben (CUNY, USA)
                Guo Shuchun (IHNS, CAS, PRC)
                Xu Yibao (CUNY, USA)
                Zou Dahai (IHNS, CAS, PRC)

The special symposium S-115: "Mathematical Knowledge at Work in Ancient China," sponsored by the ICHM during the XXIVth ICHSTM Congress in Manchester, England, was held on Tuesday, July 23, in three consecutive sessions from 9:00 AM until 15:30 PM in Roscoe Room 2.4 at the University of Manchester. The Symposium, co-organized J.W. Dauben (Herbert H. Lehman College,

The City University of New York, USA), Guo Shuchun (Institute for the History of Natural Sciences, Chinese Academy of Sciences, China), Xu Yibao (Borough of Manhattan Community College, The City University of New York, USA), and Zou Dahai (Institute for the History of Natural Sciences, Chinese Academy of Sciences, China), originally consisted of four sessions with 20 participants in all, but due to various cancellations, the symposium when it met in Manchester on July 23 included only 15 participants. Of these, four received financial support for their participation in the Manchester Congress.

The symposium was devoted to the subject of "Mathematical Knowledge at Work in Ancient China," and reflected the general over-all theme of the Congress. The history of ancient Chinese mathematics and its applications has been greatly stimulated in the past few decades by remarkable archaeological discoveries of texts from the pre-Qin and later periods that for the first time have made it possible to study in detail mathematical material from the time at which it was written. Previously, the bulk of our knowledge of ancient Chinese mathematics came from works transmitted for more than a thousand years in writing before they were first printed in 1084 during the Northern Song Dynasty, and through later editions and collations. This special session was devoted to the history of ancient Chinese mathematics, including the recent Warring States, Qin and Han bamboo mathematical texts currently being conserved and studied at Tsinghua University and Peking University in Beijing, the Yuelu Academy in Changsha, and the Hubei Museum in Wuhan. Particular attention was given to these recently unearthed texts and the new light they shed on the history of early mathematical thought and its applications in ancient China. Many presentations focused on the development of techniques and justifications given for the problems that were a growing part of the corpus that eventually culminated in the comprehensive *Nine Chapters on the Art of Mathematics*. Contributions to this special session examined the evolution of Chinese mathematics from early texts like the *Shu* and *Suanshushu* to the commentary provided by Liu Hui for the *Nine Chapters*, which demonstrates the many developments mathematics underwent from the Warring States to the end of the Han dynasty, including new techniques for solving problems as well as the justifications that were given to establish the correctness of mathematical results. In the context of "Knowledge at Work," symposium participants were especially concerned with showing how these mathematical works were applied in the service of astronomy, surveying, state construction projects, government administration, and the day-to-day accounting that the imperial bureaucracy required. The individual participants and their topics were as follows:

Joseph Dauben (City University of New York, USA): The evolution of mathematics in ancient China: from the newly discovered 數 *Shu* and 算數書 *Suan shu shu* bamboo texts to the *Nine chapters on the art of mathematics*.

Feng Lisheng (Tsinghua University, China) and Xu Yibao (Borough of Manhattan Community College, The City University of New York, USA): The Tsinghua multiplication table.

Guo Shirong (Inner Mongolia Normal University, China): Applications of mathematical knowledge to military affairs in the Han dynasty of China.

Guo Shuchun (Institute for the History of Natural Sciences, Chinese Academy of Sciences, China): 战国秦汉数学简牍发现之意义刍议 (A discussion on the significance of the discovery of mathematics bamboo slips from the Warring States period, Qin and Han Dynasty).

Roger Hart (Texas Southern University, USA): Tracing practices: the diffusion of linear algebra across medieval Eurasia.

Horng Wann-Sheng (National Taiwan Normal University, Taiwan): Bamboo texts in context: a comparative study of the *Suanshushu* and the *Shu*.

Ji Zhigang (Shanghai Jiao Tong University, China): From everyday arithmetic to bureaucratic mathematics: a comparative analysis of the contents of 《数》, 《算数书》 and 《九章算术》.

Jochi Shigeru (Osaka Kyoiku University, Japan) and Liu Bowen (National Kaohsiung First University of Science and Technology, Taiwan): The application of *Zhoubi Suanjing* in Japan.

Tina Su Lyn Lim (Independent Scholar, Denmark): The continuation of ancient mathematics.
Charlotte Pollet (National Tsing Hua University, Taiwan): Chinese mathematics of the first millennium AD, as reconstructed on the basis of medieval sources.

Tamura Makoto (Osaka Sangyo University, Japan): On the *Shu* in comparison with Qin and Han slips.

Donald B. Wagner (University of Copenhagen, Denmark): Mathematics in the planning of public works in China from the first to the fourteenth century CE.

Wang Jinyu (Dunhuang Academy, China): A new discovery of mathematical texts among Dunhuang documents and its main contents.
Xu Yibao (Borough of Manhattan Community College, The City University of New York, USA): The meanings of 筭 *Suan* in the *Jiuzhang Suanshu*.

Zou Dahai (Institute for the History of Natural Sciences, Chinese Academy of Sciences, China): The background of the problems related to foodstuffs in the *Nine Chapters*: a study based on the unearthed documents.

In all, the room with a capacity of about 60 people was almost always full to capacity for the duration of the symposium. The organizers were very pleased with the exceptionally high quality of the presentations, all of which used Powerpoint to illustrate in detail the contents of the various presentations. Many of the results from this symposium have either already been accepted for publication or will appear shortly in major journals, including *Historia Mathematica*

SYMPOSIUM S116 "THE HISTORY AND PHILOSOPHY OF MATHEMATICAL OPTIMIZATION"

Organizers: Craig Fraser (University of Toronto, Canada)
Michael Stoeltzner (University of South Carolina, USA)

Abstract

The idea to describe the laws of nature by means of optimal forms, by the minima or maxima of empirical measures, has fascinated mathematicians, physicists and philosophers over the centuries. Great hopes in a universal approach were followed by striking counterexamples, both having in their wake some classical philosophical controversies. The symposium will examine historical studies of optimization from the sixteenth to the twentieth century. The scope of the symposium is broad and includes the differential calculus, calculus of variations, variational mechanics and the mathematical physics of work and potential, Hamilton-Jacobi theory, linear programming, optimal control theory, optimization in economics and geometric optimization. Technical, contextual and philosophical aspects of the subject will be explored.

The subject of the symposium is ideally suited to the theme of the congress, "Knowledge at work." In many areas of physical science, the investigation of optimization involves the integration of theoretical and applied concepts and techniques of solution. In fields as diverse as mechanics, thermodynamics, engineering, economics, population biology and game theory, the effective implementation of procedures based in theory is achieved using a principle of optimization.

Program

The symposium took place at the University of Manchester, on July 25 in University Place 3.205. It was divided into two parts A and B.

S116A
25 July, 09:10–10:40
Chairs: Craig Fraser & Michael Stoeltzner

Maria Rosa Massa Esteve | Universitat Politècnica de Catalunya, Spain
Maxima in geometric figures in Mengoli's Geometriae speciosa elementa

Ariga Nobumichi | National Museum of Nature and Science, Japan
Euler's principle of least 'effort': development and interpretation

Sandro Caparrini | University of Lille, France
Maxima and minima in Italian mathematics, 1770-1820

S116-B
25 July, 11:10–12:40
Chair: Maria Rosa Massa Esteve | Universitat Politècnica de Catalunya, Spain

Craig Fraser | University of Toronto, Canada
Zermelo's navigation problem in the calculus of variations

Helmut Pulte | Ruhr-Universität Bochum, Germany
Hermann von Helmholtz on least action and 'monocyclic systems'

Michael Stoeltzner | University of South Carolina, United States
The principle of least action as a universal guide to theory-building: Max Planck and physics around 1900

Adrian Wüthrich | Technische Universität Berlin, Germany
The role of the action function in Feynman's development of a divergence-free quantum electrodynamics

Jos Uffink | University of Minnesota, United States
Extremal principles in physics

Tinne Hoff Kjeldsen of Roskilde University, Denmark was scheduled to deliver the paper "The significance of duality and the question of multiple discoveries in the history of linear and nonlinear programming," but had to withdraw shortly prior to the congress for personal reasons.

We consider that the event was highly successful. Overall the sessions were well attended. The two organizers tentatively plan to produce a book which will include some of the talks from the symposium, as well as others.

Three speakers were awarded ICHM grants: Sandro Caparrini, who was awarded $700, Adrian Wüthrich, who was awarded $400 and Michael Stoeltzner, who was awarded $250. All filled the necessary declarations and have received their grants.

Symposium S117 "The Institutionalization of Mathematics and the Founding of National Societies"

Organizers: Luis Saraiva (University of Lisbon, Portugal)
    Sergio Nobre (UNESP - São Paulo State University, Brazil)

Abstract

The main aim of this symposium is to analyze and compare historical processes of the institutional organization of mathematicians whether in national or in transnational associations. The participants will put emphasis on the way in which each particular association tackled issues such as mathematics in education, research mathematics, applied mathematics, mathematics in the development of a country, the international organization and cooperation of mathematicians, and other related themes. In short, we will analyze and compare knowledge at work in the specific area of mathematics in different historical contexts, and in connection with the institutionalization of this domain of knowledge and the foundation of national societies.

To this end, we have invited a comprehensive group of distinguished historians from countries in Europe, Asia, America and Africa, and we hope for a successful symposium highly relevant to contemporary historical inquiry. We are aware that important countries have been omitted as regards mathematics, but we are limited by the number of speakers that a symposium can have in a Congress like this, and we believe that our choice allows us to have a sufficient variety of historical situations to permit the analysis of the major issues from different angles and from different historical contexts.

Program

The symposium took place at the University of Manchester (Roscoe 2.4), on the mornings of July 25 and 26 (on both days from 9.00 to 13.00).

Of the initial set of 17 speakers, three could not be in Manchester, but they sent their texts and power points, which were read and presented by Luís Saraiva. Unfortunately, another two of the invited speakers, Paulus Gerdes from Mozambique, and Moritz Epple from Germany could neither participate in the Symposium nor send any texts to be read in Manchester. We describe the four sessions of the Symposium:

S117A
Thu 25 July, 09:00–10:30 ▪ Roscoe 2.4
Chair: Luis Saraiva | Universidade de Lisboa, Portugal

Ubiratan D'Ambrosio | Brazilian Society for the History of Mathematics, Brazil
Institutionalization as a factor in building up mathematics as a discipline (talk read by Luis Saraiva)

Sérgio Nobre | Universidade Estadual Paulista (UNESP), Brazil
From a regional society to a national society: the foundation of the Brazilian Society of Mathematics

Eduardo L. Ortiz | Imperial College London, United Kingdom
Good neighbours policy and mathematics in Latin America in the 1940's

Dhruv Reina | Zakir Husain Centre for Educational Studies, India
The phased institutionalization of mathematics education and research in late colonial India (talk read by Luis Saraiva)

S117-B
Thu 25 July, 11:00–13:00 ▪ Roscoe 2.4
Chair: Sérgio Nobre | Universidade Estadual Paulista (UNESP), Brazil

Djebbar Ahmed | Université Lille 1, France
Les premières sociétés mathématiques au Maghreb

David Rowe | Johannes Gutenberg University, Mainz, Germany
Reassessing the influence of German mathematics on research in the United States, 1876-1914

Erwin Neuenschwander | Universität Zürich, Switzerland
The founding of the Swiss Mathematical Society: an episode in the institutionalization of mathematics in Switzerland

S117-C
Fri 26 July, 09:00–10:30 ▪ Roscoe 2.4
Chair: Tatsuhiko KOBAYASHI | Maebashi Institute of Technology, Japan

Martin Andler | Université de Versailles St-Quentin, France
The creation of the Société mathématique de France in 1872

Umberto Bottazzini | Università degli Studi di Milano, Italy
From the Circolo Matematico di Palermo (1884) to the Unione Matematica Italiana (1922): contrasting views on the institutionalization of mathematics in Italy

Luis Español | University of La Rioja, Spain
The founding of the Spanish Mathematical Society in 1911, and several subsequent re-foundings

Luis Saraiva | Universidade de Lisboa, Portugal
The beginnings of the Portuguese Society of Mathematics, 1936-1945

S117-D
Fri 26 July, 11:00–13:00 ▪ Roscoe 2.4
Chair: Djebbar Ahmed | Université Lille 1, France

Christine Phili | National Technical University of Athens, Greece
The University of Athens: a cradle for the development of the mathematical community in Greece

Liu Dun | Chinese Academy of Sciences, China
The Chinese Mathematical Society and mathematics in modern China

Tatsuhiko KOBAYASHI | Maebashi Institute of Technology, Japan
The conversion from Wa-san (pre-modern Japanese mathematics) to Yo-san (western mathematics)

Serguei Demidov | Russian Academy of Sciences, Russia
The Moscow Mathematical Society and the development of a Russian mathematical community (talk read by Luis Saraiva)

We consider that the event was highly successful, with audiences of more than 30 people in each of the four sessions, participating with questions at the end of the talks. We are thinking of publishing a book which will include most of the talks included in the symposium, and a couple which were not presented in Manchester, but were intended to.

Two speakers were awarded ICHM grants: Ahmed Djebbar, who was awarded 600 Euros, and Christine Phili, who was awarded 500 Euros. Both filled the necessary declarations and both already received their grants.

SYMPOSIUM S107 "POINCARÉ'S *MÉTHODES NOUVELLES DE LA MÉCANIQUE CÉLESTE IN HISTORICAL CONTEXT: BRIDGING THE FRONTIERS OF KNOWLEDGE IN MATHEMATICS, ASTRONOMY AND WIRELESS TECHNOLOGY, 1892-1914*"

Organizers: **Scott Walter, (University of Lorraine & LHPS-Archives Henri Poincaré , France)**
Jeremy Gray (Open University & Univ. of Warwick, UK)

Abstract

Henri Poincaré's Méthodes nouvelles de la mécanique celeste (1892-1899) are known to have provided the basis for the emergence of 20th-century nonlinear oscillation theory and systems dynamics. Recently, Ginoux and Petitgirard noticed that as early as 1908, Poincaré initiated the modelling of current oscillations in the singing arc, a device proposed for the generation of wireless waves for telegraphy and telephony, using the same limit-cycle analysis he had developed in the Méthodes nouvelles to analyze the stability of planetary orbits. Previously, limit-cycle analyses of nonlinear current oscillations were thought to date from the late 1920s. Poincaré also investigated provocatively the topic of the stable shape of the Earth, not only theoretically in the 1880s but practically as a professional astronomer and as a senior figure in the French geodetic expedition to Peru in the early 1900s.

From an historical standpoint, Poincaré's innovations pose a number of questions about the reception of his mathematical techniques among the various communities of mathematicians, mathematical astronomers, mathematical physicists, electrical engineers, and geodesists. They also invite us to examine the history of research on continuous wave production, transmission and detection in the domain of wireless telegraphy: who was active in the field, what sort of problems were they facing, what were the constraints they were working under, what sort of material and cognitive resources were at their disposal, and under what circumstances? Similar questions can be asked about his work and its reception in theoretical and practical geodesy, that amplify the picture of French science at work in the years around 1900.

Speakers

Section I: Wireless technology and theory, 1896-1914
Chair: J. Gray (Open University & Warwick)

Elizabeth Bruton (PhD candidate, Leeds, UK)
Detecting wireless waves, from coherers to the valve

Scott Walter (University of Lorraine, France)
Poincaré's triple-dip cone: relativity, geodesics, and wireless technology at the St. Louis World's Fair (1904)

Jean-Marc Ginoux (Toulon, France)
Poincaré's lessons on wireless telegraphy (1908)

Graeme Gooday (Leeds, UK)
Commentary

Section II: Applications of Poincaré's Méthodes nouvelles in celestial mechanics and mathematics
Chair: T. Sauer (Caltech & Einstein Papers)

Frédéric Brechenmacher (Lens, France)
On algebraic practices adjacent to those of the Méthodes nouvelles and their application by Poincaré

Jeremy Gray (Open University & Warwick, UK)
Testing Newton's mechanics: Poincaré on geodesy and geodesics

Philippe Nabonnand (University of Lorraine, France)
Poincaré on the geodesics of convex surfaces (1905)

Tatiana Roque (Rio de Janeiro, Brazil)
The reception of Poincaré's Méthodes nouvelles among mathematical astronomers, 1892-1912

SYMPOSIUM S010 "INTRODUCTION OF MATHEMATICS IN IBEROAMERICA (PART II) "

Organizers: Alejandro R. Garciadiego (Universidad Nacional Autónoma de México, Mexico)
Clara H. Sánchez (Universidad Nacional de Colombia, Colombia)

Abstract

The goal of this symposium is to invite an international group of scholars to discuss diverse aspects of the introduction of Mathematics in Iberoamerica.

In previous meetings (*e.g.,* Budapest 2009), we discussed the adaptation of mathematical ideas, concepts and methods developed in the Western Hemisphere from the beginnings of the XIX century onwards. In that particular case, we selected two branches of mathematics (Set Theory and Logic), in order to keep a precise intellectual framework and to be able to unfold coherent and vivid discussions as a consequence of alternative historical reconstructions, even from the same area. It is important to keep in mind that —although most of the countries of this region share similar roots and growths and, as a consequence, it is possible to analyze parallel historical reconstructions— they also own their particular idiosyncrasies and independent evolutions.

On this occasion, in order to enrich the diversity of this symposium, participants will have complete freedom to discuss any intellectual conditions that allowed the introduction of mathematical ideas into Iberoamerica, as well as later developments and subsequent influences and consequences. That is to say, the symposium will not be limited to any specific time and/or branch framework; although sessions will be grouped by time or topic. The event will cover studies since the establishment of printing in the New World (*ca.,* 1551), up to the consolidation of professional mathematical communities (*ca.,* 1960s). Possible examples of time tables of the sessions include:

the Colony (1520s to 1820s); XIX; and, XX centuries. Possible cases of thematic sessions include: the lack of texts on Euclidean Geometry; the influence of Positivism during the XIX century and its role in the teaching of mathematics; and, the development of research groups in contemporary mathematics; among others.

Program

S010-A. The foundations of mathematics
Wed 24 July, 14:10–15:40 ▪ Roscoe 1.010
Chair: Alejandro GARCIADIEGO | Universidad Nacional Autónoma de México, Mexico

Fernando ZALAMEA | Universidad Nacional de Colombia, Colombia
A brief history of the Latin-American symposia of mathematical logic, 1970-2012

Abstract: The actual consolidation of mathematical logic in Latin America comes from a variety of perspectives, not the least the construction of a solid community of researchers. Fifteen SLALM (Simposio Latino Americano de Lógica Matemática), from 1970 till 2012, have being central for a solid glueing of that community. We will present in our talk a brief history of those SLALMs, underscoring both (i) the impetus of some central figures (Chuaqui, Cignoli, Da Costa, Caicedo, Di Prisco, amongst others) and (ii) the construction of a well-connected web of researchers between leading countries (Brazil, Colombia, Chile, Argentina). The result confirms the role of an oscillating pendulum, in the advancements of science, between local, individual, initiatives and global, community, weavings.

Andrea ARREDONDO | Universidad Nacional Autónoma de México, Mexico
The foundations of mathematics in context: the case of Mexico

Abstract: In nineteenth-century, the studies leaded by German mathematicians about arithmetic were characterized by the pursuit of rigor, and of a strong support that served as a solid foundation upon which they could build the rest of mathematical knowledge. This project was developed not only because of the uncertain place on which mathematics of that time found themselves due to the emergence of new and unexpected results in geometry and analysis, but also because it was strengthened by the broader academic context, in which transformations in education and the German values of that period were shaping a particular conception of knowledge in which certain views on what and how should be studied were being privileged. On the other hand, Mexico's concerns about formality in demonstrations and about the search for a solid construction of mathematics emerged in the twentieth-century, in the decade of the forties, under the context of the establishment of the Faculty of Sciences and the professionalization of mathematics in the country. Because of this, the impact of studies such as those of Frege, Dedekind, Cantor, and Hilbert had a rather pedagogical orientation. An example of this, is "What is arithmetic?", a book written by Francisco Zubieta Russi published in 1953. This book was the first to include the mathematical ideas of the above mentioned mathematicians on the principles that support arithmetic. The preface and the exposition of the notions of arithmetic throughout this book, give a clear idea of how mathematics and teaching of mathematics were conceived in this period.

Clara Helena SÁNCHEZ BOTERO | Universidad Nacional de Colombia, Colombia
The introduction of set theory and modern mathematics in Colombia: the Colombian contribution

Abstract: The creation of a formal program in mathematics at the Colombian National University at the beginnings of the 50's of the last century is due to the Italian mathematician Carlo Federici and

the Hungarian mathematician John Horváth. The latter is responsible for the visits of Solomon Lefschetz, John von Neumann, Laurent Schwartz, Jean Dieudonné, Serge Bischler, among others, in Colombia. The first alumni of this program were mostly self-taught, but they took the duty to teach modern mathematics the next generations to come. In this work we present their contribution to this enterprise at university and high and primary school. The first publications done by Colombians on this matter appeared in the *Revista de Matemáticas Elementales* (founded in 1952 and initially published by the Colombian National University and University of the Andes). Beginning in 1965 some documents written by Colombian mathematicians were published and used as university textbooks. Their contents are analyzed in our work. On the other hand, modern mathematics was introduced at primary and high-school using textbooks prepared by the Research Institute of Pedagogical National University. Also in this Institute guides for primary and high-school teachers were prepared and used in normal schools whose mission is to form elementary school teachers. Finally, as a byproduct of this effort, a collection named Colección Matemática Actualizada was published. This collection is examined in detail.

This presentation is based on work co-authored with Víctor S. Albis González. *References:*

Clara H. Sánchez B. and Víctor Albis G. "Historia de la enseñanza de las matemáticas en Colombia. De Mutis al siglo XXI". *Quipu* **141** (2012) 109-158.

Clara H. Sánchez, and Víctor Albis. "La introducción de la teoría de conjuntos y la matemática en Colombia. Primera parte: el aporte de los extranjeros". *Mathesis* **III 4** (2009) 265-293.

Alejandro GARCIADIEGO | Universidad Nacional Autónoma de México, Mexico
Mathemorphosis: a new methodological tool for the understanding of the history of mathematics

Abstract: Apparently, throughout centuries, the pedagogy and history of mathematics have maintained a symbiotic relationship. For example, almost as soon as Euclid´s *Elements* emerged, as a basic mathematical textbook or part of it in Western culture, some editions included, along the permits and dedications, a chronological section. When this relationship became even more explicit, in particular, parallel to the processes of professionalization of both disciplines in the second half of the XX century, it became a common practice to use, apply and or include history into the pedagogy of mathematics. In this occasion, we will discuss a new powerful tool in this direction.

S010-B
Wed 24 July, 16:10–17:40 ▪ Roscoe 1.010
Chair: Clara Helena SÁNCHEZ BOTERO | Universidad Nacional de Colombia, Colombia

Jose A. CERVERA | El Colegio de México, Mexico
The introduction of logarithms into Mexico and China: a comparative study

Abstract: The Mercedarian friar Diego Rodríguez (1596-1668) is considered to have been the mathematician who first introduced the study of logarithms in the New Spain, just twenty years after the development of this technique of calculation by John Napier (1550-1617). We must not forget that logarithms were developed as a method to carry out arithmetic calculations quickly, which was essential for astronomical calculations as well as for other sciences. Why did logarithms arrive in Mexico years before they were used in Spain? Was the isolated genius of Diego Rodríguez which enabled such a result, or there are objective reasons to understand the delay of Spain in the 17th century mathematics? In order to find answers to these questions, I will consider another example for comparison: the introduction of logarithms in China by the Jesuits in the middle of the 17th century, as a way for the spread of Christianity.

Elena AUSEJO | Universidad de Zaragoza, Spain
The consolidation of infinitesimal calculus in Spain, 1767-1814

Abstract: A limited introduction of calculus in Spain –on a fluxional basis– took place in a few Jesuit and military institution in the second half of the 18th century, until the expulsion of the Jesuits in 1767.

The setting up the colleges and seminars abandoned after the Jesuits' expulsion eventually facilitated the emergence of teachers and institutions that allowed mathematics to thrive during the following period, up to the Independence War against Napoléon (1808-1814).

This paper presents the network of mathematicians who starred in this process (Jorge Juan, Bails, Juan Justo García, Subirás, Varas, Verdejo, Ibarra, Ciscar, Chaix, and Vallejo, among others) in institutions such as the former Jesuit colleges, military academies, technical institutions, and university. The most relevant works, from Benito Bails' *Elements of Mathematics* (10 vols. 1772-83) and *Principles of Mathematics* (3 vols. 1776) to Vallejo's *Elementary Treatise of Mathematics* (5 vols. 1812-1817), are considered.

From these data, conclusions are established as regards foreign influences and main trends in the consolidation of calculus in Spain. The powerful influence of Jorge Juan definitely tipped the scales in favour of continental calculus, partly for pedagogical reasons, but also because differences between fluxional or infinitesimal approaches were not so important for many Spanish authors during this period: by the end of the 18th century, Leibniz's notation was absolutely dominant, but fluxional concepts were still considered more rigorous. Nevertheless, the concept of limit as defined by D'Alembert and developed by Cousin, gradually emerged from Bails and was adopted by Ciscar, who dismissed differentials despite their usefulness, as a result of his deep understanding of the problem of foundations of calculus.

The theory of limits as the basis for the foundations of calculus, which was a clear precedent for the correct approach to the problem, was also adopted in Chaix's *Instituciones de cálculo diferencial* (1801), the first Spanish work entirely devoted to differential calculus. In this work, functions were the central element of calculus, derivatives –not differentials– were the characteristic element, the expression dy/dx was a symbol –not a quotient– and geometry was relegated to applications in favour of algebra.

Finally, the fourth volume of Vallejo's *Elementary Treatise* (1813), devoted to differential and integral calculus, also followed D'Alembert in defining calculus through the concept of limit, reduced calculus to algebra in Lagrange's style, and introduced Lacroix in Spain, albeit avoiding differentials and including finite differences.

Sergio H. OROZCO-ECHEVERRI | Universidad de Antioquia, Colombia
Political theology and colonial interests in Mutis' defence of Newton's natural philosophy in the Viceroyalty of New Granada

Abstract: Newtonian natural philosophy first circulated in America–in the first half of the eighteenth century–during the colonial activities associated to the scientific expeditions to Perú and Quito. However, it was not until the Bourbon Reforms in the way supported by the reign of Carlos III, in the second half of the eighteenth century, that the educational system of the Spanish colonies was seriously considered as needing a deep reform for the economic and social improvement of the Empire. Such an educational system of the New Granada was ruled by the Dominican order whose curricula were shaped by the traditional Aristotelian-Scholastic ideas and it permeated the intellectual and social activities of the colony. José Celestino Mutis y Bossio (1732-1808) is well known for his leading role in the Royal Botanical Expedition. He was a Spanish priest that arrived at

the Audience of Santafé de Bogotá in 1761 having finished his medical education in Cadiz to become the physician of the new Viceroy Pedro Messía de la Cerda. However, historians have seriously overlooked his defence of the Newtonian natural philosophy, and his arguments in favour of the usefulness of mathematics for the Viceroyalty, in contrast to the Scholastic thought highly dominant within the social and academic circles of the colony. Mutis' defence of the 'new philosophy' included the first translation into Spanish of Newton's Philosophiae naturalis principia mathematica (circa 1770), the creation of the first Chair of Mathematics in the Colegio Mayor de Nuestra Señora del Rosario (1762) along the lines of Newtonian natural philosophy, and the foundation of the first astronomical observatory in America (1802). It is in this context that this paper aims to expose how Mutis' arguments in defence of Newton's natural philosophy were shaped by the colonial interests of the Bourbon reforms and particularly by the political theology there outlined against the traditional and dominant ideas and political structure of the Dominican Order, which even appealed to the Holy Inquisition against Mutis' reformist ideas.

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From Pombo to Rueda: Determinants in Colombian textbooks of algebra, 1858-1919

Abstract: In 1858, the engineer Lino de Pombo O'donnell (1797-1862), who was Mathematics teacher at Military College, published the first edition of *Lessons of Arithmetic and Algebra.* In this textbook emerging procedures of the determinants were explained by the author to solve linear system. The form that Pombo explained this topic was similar to Etienne Bézout (1730-1783).
Years later, the Mathematics teacher at the National University, Manuel Antonio Rueda (1858-1907), published many editions of a textbook of algebra, where finally in the ninth edition appeared the determinants. In 1919, the writer and Mathematics teacher, Victor E. Caro (1877-1944) added as an appendix (*Elementary theory of determinants*) to Rueda's book, few pages where explained this topic following other authors.
The aim of this work is to make a general outline of the determinants at Colombian University, from Pombo to Rueda. We will analyze this topic in Colombian textbooks and its relations with the first European textbooks.