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Nicolas Rouche (1925-2008)

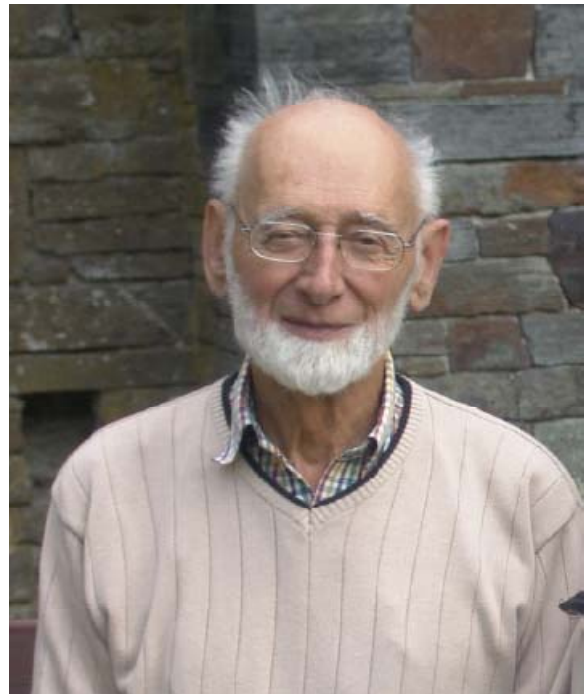
Caterina Vicentini has written this appreciation of Nicolas Rouche who died in November 2008.

Dear Nicolas, we are going to miss you!

Nicolas Rouche died during the night of 17, 18 November 2008. Everyone in our field has had the occasion, if not to meet him, at least to have read his papers or books on epistemology and didactics of mathematics.

When Evelyne Barbin asked me to write a paper in his honour, the first thing I thought was that I've always felt extremely grateful to him. The reasons for this gratitude can be summed up by looking at his personality and his way of working.

Nicolas Rouche was a knowledgeable, very kind and democratic man, with a good feeling for the philosophical and social aspects of mathematical education. He was particularly concerned with the notion of *sens* (sense or meaning). Consider only a few titles from his many papers and books: *Faire des mathématiques: le plaisir du sens* (with R. Bkouche and B. Charlot, Armand Colin, 1991); *Le sens de la mesure* (Didier Hatier, 1992); *La dérivée, l'intégrale, la primitive, un univers de sens* (paper in the Bulletin of the APMEP, Belgian association of mathematics teachers); *Du savoir à l'élève ou de l'élève au savoir, une question de sens* (same revue). For



Nicolas there were essentially two meanings of the word 'sens' in mathematical education: the strict and unambiguous 'sens' within a well made mathematical theory; and, on the other hand, the rich contextual 'sens' that goes beyond the strictly narrow meaning and comes from real situations in daily life. These two approaches to the word 'sens' are opposite one to the other. The first one gives to each word a unique reference and introduces rigour and precision, the second one enriches the meanings, corresponds to imagination, suggestion, etc. Following the first, we say: the meaning is clear; following the second, we say: it is full of meaning, or: the meaning is deep. In the teaching-learning activities we

have to be aware of both meanings of the word 'sens'. In fact it's the ambiguous and rich 'sens' of daily life that enables us to go from the real world to mathematics, that is to the strict and precise 'sens' of mathematics. These two extremes constitute the way from pupils to knowledge and from knowledge to pupils.

To have a better understanding of this focus on the 'sens' and on the dialogue between reality and mathematics, it's important to have a look at the long and rich career of professor Rouche that allowed him to develop both his theory and practical abilities. As Jean Mawhin said, in a speech in his honour during a colloquium in Lovain-la-Neuve in 2002, Nicolas has had 'several lives'.

After classical studies at high school, Rouche became an engineer in the early 1950s. In his early professional life, he was a teaching assistant of professor Florent Bureau who taught analysis and mechanics at the University of Liège. In this period he spent a year at New York University (at the now Courant Institution) and studied under the supervision of professor Stoker. After a time he returned to Belgium and took up again as an engineer and worked, from 1953 to 1957, for the Bell Company in Antwerp. His third professional life brought him to Africa, to Leopoldville, at Lovanium University as 'chargé de cours' in 1957 and as full professor the year after.

In 1962 a new phase began: Nicolas became full professor at the Faculty of Applied Sciences at Louvain University in Belgium. Here, he was the instigator, together with his colleague René Lavendhomme, of the Institut de Mathématique Pure et Appliquée that still exists in Louvain-la-Neuve. He became the president of this institute and maintained this role until 1973. During this period he studied differential equations and created a large active group of researchers in this subject including many PhD students.

In 1976 his fifth life started. Nicolas was more and more involved in questions concerning the methodology of teaching, especially in geometry. In 1981 he created and then guided the GEM (Groupe d'Enseignement Mathématique), a group

composed of teachers and researchers active in investigating new methods of teaching mathematics which tried to overcome the damage done by the modern mathematics reforms. This group still works at the Maths Department in Louvain-la-Neuve.

The sixth life of Nicolas started in the 1990s, when he created the CREM (Centre de Recherche sur l'Enseignement des Maths) in Nivelles, an association financed by the government of the Communauté Française de Belgique that put together teachers and researchers from nursery school to PhD and had, and still has, the aim to develop a coherent way of rethinking the teaching of mathematics from childhood to adult age.

Any discussion of professor Rouche's activities could be much longer. I'm pleased to just recall his career as a university teacher, his thinking about the basis of mechanics, the participation in a lot of reforms, international groups and conferences on history, didactics and epistemology of mathematics, the reflections about the European integration that led to his winning the Emile Bernheim Price in 1973, his fundamental role in the Damblon Commission on teaching in secondary schools and his social awareness.

But let me conclude with a personal note. It was during the fifth life of Nicolas that I first met him. I was a young teaching assistant at University in Louvain-la-Neuve, doing a PhD in category theory and he was the head of the GEM. I was emerging from a personal and professional crisis: I could no longer see the meaning of what I was studying. I remember that during the last conference I took part in, I interviewed all the important professors to try to understand more about the 'sens' of category theory but with no luck. In this period I understood that teaching was my most important interest and therefore I went to follow the course of Méthodologie de l'Enseignement led by Nicolas. In this course, we didn't just listen to somebody explaining theories about how to teach but sitting together we tried to solve some mathematical problems at our own level in order to understand directly the difficulties that our students meet when they approach a new subject. For me it was

really a new way of conceiving the teaching-learning process. I was fascinated by the enormous culture Nicolas had, and impressed by his ability to speak to everyone as if he was at the same level. I can't remember a situation in which he imposed his will using his authority. I only remember a lot of dialogues in which every opinion had the same weight. Obviously, very often, if you were working with him, his ideas prevailed, but it was always and only because of the force of the ideas themselves. You were obliged to agree with him because the arguments he used were much more powerful than yours.

Dear Nicolas, going to Belgium or writing a new paper will never be the same thing without having the joy of meeting you or of having your advice. Thank you very much for your work and friendship. It is hard to say goodbye to you.

Caterina Vicentini

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Conference reports

CERME6

Working Group 15

Theory and research on the role of history in mathematics education

Fulvia Furinghetti, Jean-Luc Dorier, Uffe Jankvist, Jan van Maanen and Constantinos Tzanakis

In this working group, which was active for the first time in CERME 6, 23 papers were submitted. Four of them were rejected; four were accepted as a poster. In the end three of the accepted posters and one of the accepted papers were withdrawn. So in Lyon, 13 papers and one poster were presented.

If one takes into account that the working group has no tradition in CERME, and that those who submit and those who review have to find out what are the criteria for sound research about "Theory and research on the

role of History in Mathematics Education", then the percentage of rejections is reasonable.

Especially the demarcation of the subject area was not always clear for the researchers who submitted. In one case, which extended to a whole series of papers, the joint chairs of the working group decided that the subject area should be defined in such a manner that these papers could be included, provided that they would have sufficient quality. Yet, originally, the subject area was described by the joint chairs in a narrower manner. The papers meant in this remark concern the history of mathematics education.

One could argue that these papers are about history and that their content may influence mathematics education, in the sense that the awareness about the nature of mathematics and its role in education that may be brought in by a study of issues of the history of mathematics education is important for pre- and in-service teacher education. Yet, this was not the manner in which the joint chairs had originally described "the role of history in mathematics education". The original idea was to assemble in the working group those colleagues who research the effects that integration of historical elements (problems, texts) in current mathematics education may have. The subdivision of the main theme in seven topics was clear in this respect, as may be seen from the list:

1. Theoretical and/or conceptual frameworks for including history in mathematics education
2. The role of history of mathematics at primary and secondary level, both from the cognitive and affective points of view
3. The role of history of mathematics in pre- and in-service teacher education, both from the cognitive, pedagogical, and affective points of view
4. Possible parallelism between the historical development and the cognitive development of mathematical ideas
5. Ways of integrating original sources in classrooms, and their educational effects, preferably with conclusions based on classroom experiments

6. Surveys on the existing uses of history in curriculum, textbooks, and/or classrooms in primary, secondary, and university levels
7. Design and/or assessment of teaching/learning materials on the history of mathematics

This is not aiming at having papers about the history of mathematics education. This means to work with students in current mathematics lessons and to find out how they respond to the historical elements in these lessons. Nevertheless, after some deliberation and also because some interesting papers were submitted, the joint chairs decided to add a new topic 8 to the above list

8. Relevance of the history of mathematical practices in the research of mathematics education

and to review submissions in this area. In the preparations for CERME 7 it should be decided and clearly stated whether this topic 8 (briefly described as "the history of mathematics education") should be included or excluded from the programme.

Looking back on the proceedings of the working group during CERME6, we may conclude that there were two main streams of papers, one about the original theme of integration of history in current teaching (subtopics 1 to 7), and the other about how mathematics was taught in the past (subtopic 8). The two went together in a fairly harmonious manner.

The papers and the subtopics on which they focused are summarized in Table 1; the numbers refer to the above list of subtopics.

Ba & Dorier	1, 2, 8
Bjarnadóttir	8
Blanco & Ginovart	5, 7
Da Costa	8
Demattè & Furinghetti	2, 7
Jankvist	1, 2, 6
Hoff-Kjeldsen	1, 2, 5
Lawrence	2, 3, 5
Menghini	8

Milevicich & Lois (poster)	1, 4
Novaes & Pinto	8
Rogers	3, 6
Tardy & Durand-Guerrier	1, 3, 7
Thomaidis & Tzanakis	5, 6

Table 1. Main focus of the papers according to the 8 topics listed above

As to the working procedures, the time available for each paper was 45 minutes, which was equally divided between time for presentation and time for discussion. The discussions proceeded in a pointed and engaged manner, with input in the respective aspects of the working group: research methodology, historical references, educational and mathematical points.

In the evaluation one important observation was made about the relation of this working group with another group which is active in the intersection of mathematics education and the history of mathematics, which is the affiliated study group of ICMI about the relations between the **H**istory and **P**edagogy of **M**athematics (HPM). We observed that HPM has contributions of more varied character. In this WG 15 we tried to work with a specific methodology (or maybe two methodologies: an educational research method – often influenced by historical research and methodology – for subtopics 1 to 7 and an historical methodology for subtopic 8), which as one of its elements includes a theoretical framework, in which the relevant literature is discussed.

Finally we propose for CERME7 to include this working group again, and to then name it:

"Historical dimensions and mathematics education: theory and practice"

so as to include all 8 subtopics of the current working group 15.

- Ba, Cissé and Dorier, Jean-Luc: *The teaching of vectors in mathematics and physics in France during the 20th century*
- Bjarnadóttir, Kristín: *Geometry teaching in Iceland in the late 1800s and the van Hiele theory*

- Blanco, Mónica and Ginovart, Marta: *Introducing the normal distribution by following a teaching approach inspired by history: an example for classroom implementation in engineering education*
- Da Costa David, Antonio: *Arithmetic in primary school in Brazil: end of the nineteenth century*
- Demattè Adriano and Furinghetti Fulvia: *Historical pictures for acting on the view of mathematics*
- Jankvist, Uffe Thomas: *Students' beliefs about the evolution and development of mathematics*
- Kjeldsen, Tinne Hoff: *Using history as a means for the learning of mathematics without losing sight of history: the case of differential equations*
- Lawrence, Snezana: *What works in the classroom - project on the history of mathematics and the collaborative teaching practice*
- Menghini, Marta: *Intuitive geometry in early 1900s Italian middle school*
- Milevicich, Liliana and -Lois, Alejandro: *The historical and cognitive development of calculus ideas*
- Novaes, Bárbara Winiarski Diesel and Pinto, Neuza Bertoni: *The appropriation of the New Math on the Technical Federal School of Parana in 1960 and 1970 decades*
- Rogers, Leo: *History, heritage, and the UK mathematics classroom*
- Tardy, Claire and Durand-Guerrier, Vivienne: *Introduction of an historical and anthropological perspective in mathematics: an example in secondary school in France*
- Thomaidis, Yannis and Tzanakis, Constantinos: *The implementation of the history of mathematics in the new curriculum and textbooks in Greek secondary education*

**Fulvia Furinghetti, Jean-Luc Dorier,
Uffe Jankvist, Jan van Maanen and
Constantinos Tzanakis**

European Society for the history of science. Vienna, 10-12 September, 2008

Symposium 1: Analysis and synthesis in the context of European and non-European mathematical and scientific traditions.

Organised by Konstantinos Nikolantonakis of the University of Western Macedonia, Greece, the content of the symposium was as follows:

Central to the whole history of scientific knowledge and its acquisition was the method of analysis and synthesis, Latinized as resolution and composition, elaborated in its parallel medical and mathematical forms. The method is described for any material subject matter by Aristotle in the *Posterior Analytics* and the *Physics* and, after him, especially by Galen in medicine. It was a method of taxonomic exploration of what things were, in order to find their common nature and hence the cause of the phenomenon produced. The method similarly described for mathematics by Aristotle, and after him in more precise detail by Pappus of Alexandria and Proclus Diadochus, proceeded by the reduction of a problem to the elements of its solution, which was then constructed from those known elements. But what happened in the context of the Arabic mathematical and scientific tradition? We can examine the works of Ibn Al-Haytham and others to see how they use this method. After the publication during the 16th century of Proclus, Archimedes, Apollonios and Pappus, the same terminology was used in discussions both of mathematical analysis and synthesis, and notably by Galileo and Newton, of experimental arguments modelled on this mathematical method. The expanding practice of the mathematization of nature in the 17th century brought to the experimental natural sciences an essential insight into open-ended inference, giving not (simply) apodeictic demonstration but a measurably increasing range of confirmation. Their model for scientific discovery and demonstration was the mathematical method of analysis and synthesis. In explicitly casting their arguments in Euclidean or Archimedean postulational form mathematical physicists of

the early 17th century like Galileo and Kepler, Descartes and Newton, also introduced important philosophical and scientific sophistications, as A.C. Crombie notes. Our objective in this symposium is to study the use and development of this method for establishing mathematical and scientific truths in the context of European and non-European mathematical and scientific traditions.

In the frame of this Symposium there five papers were presented:

Carlos Henrique Barbosa Gonçalves, University of São Paulo: Analytic thinking in Old Babylonian mathematical problems. In this work, he examined the presence of analytic thinking in Mesopotamian mathematics. He focused on the fact that analytic thinking is understood under a ‘directional interpretation’, referring to the reasoning in mathematics that proceeds from the unknown to the known elements of a problem. The analytic character of certain families of Old Babylonian mathematical problems, e.g., ‘surface-and confrontation’ problems, solved through ‘cut-and-paste’ techniques, has already been identified. As regards geometry problems, the identification of analytic procedures in their solutions is a necessary step for the field to form a general image of the roles of analysis and the way it was employed in the Mesopotamian mathematical corpus. Given the absence of an explicit theoretical discussion on the nature of mathematics in the extant Mesopotamian evidence, a situation entirely different from that in the European tradition, the identification of analytic thinking in that context must be made only through the examination of the specific pieces of mathematics it produced. On these assumptions, he has identified and examined the presence of analytical thinking in the following Mesopotamian geometric evidence:

1. tablets DB2-146, VAT 8512 and STR 367;
2. the practical geometry related to the fabrication of bricks.

As a result, he has seen firstly that the analytic thinking in Mesopotamian

mathematics had as its main characteristic a strong operative use of unknown elements in the solutions of mathematical problems, assuming thus some accessibility to their properties even if they are not completely known; he has also seen that solutions of mathematical problems progressed by steps that included at the same time known and unknown elements, in such a way that analytic and synthetic thinking were almost inseparable from each other.

Konstantinos Nikolantonakis, University of Western Macedonia in Greece: Analysis and Synthesis in the context of Ancient Greek and Arabic mathematical traditions. In this context he showed that central to the whole history of scientific knowledge and its acquisition was the method of analysis and synthesis, elaborated in its mathematical forms. The method is described for any material subject matter by Aristotle in the *Posterior Analytics* and the *Physics*. The method is similarly described for mathematics by Aristotle, and after him in more precise detail by Pappos of Alexandria in his preface to Book VII of the *Collection*, Proclus, in the second Prologue to his *Commentary on Euclid’s Elements Book I* and the Pseudo-Euclid in a short passage, proceeded by the reduction of a problem to the elements of its solution, which was then constructed from those known elements. The terms analysis and synthesis were very well known to the great mathematicians of the Hellenistic period – Archimedes, Apollonios, Diophantos etc. but no one has explained them more explicitly. There are two distinct things: first to use a practice and then to give an exposition on the ideas which built a procedural theme, as a method. Pappos explains the method used by Euclid, Aristaeus the elder and Apollonios from Perga, the sense of analysis and synthesis, their reversibility, the distinction of theoretical analysis and problematical analysis, and at the end the conditions of the application. But what has happened in the context of Arabic mathematical tradition afterwards? We don’t know if these fragments of Pappos and Proclus were translated into Arabic. This paper

examines how Ibrahim Ibn Sinan (Xth century) used this method (work made by H. Bellosta) and compares his productions with those of his Greeks predecessors and especially with those given by Pappos from Alexandria.

Steffen Ducheyne, Centre for Logic and Philosophy of Science, University of Ghent: The Influence of the Aristotelian Tradition of Analysis-Synthesis on Newton. He pointed out that traditionally interpreters have pointed to the mathematical tradition of analysis-synthesis to account for Newton's views on analysis-synthesis in natural philosophy. From a purely logical point of view, the mathematical tradition of analysis-synthesis is incompatible with Newton's conception of analysis as discovering causes, and synthesis as assuming these causes to explain phenomena. In the mathematical tradition analysis means reasoning from what is sought to what is known and conversely for synthesis. In Newton's view analysis is reasoning from what is known, the effect, to what is sought, the cause, and conversely for synthesis. In the mathematical tradition the relation between analysis-synthesis is purely inferential and not causal. This paper thus offers a case-study of how analysis-synthesis were rendered causal within natural philosophy.

Ducheyne's aim was to establish that the Aristotelian tradition of analysis-synthesis epitomised by these textbooks is important for some 'general' features of Newton's conception of science, namely:

- a) In the order of things ('ordo naturae') causes come first and effects follow from them, in the order of knowing he has noticed effects first and from them he has tried to infer the causes.
- b) Hence, one of the most important modes (i.e., 'regressus demonstrativus') in natural philosophy is reasoning backwards from the effects to the causes; next we reason from the causes to the effects.
- c) There is a distinction between proximate causes (i.e., causes which produce their effect directly) and remote causes (i.e., causes which

produce their effect by means of some intermediary). On the highest level we have remote causes, next proximate causes, and finally the observed effects.

Newton's causal outlook on scientific reasoning (especially in the *Principia* and *The Opticks*) has striking parallels with this textbook tradition. Ducheyne has argued that, although Newton reinterpreted the notion of 'cause', he formulated his views on natural philosophy on a more abstract level in the Aristotelian terminology of analysis-synthesis. He recast his new notion of 'cause' in a familiar language. It turns out that Newton veiled his innovative new style of natural philosophy in Aristotelian terminology. This causal tradition has wrongfully been neglected. This article offers a more balanced view on the contribution of Aristotelianism on Newton. Newton drew from, and was trained in, a set of common texts and techniques which were still the most important sources for university trained natural philosophers at the mid-seventeenth century.

Mónica Blanco, Departament de Matemàtica Aplicada III, Universitat Politècnica de Catalunya, Spain: Could L'Hôpital have read Newton's *Methodus Fluxionum*? In 1696 the Marquis de L'Hôpital published the first systematic work on differential calculus, the *Analyse des infiniment petits*. This work relied largely upon the *Lectiones de calculo differentialium*, a manuscript containing the lessons that Johann Bernoulli gave L'Hôpital between 1691 and 1692. However, the works cannot be said to be identical. The most remarkable difference between them concerns the treatment of algebraic and transcendental curves, which determined in turn the choice of coordinates. The tendency towards algebraization in the eighteenth century entailed an increasing use of orthogonal coordinates, thus announcing the emergence of the concept of function. Johann Bernoulli's lessons illustrate this tendency. Contrary to this L'Hôpital stuck to a geometric treatment of the curve which led to choosing coordinates according to the geometric nature of the curve. This was the usual procedure at the end of the

seventeenth century and in fact Leibniz had suggested choosing the abscissae according to the nature of the problem to be solved.

In particular, in the problem of the tangent to the cycloid, L'Hôpital's approach turned out to be similar to the one Newton presented in his *Methodus Fluxionum*, written in 1671 though not published until 1736. Why did L'Hôpital not follow his master in the selection of coordinates for the cycloid? The conceptualization of science as a form of communication, the analysis of communication processes and the interaction between basic units of communication offer an interesting framework to answer this question. This paper analyzes the complex network of diversified communicative practices that might have allowed L'Hôpital to become acquainted with parts of Newton's *Methodus Fluxionum* before its publication.

Eduard Recasens, Universitat Politècnica de Catalunya, Barcelona, Spain: A comparative study of the introduction of barycentric analysis in the works of Zaragozà, Ceva and Möbius. In the Ancient World, Archimedes used the physical concept of centre of gravity as a method of discovery for calculating areas and volumes. In the 17th century the idea of using the properties of the centre of gravity to discover geometric truths was elaborated by José Zaragozà in his book *Geometria Magna in Minimis* (1674), but Zaragozà did not use the physical centre of gravity. Instead, he defined the *Centrum Minimum* in geometrical classical terms as a point whose properties are the ones typical of the centre of gravity. Therefore, Zaragozà was the first who created a barycentric theory in the geometric field. The same idea and method reappeared four years later in Giovanne Ceva's book *De lineis rectis se invicem secantibus statica constructio* (1678), but this time the method was based on the physical principles of the balance equilibrium. Finally, in the 19th century, Ferdinand Möbius introduced again, in his book *Der barycentrische Calcul* (1827), the same method but using algebra instead of traditional geometrical language as Zaragozà had done.

This paper described how Zaragozà, Ceva and Möbius introduced barycentrism. The contribution of this paper is a comparative study of three genuine methods of barycentric analysis elaborated by means of different scientific languages and analyses the extent to which the potentialities of a same idea – barycentrism as a method of analysis in geometry – vary when expressed in physical, geometric or algebraic terms.

Konstantinos Nikolantonakis,
Greece

The editors welcome reports from conferences.

Work in progress

We encourage young researchers in fields related to *HPM* to send us a brief description of their work in progress or a brief description of their dissertation.

New Books

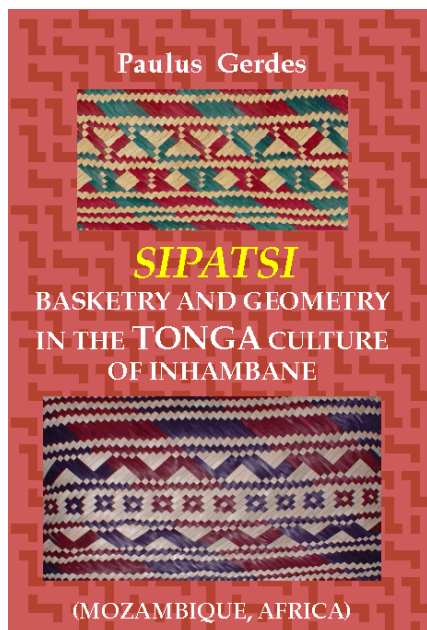
Sipatsi: Basketry and Geometry in the Tonga Culture of Inhambane (Mozambique, Africa)

Paulus Gerdes

Gitonga speaking basket weavers, mostly women, from Inhambane in the Southeast of Mozambique make colourful 'sipatsi' purses, and handbags. They are very creative in inventing new decorative designs and patterns.

In several chapters, activities and problems for exploration in mathematics (teacher) education have been presented, underscoring the scientific and educational wealth of the *sipatsi* as a mathematical construct.

<http://stores.lulu.com/pgerdes>



Geometria Sona de Angola: Matemática duma Tradição Africana

Paulus Gerdes' book "Sona geometry from Angola: Mathematics of an African Tradition" (Polimetrika Science Publishers, Monza, 2006) is now also available in Portuguese (Preface by Arthur B. Powell, Rutgers University, Newark).
CEMEC-UP e Lulu, 2008, 244 pág.



Have you read these?

Aboav, David (2008). Euclid's book on divisions of figures: a conjecture as to its origin. *Archive for History of Exact Sciences* 62 (6), 603-612.

Acerbi, Fabio (2009). The meaning of $\pi\lambda\alpha\sigma\mu\alpha\tau\iota\kappa\acute{o}$ ν in Diophantus' *Arithmetica*. *Archive for History of Exact Sciences* 63 (1), 5-31.

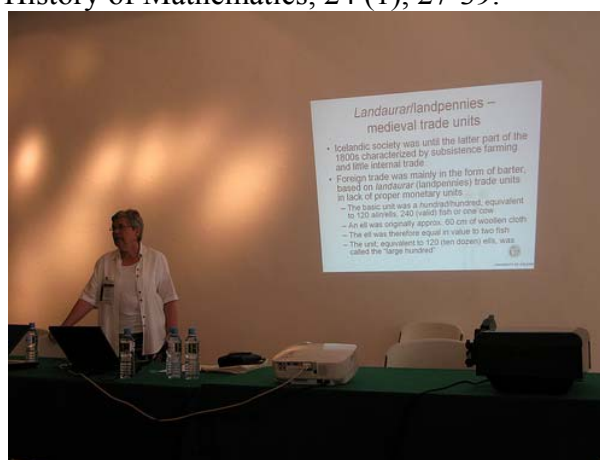
Adelmann, Clemens and Eberhard H. -A. Gerbracht (2009). Letters from William Burnside to Robert Fricke: automorphic functions, and the emergence of the Burnside

Problem. *Archive for History of Exact Sciences* 63 (1), 33-50.

Albree, Joe, Scott H. Brown (2009). 'A valuable monument of mathematical genius': The Ladies' Diary (1704-1840), *Historia Mathematica* 36 (1), 10-47.

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Anderson, David (2009). The contribution of M H A Newman and his mathematicians to the creation of the Manchester 'Baby'. *BSHM Bulletin: Journal of the British Society for the History of Mathematics*, 24 (1), 27-39.



(Kristin Bjarnadóttir presenting in Mexico)

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Pinknet Davis, T. (2008, April). A History of Mathematics Education during the Twentieth Century. *Mathematics Teacher*, 101(8), 623-623.

Pourciau, Bruce (2009). Proposition II (Book I) of Newton's *Principia*. *Archive for History of Exact Sciences* 63 (2), 129-167.

Przenioslo, Malgorzata (2009). International mathematical journals published in Poland between the Wars. *BSHM Bulletin: Journal of the British Society for the History of Mathematics*, 24 (1), 20-26.

Saracho, O., & Spodek, B. (2009, February). Educating the Young Mathematician: A Historical Perspective Through the Nineteenth Century. *Early Childhood Education Journal*, 36(4), 297-303

Saracho, O., & Spodek, B. (2009, February). Educating the Young Mathematician: The Twentieth Century and Beyond. *Early Childhood Education Journal*, 36(4), 305-312.

Xu, Y. (2008, September). The Westernization of Mathematics in China/A Draft History of Mathematics Education in the Late Qing Dynasty/A Short History of Algebra in Modern China. *ISIS: Journal of the History of Science in Society*, 99(3), 606-608.



Have you been here?

In this section we bring links related to the scope of the HPM from around the world. Please send suggestions.

New link(s) in this issue



Monuments on Mathematicians

<http://www.w-volk.de/museum/exposi.htm>

Societies and organisations

Commission on the History of Mathematics in Africa (including newsletter)

http://www.math.buffalo.edu/mad/AMU/amuc_hma_online.html

Association des Professeurs de Mathématiques de l'Enseignement Public [APMEP] History site:

<http://www.apmep.asso.fr/BMhist.html>

| *b s h m* |

British Society for the History of Mathematics [BSHM]

<http://www.bshh.org>

HOMSIGMAA - History of Mathematics Special Interest Group of the MAA

<http://www.maa.org/sigmaa/hom>

HPM Americas

<http://www.hpm-americas.org/>

Italian Society of History of Mathematics
<http://www.dm.unito.it/sism/indexeng.html>

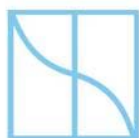
**Association pour la Recherche en
Didactique des Mathématiques:**
<http://www.ardm.asso.fr/>

**Commission Française pour l'Enseignement
des Mathématiques:** <http://www.cfem.asso.fr/>

**Instituts de Recherche sur l'Enseignement
des Mathématiques (IREM):**
<http://www.univ-irem.fr/>

**Canadian Society for History and
Philosophy of Mathematics**
<http://www.cshpm.org>

Sociedade Brasileira de
História da Matemática



SBHMat

**Brazilian Society for History of
Mathematics**
<http://www.sbhmat.com.br>

Nuncius Newsletter
<http://brunelleschi.imss.fi.it/nuncius/inln.asp?c=5302>

**International History, Philosophy and
Science Teaching Group**
www.ihpst.org

**Centre for the History of the Mathematical
Sciences.**
The Open University, UK
http://puremaths.open.ac.uk/pmd_research/CHMS/index.html

Oxford Museum of the History of Science
www.mhs.ox.ac.uk/exhibits/



*The Measurers: a Flemish Image of Mathematics in the Sixteenth
Century*

Practical mathematics and its application in Renaissance Europe.
3rd July - 15th December 1995

<http://www.mhs.ox.ac.uk/measurer/text/title.htm>

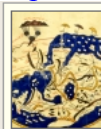
The Geometry of War, 1500-1750

The application of mathematical science in the context of the
battlefield.

20 February - 30th November 1996



<http://www.mhs.ox.ac.uk/geometry/title.htm>



Science in Islam

A resource for secondary schools, bringing together a number of
objects of Islamic origin that provide insight into some of the
achievements and developments of Islamic science and
technology, founded upon a legacy from the ancient world.

25 April - 25 July 2006

<http://www.mhs.ox.ac.uk/scienceislam/>

Topics and Resources

**MATHS for EUROPE: The history of some
aspects of mathematics like: history of
mathematical persons, symbols,
algorithms...**

<http://mathsforeurope.digibel.be/index.html>

<http://mathsforeurope.digibel.be/list.htm>

<http://mathsforeurope.digibel.be/olvp.htm>

<http://mathsforeurope.digibel.be/olvp2.htm>

<http://mathsforeurope.digibel.be/olvp3.htm>

Ethnomathematics on the Web

[http://www.rpi.edu/%7Eeglash/isgem.dir/links
.htm](http://www.rpi.edu/%7Eeglash/isgem.dir/links.htm)

About Medieval Arabic Numbers

[http://www.geocities.com/rmlyra/Numbers.ht
ml](http://www.geocities.com/rmlyra/Numbers.html)

<http://www.geocities.com/rmlyra/arabic.html>

Annotated Bibliography on Proof in Mathematics Education

[http://fcis.oise.utoronto.ca/~ghanna/educationa
bstracts.html](http://fcis.oise.utoronto.ca/~ghanna/educationa
bstracts.html)

BibM@th

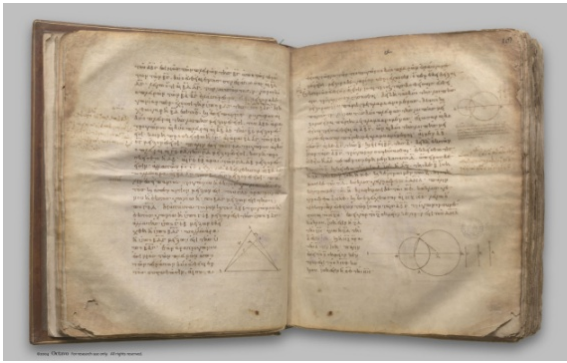
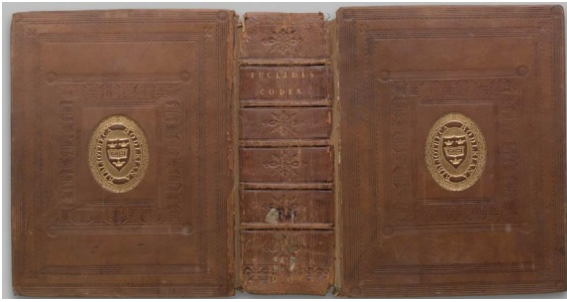
[http://www.bibmath.net/dico/index.php3?actio
n=rub&quoi=0](http://www.bibmath.net/dico/index.php3?actio
n=rub&quoi=0)

**Centro Virtual de Divulgación de las
Matemáticas, esta siendo desarrollada por
la Comisión de Divulgación de la Real
Sociedad Matemática Española (R.S.M.E.)**

<http://www.divulgamat.net/index.asp>

**Digitization of the oldest extant manuscript
of Euclid's *Elements***

<http://librarieswithoutwalls.org/bookviewer/>



History of Statistics

<http://www.stat.ucla.edu/history/>

Images of Lobachevsky's context

<http://www.ksu.ru/eng/museum/page0.htm>

Images of Mathematicians on Postage Stamps

<http://members.tripod.com/jeff560/index.html>

Photos of Mathematicians

<http://www.math.uni-hamburg.de/home/grothkopf/fotos/math-ges/>

Numdam-Digitization of ancient mathematics documents

<http://www.numdam.org/en/ressnum.php>

The Montana Mathematics Enthusiast (journal)

<http://www.montanamath.org/TMME/>

Convergence: an online magazine of the MAA providing resources to teach mathematics through its history

<http://convergence.mathdl.org/>

International Journal for Mathematics Teaching and Learning,

<http://www.cimt.plymouth.ac.uk/journal/default.htm>

Homepage of International Journal for the History of Mathematics Education

<http://www.tc.edu/centers/ijhmt/index.asp?Id=Journal+Home>

Documents for the History of the teaching of mathematics in Italy

<http://www.dm.unito.it/mathesis/documents.html>

Ethnomathematics Digital Library

<http://www.ethnomath.org/>

Some Japanese Mathematical Landscapes:

The results of wandering in a beautiful country, with a mathematical eye, aided by a digital camera, by A. Arcavi

http://math.criced.tsukuba.ac.jp/museum/arcavi/arcavi_english/index.html

Wann-Sheng Horng's webpage

with HPM related materials in Chinese.

<http://math.ntnu.edu.tw/~horng/>

Fred Rickey's History of Mathematics Page

<http://www.dean.usma.edu/math/people/rickey/hm/default.htm>

CultureMATH. Ressources pour les enseignants de Mathématiques

www.dma.ens.fr/culturemath/actu/livres.htm

The French INRP (National Institute for Pedagogical Research) is developing a website on questions related to mathematics teaching: EducMath

<http://educmath.inrp.fr>

Geometrical books and instruments from 15th to 18th century

<http://www.geometricum.com/>

David Henderson's Home Page [Educational and Historical Topics on Geometry]

<http://www.math.cornell.edu/~dwh/>



(Albrecht Heeffler on Mexican pyramid)

Homepage of Albrecht Heeffler

<http://logica.ugent.be/albrecht/>

Homepage of Jens Høyrup

<http://www.akira.ruc.dk/~jensh/>

L'Enseignement Mathématique, Archive

<http://retro.seals.ch/digbib/vollist?UID=ensmat-001>

Homepage of Prof. Leo Corry

<http://www.tau.ac.il/~corry/>

Opera Mathematica of Christoph Clavius

<http://mathematics.library.nd.edu/clavius/>

Archimedes Project [Some famous mathematical books of the Renaissance period are available on line, i.e. Pacioli's *Summa*]

http://archimedes2.mpiwg-berlin.mpg.de/archimedes_templates

Simon Stevin's *De Meetdaet* [The Practice of Measuring]

<http://www.math.leidenuniv.nl/~wiskonst/meetdaet/index.html>

and *The Principal Works of Simon Stevin*

http://www.historyofscience.nl/works_detail.cf?m?RecordId=2702

Mathematicians Gallery

http://www.math.uconn.edu/MathLinks/mathematicians_gallery.php?Rendition=printerfriendly

History of Mathematics

<http://www.otterbein.edu/resources/library/libpages/subject/mathhis.htm>

The Garden of Archimedes. A museum for Mathematics

http://web.math.unifi.it/archimede/archimede_NEW_inglese/

Mathematical instruments

<http://brunelleschi.imss.fi.it/museum/esim.asp?c=500164>

and

<http://web.mat.bham.ac.uk/C.J.Sangwin/Sliderules/sliderules.html>

and

<http://www.mhs.ox.ac.uk/epact/catalogue.php?ENumber=52265>

Homepage of Eleanor Robson

<http://www.hps.cam.ac.uk/dept/robson.html>

Flickr group for HPM related photos

<http://www.flickr.com/groups/812621@N24/>

We would like to provide a more comprehensive list of websites containing resources useful to researchers and students (not necessarily in English). If there are any you use, or you know are useful for students or researchers, please send your recommendations to the editors.

Notices

Younes Mahdavi, a student from Tehran working on Persian trigonometry texts has sent us this account of the work of Nasir-al-Din-al-Tusi.

Nasir al-Din al-Tusi (1201-1274), A Persian treatise on trigonometry

The word trigonometry is derived from the Greek and it means the measurement of triangle. It is not however a Greek word since this branch of mathematics, undoubtedly of Greek origin, was not known by its present name until the beginning of the 17th century. The name was apparently invented by the

German astronomer Pitiscus in 1599 when he entitled one of his works *Trigonometria libri quinque*.

The subject had been studied well before Euclid's time since both Euclid (fl. 300 BC) and Autolycus (fl. 310 BC) quoted propositions about the great and small circles on the sphere and regarded them as known propositions. The only work on the subject which collected the propositions quoted by Autolycus and Euclid, is a work entitled *Spherica*, in three Books by Theodosius (c.160–100 BC). In addition there is Menelaus' *Spherica* (c. 70–140 AD) which is much more developed than the treatise of Theodosius. It contains the famous theorem now known as Menelaus' Theorem.

In the Islamic era various texts were composed involving trigonometry but most of them were treated as an elementary part of astronomy. The first compilation, of purely mathematical interest, is a treatise entitled *Maqālid 'ilm al-hay'a* (Keys to the Science of Astronomy) by al-Bīrūnī (973- after 1050).

By the end of the 10th century Islamic mathematicians discovered that Menelaus' Theorem in spherical trigonometry is not easily applicable to solving different problems. Therefore they made some attempts to remove the difficulty.

The simplification at this time led to techniques of astronomy involving two 'figures' (in Arabic *text*, *shakl*, i.e. theorem) which can be demonstrated as sufficient to replace Menelaus' Theorem. As soon as the theorems are introduced, they became fundamental ones in calculations. The first was called *al-shakl al-mughnī* ('the figure that dispenses', now called the sine theorem) and the second *al-shakl al-zillī* ('the shadow figure', now called the tangent theorem).

In the introduction of *Maqālid* al-Bīrūnī mentioned the inventors of these two theorems and discussed the contribution of each of

mathematicians to the subject. Moreover he gave different demonstrations of the theorems or their preliminaries given by his contemporaries. In 1980, *Maqālid* was edited and published with its French translation by Marie-Thérèse Debarnot. As al-Bīrūnī asserts in the *Keys*, the introduction of the first theorem is due to Abū Nasr ibn 'Iraq (died around 1036). It was Abū Nasr who gave the first complete version of the *Spherica* of Menelaus which was abandoned by his predecessors in the face of some difficulties. Abū Nasr dedicated a treatise to al-Bīrūnī entitled *Risāla fī ma'rifat al-qusīy al-falakīya* and expounded his idea in it. The inventor of the second theorem is Abū al-Wafā' al-Būzjānī (940-97 or 98). Abū al-Wafā' demonstrated the second theorem in a book that he entitled *Almagest*.

The end of the 10th century marks a turning point. In astronomy texts, trigonometry occupies an important place with chapters on sines and chords, shadows (tangent) and the formulae of spherical calculations. There is also an interest in the resolution of triangles. The tradition leads to a composition of a new type of work, represented by a treatise of Nasīr al-Dīn al-Tūsī, entitled *Kashf al-qinā' 'an asrār shakl al-qatṭā'* (Treatise on the Secrets of the Sector Figure).

Nasīr al-Dīn al-Tūsī (1201-1274), the founder of the famous observatory of Marāgha, is the author of more than sixty works some of which concern philosophy and theology. His scientific works include numerous revisions (*Tahrīr*) mostly of the Greek mathematical and astronomical works. These revisions were compiled in a collection named *Tahrīr Mutawassitāt* (the Middle[text]s) which were studied after Euclid's *Elements* and before Ptolemy's *Almagest*. Two of his revisions included in such collections, are of the *Spherica* of Menelaus and Theodosius under the title *Ukar*

([On] Spheres). The treatise *Kashf al-qinā'* is a work of the most mathematical interest on spherical trigonometry. Al-Tūsī, as he mentioned at the beginning of the treatise, firstly wrote it in Persian and afterwards, at the request of some scholars, he omitted some unnecessary details and translated it into Arabic. There are several manuscripts of the Arabic version in different libraries all over the world, but the only extant Persian one is at the Bodleian library in Oxford. In 1891, a French translation of the Arabic treatise was published with its Arabic text by Alexander Pasha Carathéodory. In 1988, this translation and the original text were reprinted in Fuat Sezgin, *Islamic Mathematics and Astronomy*, vol. 47, pp. 1-157. I am now editing the Persian text as my Master thesis in the History of Science at the Institute of the University of Tehran. *Kashf al-qinā'*, in five Books, encompasses some parts of the *Elements*, the *Spherica*, the *Almagest* and many other Greek works. Books I, II and IV concern compound ratios and Menelaus Theorem, both plane and spherical. Book III, about the lemmas necessary for spherical calculations, briefly evokes the resolution of plane triangles using only the sine theorem. It is Book V, in particular, which constitutes the proper trigonometric part. In the first four chapters, after comparing the elements of spherical triangles, al-Tūsī partitioned the spherical triangles into ten classes (completing the classification pointed out before in *Keys*, by al-Bīrūnī).

Chapters 5 and 6 were dedicated to the relations of the right-angled triangle. He then, in Chapter 7, gave general expressions for six fundamental relations, applied to the resolution of right-angled triangles in Chapters 5 and 6. In modern notation, the formulae established by al-Tūsī (for a spherical triangle ABG with a right angle at G, and R=60 as the radius of the basic circle) are as follows:

In Chapter 5: the relation

$$\frac{\sin g}{R} = \frac{\sin a}{\sin A}$$

and the corollaries

$$\frac{\cos a}{\cos g} = \frac{R}{\cos b}, \quad \frac{\cos A}{\cos a} = \frac{\sin B}{R}$$

In Chapter 6: the relation

$$\frac{\sin A}{R} = \frac{\tan b}{\tan B}$$

and

$$\frac{\cos A}{R} = \frac{\cot g}{\cot b}, \quad \frac{\cot g}{R} = \frac{\cot A}{\tan B}$$

as the corollaries.

The use of the polar triangle applied to the resolution of an ordinary triangle with given angles, was first noted in this treatise and it is the first known use of the duality principle which was later developed in Europe in the time of Viète (1593).

Younes Mahdavi

The Institute for the History of Science,
Tehran University
ymahdavi@hotmail.com

Announcements of events

HPM-Americas: Second Annual Carriage House Meeting

March 13-14, 2009

Washington, DC, United States

Deadline for speaking proposals: February 20, 2009. Please submit proposals to Bob Stein (bstein@csusb.edu), describing the subject of the proposed talk and giving contact information (name, affiliation, address and e-mail address, and phone number).

HPM-Americas is the Americas Section of the International Study Group on History and Pedagogy of Mathematics, chartered under the International Mathematical Union.

Summer course on Mathematics and narrative: bringing mathematics back to the cultural mainstream

July 20-24, 2009

Budapest, Hungary

<http://www.sun.ceu.hu/mathematics>

EMF 2009: GT4 Dimensions linguistique, historique et culturelle dans l'enseignement des mathématiques

April 6-10, 2009

Dakar

For more information, including call for papers, see

<http://fastef.ucad.sn/emf2009/groupe4.htm>

3rd International Symposium on the History and Pedagogy of Mathematics in China

May 22-25, 2009

Beijing, China

Major Topics of the Symposium:

- The problems, issues, and solutions in developing math courses for the history of mathematics at secondary level.
- Research on case studies of the history and pedagogy of mathematics
- New development of research on the history and pedagogy of mathematics
- History of mathematics, culture of mathematics, and human civilization
- New development of the history of mathematics

Contact person: Xichi Wang,

xiciwang@bnu.edu.cn

Philosophical Aspects of Symbolic Reasoning in Early Modern Science and Mathematics (PASR)

August 27-29, 2009

Ghent, Belgium

This conference brings together scholars working on philosophy of science, history of science, history of philosophy and history of mathematics on the role and function of symbolic representations in the development of modern science and mathematics from the

end of the sixteenth century throughout the seventeenth century.

<http://www.pasr.ugent.be/>

Models in Developing Mathematics Education

September 11–17, 2009

Dresden, Germany

Second announcement:

<http://www.informatik.htw-dresden.de/~paditz/SecondAnnouncementDresden2009.doc>

ESU 2010

To be announced

ICME 12

July, 2012

Seoul, South Korea

HPM 2012

To be announced

A note from the Editors

The Newsletter of HPM is primarily a tool for passing on information about forthcoming events, recent activities and publications, and current work and research in the broad field of history and pedagogy of mathematics. The Newsletter also publishes brief articles which they think may be of interest. Contributions from readers are welcome on the understanding that they may be shortened and edited to suit the compass of this publication.

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The views expressed in this Newsletter may not necessarily be those of the HPM Advisory Board.

Please pass on news of the existence of this newsletter to any interested parties.

This and previous newsletters can be downloaded from our website:

<http://www.clab.edc.uoc.gr/hpm/>

Items for the Newsletter should be sent to the editors, preferably by email (see addresses below).

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No.	Deadline for material	Sent to distributors
71	12 June 2009	1 July 2009
72	12 October 2009	1 November 2009
73	12 February 2010	1 March 2010

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