International Study Group on the Relations Between the HISTORY and PEDAGOGY of MATHEMATICS
An Affiliate of the International Commission on Mathematical Instruction

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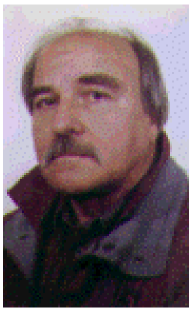
Roland Stowasser

In the latest of our interviews with people who have been influential in the life of HPM, Gert Schubring reports his conversation with Roland Stowasser.

G.S.: Would you describe the process of creating HPM more in detail? Leo Rogers (see HPM no. 60) reports that he made the proposal for founding this group while ICME 2 (Exeter 1972) was being prepared. In the last issue, presenting P.S. Jones's contributions (HPM no. 64), we read, however, that HPM became established in 1976, at ICME 3 in Karlsruhe. How did you become involved in the deliberations for creating HPM and how did the joint chairmanship by him and you come about?



R.J.K.: At ICME 2 in Exeter, there was in fact a group working during the time of the Congress, but without any official affiliation with ICMI. Phil Jones was Chairman of this working group, during the Congress, and Leo Rogers Secretary. In the period between ICME 2 and ICME 3, there was no work going on by that group, except deliberations for preparing a continuation of the Exeter Working Group 11 (Relations between the History and Pedagogy of Mathematics) during ICME 3 - mainly between Phil Jones, Leo Rogers, Graham Flegg, Henk Bos, Jean Dhombres, Ivor Grattan-Guinness, Otto Bekken, Hans Georg Steiner, Ed Jacobson and me. Such meetings took place in Bielefeld, Ann Arbor (Michigan), London, Paris and other places.

Hans Georg Steiner, then vice-president of ICMI was highly involved in the preparation of ICME 3. He pushed forward that the Program Committee for Karlsruhe charged me with the chairmanship of the Exeter Working Group 11. It was my initiative, then, to coopt Phil Jones. At the Karlsruhe Congress, EWG 11 met with about 70 participants, coming from twenty countries. EWG was renamed "History of Mathematics as a critical Tool for Curriculum Design". A report on the work of EWG 11 can be found in the Proceedings of the International Congress of Mathematical Education. Karlsruhe 1977 (pp. 303-307).

G.S.: How did the proper work of HPM begin after these preparatory stages? How did you define its tasks and aims? How did your cooperation with Jones as chairperson function, in those times without e-mail? How were the larger international contacts established?

R.J.K.: After Karlsruhe, the affiliation of the EWG as a study group of ICMI was our major goal; it was agreed to call it the International Study Group Between the History and the Pedagogy of Mathematics". The decision about the affiliation was taken by the Executive Committee of ICMI in 1977. The principal aims were then adopted:

1) To promote international contacts and exchange information concerning:
   a. Courses in History of Mathematics in Mathematics Teaching.
   b. The use and relevance of History of Mathematics in Mathematics Teaching.
   c. Views on the relation between History of Mathematics and Mathematical Education at all levels.
2) To promote and stimulate interdisciplinary investigation by bringing together all those interested, particularly mathematicians, historians of mathematics, teachers, social scientists and other users of mathematics.
3) To further a deeper understanding of the way mathematics evolves and the forces which contribute to its evolution.
4) To relate the teaching of mathematics and the history of mathematics teaching to the development of mathematics in ways which assist the improvement of instruction and the development of curricula.
5) To produce materials which can be used by teachers of mathematics to provide perspectives and to further the critical discussion of the teaching of mathematics.
6) To facilitate access to materials in the History of Mathematics and related areas.
7) To promote awareness of the relevance of the History of Mathematics for Mathematics Teaching in mathematicians and teachers.
8) To promote awareness of the History of Mathematics as a significant part of the development of cultures.
   (ZDM vol.10, Heft 2, p.80/81)

Moreover, it had been agreed in Karlsruhe that – at least until ICME 4 – P.S. Jones and R.J.K. Stowasser should serve jointly as chairmen and L. Rogers as secretary for the group. The group should be represented officially also at ICM 1978 in Helsinki; the local chairman there was Graham Flegg.

G.S.: Which role did the HPM-newsletter play during these first periods?

R.J.K.: In the beginning, it was not planned to have regular newsletters. In Karlsruhe, an address list of the participants had been

Biographical notes

Roland J.K. Stowasser is Professor Emeritus at the Department of Mathematics of the Technische Universität Berlin (1981 -1996).

He taught for some years at the Carl-Duisberg-Gymnasium, later served as Director of the Studienseminar in Wuppertal (Germany) and worked as Associate Professor at the University of Bielefeld. (Institut für Didaktik der Mathematik 1974 – 1981). He was invited to teach at numerous universities, in particular at ETH Zürich, City College New York, several Finnish universities, Paris XIII.

He has co-authored secondary school textbooks, published papers in a variety of educational journals, and served as chief editor of the German journal *Mathematiklehrer* (The Mathematics Teacher). Professor Stowasser was chairman of the ICMI-affiliated "International Study Group on the Relation between History and Pedagogy of Mathematics". He was a member of the "Commission internationale pour l'étude et l'amélioration de l'enseignement des mathématiques".

Professor Stowasser's primary research interests are the history of mathematics as related to mathematics education, curriculum development in the light of microcomputer technology, problem solving and artificial intelligence. Busy with these interests, he has produced many attractive problem-solving sequences with roots in the history of science, exploiting computer graphics. In this context aesthetics of mathematical ideas got his special attention.
http://www.joensu.fi/lenni/Revision.html

1991-94 Stowasser was engaged in the European joint project "New Approaches to the Teaching of Engineering Mathematics" giving special attention to low level modelling and the art of visual problem posing. He was initiator of the ERASMUS-Project “New Forms and Contents of Math Teaching”.
http://www.math.jyu.fi/~kahanpaa/TUBerlin/home.de.html

established, with about 80 interested people. This list became permanently enlarged. It was Leo Rogers who used this list – I guess from 1978 onwards – for transmitting information about relevant publications and in February 1980 to communicate an extensive "Paper" for the meeting of HPM at ICME 4 in Berkeley. Newsletters in a proper sense were first produced and distributed by Bruce Meserve from 1980 onwards.

G.S.: When and how did the first change in the board of HPM occur?

R.J.K.: At ICME 1980, in Berkeley, it was suggested to designate once more chairmen for the work till the next ICME, but for reasons of continuity to replace only one of them: Phil Jones by Bruce Meserve. He and I served together as chairmen until 1984. Leo Rogers remained secretary until ICME 5.

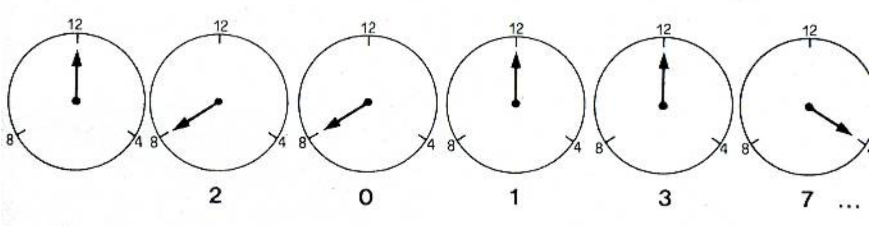
G.S.: Which of your original intentions has been best realized in the meantime? What should be improved?

R.J.K.: The problems which every newly founded group has: to make itself known and to maintain regular exchange of information about the group, relevant conferences, adequate literature, etc, have well been solved since Bruce Meserve became chairman. However the HPM-Newsletters can less well care for the immediate practical needs of the teachers in their class the next morning for the daily routine. Item 5 of the “Principal Aims” of the ISGHPM considered this question (ZDM 10/2/1978). It should be solved by establishing a multilingual HPM-action group which collects worldwide the best historically relevant ideas for the class the next day and make them available as leaflets from HPM.

G.S.: What is your view of the use of History of Mathematics for Teaching? How do you see the role of teachers in practicing it?

R.J.K.: My idea of the benefit of the History of Mathematics in the classroom is explained in my article: “Organizing Ideas in the Focus of Mathematics for All” (P. Damerow et al. (eds.), *Mathematics for All*. UNESCO, Science and Technology Education, Document Series 20, 1985, pp. 72-75. http://unesdoc.unesco.org/images/0007/000759/075946e.pdf).

R.J.K. Stowasser presented the construction of two problem sequences tailored for 11-year-olds with roots in the history of mathematics. CLOCKS AND PASCAL'S ALGORITHMS using Pascal's essay 'Caractère de divisibilité des nombres,...' begins with a question such as, 'What time is it 201375482608577445936007571108 hours later than 12?' and asks for a very fast digital manipulation with the hour



There are interesting transfer possibilities leading to all the divisibility rules normally treated - and many others never seen at school – which, with this method, come from a uniform point of view resulting in remarkable insight (for rediscovery of Pascal's general divisibility rule by 11-year-olds, see: *Beiträge zum Mathematikunterricht* 1972, Hannover 1973, pp. 125-32).
The other sequence EXTREMAL RECTANGLES related to Euclid 6; 27 can be found in: *Der Mathematikunterricht* 22,3, Stuttgart 1976. The reader will surely remember the important steps in solving the problem from coherent (funny) stories about the search of a spy and of the general (shortest diagonal), the military examination and measuring the king (biggest stomach).

G.S.: Given Otto Toepliz's initiatives, Germany may be credited with being a forerunner in the educational use of mathematics history. Yet present Germany contributions seem to be much fewer than in other countries (Great Britain, France, USA). What might be the reason that there is so little interest in Germany?

R.J.K.: It is a pity that Toeplitz´s book had almost no influence on the current lectures on calculus. Far more effective for schools was what prospered in the long shadow of the mathematical-historical school of Moritz Cantor (Source books by school teachers like Wieleitner, Lietzmann, Fladt etc, not to mention Dörries's Miniatures). However since 1980 the interest in using the History of Mathematics for the classroom has grown in Germany, in the East with scientists close to Hans Wußing more than in the West. Earlier, the lost World War II had to be digested and the severe loss of scientists in the Third Reich was a heavy burden on the country. Moreover, the unsuccessful "New Math" movement put a strain on all pedagogical resources.

Gert Schubring, Germany
gert.schubring@uni-bielefeld.de

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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.

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Ph.D. thesis

Pupils' Conceptions about a historical open question: Goldbach's conjecture. The improvement of mathematical education from a historical viewpoint.

Aldo Scimone
Doctoral Thesis of Bratislava University
Date of discussion: January 27th, 2003

Summary

The theoretical framework of Scimone's doctoral study is Guy Brousseau's theory of didactical situations in mathematics. It is common knowledge that this theory is based on the conception of didactic situations, where a situation is defined as the set of circumstances a person is part of (a group, a collectivity, etc.), the relations linking him to the environment and the set of data characterizing an action or an evolution, i. e. an action at a certain moment.

In particular, this work concerns an a-didactic situation, namely that part of a didactic situation which the teacher's intention with respect to the learners is not clearly explicit. An a-didactic situation is really the moment of the didactic situation in which the teacher does not declare the task to be completed but he gets the learner to think about the proposed task which has been chosen in order to allow the learner to acquire a new knowledge which is to be sought from within the same logic of the problem.

An a-didactic situation is such if it allows the learner to take over and manage the dynamics at play, to get him to be a protagonist of the process, to get him to understand the responsibility of it as a knowledge and not as a burden of the sought result. The learner must accept the suggested play (the a-didactic situation) but he must put into action the best strategies allowing him to be successful.

All this is based on solving a problem (open or closed) problem or a conjecture. So the aim of this research is to analyse some conceptions of learners while they are facing a conjecture, and in particular a famous historical conjecture like Goldbach's hypothesis. Goldbach's hypothesis was

chosen because it has a long historical background allowing an efficient a-priori analysis, which is an important phase of the experimental research in order to anticipate possible answers learners might give and their behaviour faced with the conjecture. Moreover, it has a fascinating formulation allowing pupils to mix many numerical examples, and to discuss fruitfully about its validity and some possible attempts of a proof.

So, the historical context is important because it suggests an interplay between the history of mathematics and mathematics education.

The content of the task concerns the validation or the falsification of two research hypotheses: the first one concerning learners' inability to represent mentally any general method useful for a proof; the second one concerning their intuitive ability to recognize the validity of a hypothesis. The validation or falsification of these hypotheses are very useful in order to understand the metacognitive processes which are basic for the learning phase and the cultural development of learners.

Another important point about the chosen task is that pupils did not know anything about the unsolvability of Goldbach's hypothesis, so that the a-didactic situation could not be disturbed by any interference due to their knowledge of earlier failed attempts at a solution.

Adopting Brousseau's theory, such an experiment was to be carried out by a quantitative analysis along with a qualitative analysis.

The statistical survey for the quantitative analysis had two phases: in the first experiment, which involved a sample of pupils attending the third and fourth year of study (16-17 years) of secondary school, the method of individual and matched activity was used; the second experiment was carried out in three levels: pupils from the first school (6-10 years), pupils from primary school (11-15 years) and pupils from secondary school. The quantitative analysis of the data drawn from pupils' notes was made by the software of inferential statistics CHIC 2000 (*Classification Hiérarchique Implicative et Cohésitive*) and the factorial statistical survey S.P.S.S. (*Statistical Package for Social Sciences)*.

The research identified some important misconceptions by the pupils and some blockages in the passage from the argumentative phase to a proof stage of their activity which needs to be further explored.

Filippo Spagnolo, Italy
spagnolo@math.unipa.it

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Books

La révolution mathématique de XVIIe siècle (The mathematical revolution of the 17th century)

by Evelyne Barbin, Paris, Ellipses, 2006.

In 1492 Columbus set out from the small port of Palos in Spain on his expedition to find a new trade route to the Indies. The result, as we know, was the 'discovery' of the New World and led to extensive voyages of discovery by other navigators throughout the 16th century. Less well known is that also in 1492 another event of equal importance took place, namely the publication of Niccolo Leoniceno's *The Errors of Pliny*. Leoniceno's demonstration of errors in Pliny's *Natural History* showed his readers that the Ancients had been fallible. Gradually other works of the Ancients were put up to scrutiny, most famously Vesalius' refutation of the greatly admired but faulty Galen, whose works on the human body had guided doctors for over a thousand years. The publication of *De humani corporis fabrica* (*The structure of the human body*) in 1543 can be said to have ushered in a new world for intellectual exploration.

By the beginning of the 17th century both the spirit of discovery and the willingness to question received wisdom were essential drivers of the scientific revolution, as Evelyne Barbin reminds her readers in her account of the associated mathematical revolution. She sets the context through a reading of three seminal works, namely Francis Bacon's *Novum Organum* (1620), René Descartes'

Règles pour la direction de l'esprit (*c*. 1628) and Galileo's *Dialogue Concerning the Two Chief World Systems* (1632). These authors have different views of the nature of knowledge and of the purpose of enquiry. Bacon, for example, sees the voyages of discovery of the previous century as paradigms for a similar voyage of discovery of the mind that needs to be pursued with equal courage. What all three authors have in common is, as Barbin underlines, a hunger for invention, a desire for progress and a willingness to question the teachings of the Ancients. But while this was true of scientific thought in general, there is a parallel and significantly individual story to be told for mathematics.

In addition to a new spirit of enquiry that stimulated mathematical exploration there were essential problems from the real world that impinged on geometrical knowledge and understanding. The path of a heavy body in air (a cannon ball), the locus of a point of a wheel, the path of fastest descent (the brachystrochone), dioptrics, the shape of the catenary and other geometrical problems could not be solved by the Greek treatment of curves. Indeed most of these curves would not have been granted the status of geometrical objects by the Greeks. Descartes is clear that what was needed was nothing more than a rupture with the geometry of the Ancients.

There were two main areas of investigation of curves and of the 'new' curves in particular: determining their tangents and determining their subtangents (which is equivalent to finding the quadrature of the area under the curve). The first led eventually to the differential calculus and the second to the integral calculus. But along the way new definitions of the nature of a curve evolved as well as a better understanding of special curves, such as the logarithmic curve. There is a nice extended example of how practical demands bore geometrical fruits in Barbin's account of the search by Huygens for a perfect chronometer, spurred on by the thought of the glittering prizes awaiting the discoverer of a solution to the longitude problem. His exploration of the isochrone problem and the cardiod solution led later to elaborating a theory of involutes and evolutes. Descartes showed how ordinary curves could be defined by algebraic equations but he refused to recognise the legitimacy of transcendental curves. Leibniz, in pushing back the limits of the cartesian world, said in a letter to Arnauld that he considered he had advanced analysis beyond the pillars of Hercules. Barbin makes it clear that he was able to do so only because, following the work of the previous forty years, these pillars had now become visible.

The rupture with the past, advocated by Descartes and elaborated also by Fermat and Galileo, concerned not only new curves but also a new treatment of geometrical objects. The Aristotelian deductive proofs of the Ancients, mostly using double contradiction, were suitable for establishing the truth of a proposition but not for discovering new results. The new 'methods of invention' advocated by the 17th century mathematicians had the proof of their results subsumed within the method and Barbin ends her account with an interesting chapter discussing the way that the concept of what was acceptable as proof changed over the century.

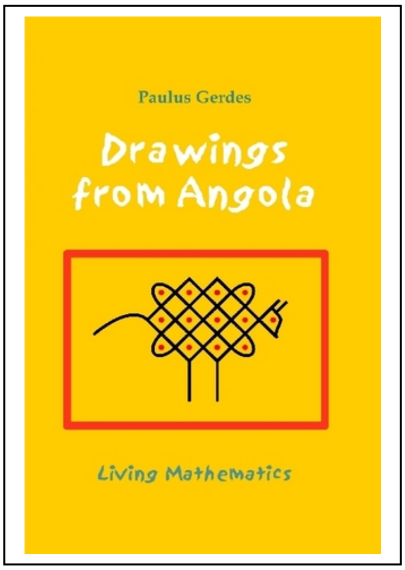
As one would expect, the reading of original texts is handled sympathetically and the reader is invited to enter the thinking patterns of 17th century geometers. The whole is a very satisfying experience and the detailed development provides a reference text for anyone wishing to delve further into the subject.

Chris Weeks, UK
chris.weeks@virgin.net

Drawings from Angola: Living Mathematics

by Paulus Gerdes

Drawings from Angola presents an introduction to an African story telling tradition. The tales are illustrated with marvellous drawings made in the sand. The book conveys the stories of the stork and the leopard, the hunter and the dog, the rooster and the fox, and others. It explains how the drawings are to be made. The reader is invited to draw tortoises, antelopes, lions, and other animals. The activities proposed throughout the book invite the reader to experiment and to explore the ‘rhythm’ and symmetry of the illustrations. Surprising results will be playfully obtained such as in arithmetic, a way to calculate quickly the sum of a sequence of odd numbers. Children will live the beautiful mathematics of the Angolan sand drawings. The book can be used both in classrooms and at home.



For youngsters from 15 years onwards, Paulus Gerdes wrote the book *Lusona: Geometrical Recreations of Africa* (L’Harmattan, Paris, 1997). Parents and teachers who like to know more about the Cokwe story telling and drawing tradition, may consult his book *Sona Geometry from Angola: Mathematics of an African Tradition* (Polimetrica, Monza, 2007).

The new book *Drawings from Angola* is now available (both in print and as download) from http://www.lulu.com by going to http://stores.lulu.com/pgerdes.

Paulus Gerdes, Mozambique
pgerdes@virconn.com

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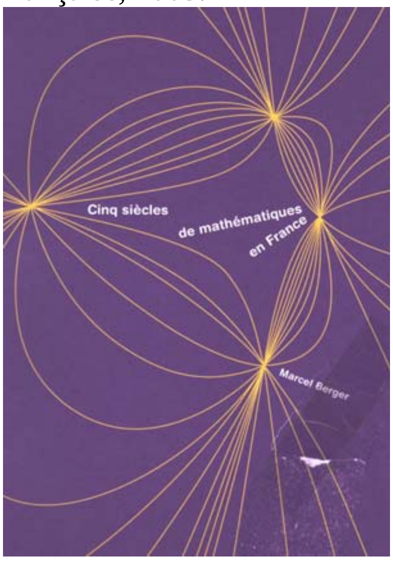

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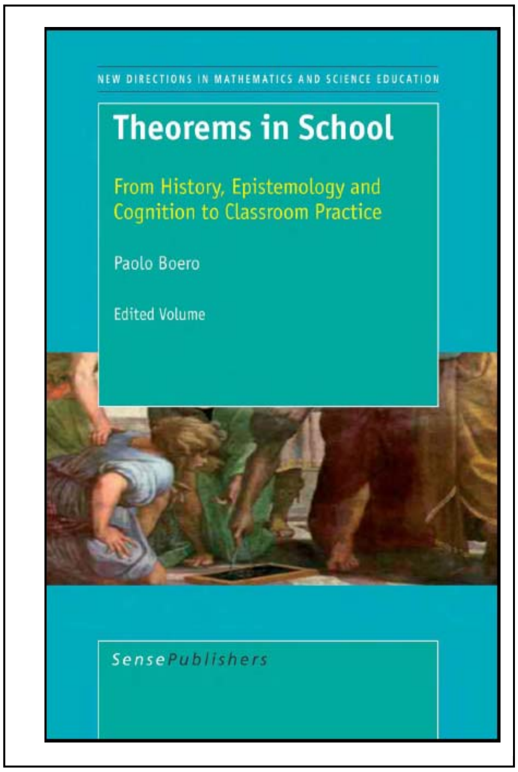

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http://www.cimt.plymouth.ac.uk/journal/default.htm

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Societies and organisations

African Mathematical Union: Commission on the History of Mathematics in Africa (including newsletter)
http://www.math.buffalo.edu/mad/AMU/amuchma_online.html

Association des Professeurs de Mathematiques de l'Enseignement Public [APMEP] History site:
http://www.apmep.asso.fr/BMhist.html

British Society for the History of Mathematics [BSHM]
http://www.bshm.org

HOMSIGMAA - History of Mathematics Special Interest Group of the MAA
http://home.adelphi.edu/~bradley/HOMSIGMAA/

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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://faculty.umf.maine.edu/~molinsky/cshpm/

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

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

About Medieval Arabic Numbers
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/educationabstracts.html

BibM@th
http://www.bibmath.net/dico/index.php3?action=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

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/

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

Culture*MATH*. 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

Homepage of Albrecht Heeffer
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

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

The Bernt Michael Holmboe Memorial Prize

The main activity of The Abel Fund is, obviously, the award of the Abel Prize, which this year was awarded to Srinivasa S. R. Varadhan. However, the Fund does also support a reward for young mathematicians from developing countries, the Ramanujan Prize, and a prize promoting excellence in teaching mathematics in Norway, the Bernt Michael Holmboe Memorial Prize.

Bernt Michael Holmboe was the teacher who discovered Niels Henrik Abel's talents and who inspired him to further studies. The prize in his name is given to an outstanding teacher in Norwegian primary or secondary school. This years' winner was Karl Erik Sandvold, who teaches in the same cathedral school in which Niels Henrik Abel was a student (Oslo Cathedral School).

The awarding of the prize is followed by a short seminar. This year, the seminar consisted of three talks. The first was a talk by the prize winner on what he considers good mathematics teaching. Secondly, Professor Jan van Maanen (Freudenthal institute) talked about the personal, historical and educational dimensions involved in asking students to bring mathematical problems into the classroom (problems which often have a long history in "recreational mathematics"). Thirdly, Associate Professor Per Manne discussed Bernt Michael Holmboe's "proof" of the parallel axiom.

It seems fitting that an outstanding present-day mathematics teacher is celebrated in the name of Abel's teacher and with talks on the history and pedagogy of mathematics.

Bjørn Smestad, Norway
Bjorn.Smestad@lu.hio.no

Father Henri Bosmans (S.J.) (1852-1928)

A Belgian pioneer in the history of mathematics

Henri Bosmans was born in Malines, Belgium in 1852 and entered the Jesuit order in 1871. He was first assigned to the Jesuit college of Ghent. When he was asked in 1887 to replace the professor of mathematics at the Jesuit college of Brussels, the move brought about a change of direction for his further life. It is only in 1894 that he began publishing on the history of mathematics. What started out as hesitantly posing and answering questions under a pseudonym in *L'Intermédiaire des Mathématiciens*, grew into an impressive collection of publications of high scholarship. He turned out to be a prolific researcher and writer who could write confidently about his main subjects: Jesuit science and early modern mathematics. He was highly respected by his peers, which were not the least: David Eugene Smith, Moritz Cantor, Johannes Tropfke, Florian Cajori, Gino Loria, Gustav Eneström and Paul Tannery. Some of them he regarded as friends. By his death in 1928, almost 300 contributions by him had appeared in scientific journals, ranging from small notes to 200-page articles, including transcriptions of manuscripts. In addition, about the same number of reviews of books and articles were published. Bosmans did not hesitate to be critical about the work of others, including Eneström's continued disparaging of Cantor.

Despite the scope and merits of his work, Bosmans is little known today. Shortly after his death, Adolphe Rome, a canon from Louvain working on ancient Greek mathematics, published a biography and an annotated bibliography of Henri Bosmans in *Isis* (Rome, 1928). Two decades later, George Sarton, the founder of *Isis* wrote his emotional appeal to republish the papers of Father Bosmans in book form (Sarton, 1949). This was followed by both an updated biography and a bibliography (Bernard-Maître (1950). However, more than half a century later, Sarton's appeal for republishing Bosmans' work has not yet been answered.

Now several initiatives have been launched to open up available material. An on-line archive currently contains all of Bosmans's publications (Heeffer, 2006), most of which are accessible in full text. A commemorative symposium on Henri Bosmans was held at the ULB in Belgium, on 12 and 13 May, 2006, the proceedings of which will soon be published (Stoffel 2007), including an updated biography (Hermans 2007) and bibliography (Heeffer 2007). For the rest of this short note, we would like to address two questions: 1) Why is it that today Bosmans is not recognised as are many of his peers active in the early twentieth century? 2) What makes his work still of value today?

As to the first question, all of his publications were in French, and as such became more and more neglected in twentieth-century literature. But more so, he was missed out by the type of journals he contributed to. He published one article in *Isis* on Tacquet, but most of his other publications were confined to two local journals in Brussels, *Revue des questions scientifiques* and *Annales de la Société scientifique de Bruxelles*. Unlike Cantor, Tropfke, Cajori and Loria, he did not publish any books. The type of publication reflects Bosmans's way of working. He was very much oriented towards original sources, being rare books and manuscripts. While studying a text he took elaborate notes, sometimes copying whole books and manuscripts. Then he presented his findings for the *Société scientifique* which resulted in a publication. Therefore, his articles deal almost exclusively with persons or a single work of a person. Others, like Cantor, Cajori and Tropfke concentrated on larger-scope narratives or conceptual developments, an evolution which would become the standard in the later twentieth-century history of mathematics.

Despite these aspects which rendered Bosmans's work less appreciated, there are many reasons for reassessing his work. Firstly, the rigour and care he took in his handling of source material is unparalleled. This now appears to be of great value. There are several lost works which have been preserved thanks to Bosmans' industry. For example, the library of the University of Louvain owned a copy of Stifel's *Arithmetica Integra* of 1544, with marginal comments by Gemma Frisius. In 1905, Bosmans meticulously copied the book by hand including Frisius comments. Respecting all type, position, marginal comments and even the printer's emblem, Bosmans' copy is an exact replica of the original. The book was destroyed in the fire of 1914 together with thousand manuscripts, 800 incunables and about 300,000 other books. Thanks to Bosmans we know that Frisius was actively involved with algebra, which is not apparent from Frisius's own work, the *Arithmeticae practicae methodus facilis* of 1540, and also that he was rather sceptical with regards to Stifel's use of the second unknown. Also the only known copy of *L'Appendice Algebraique* of Stevin was destroyed in the fire but copied by Bosmans (van Praag 2004). When Bosmans cited or copied something you can be sure it is a faithful representation of the original source.

Bosmans' work is still of great value because of the originality of the material he discussed. Some authors and works he analysed have in the mean time been studied more frequently but constituted at the time an unexplored domain. Sixteenth-century algebra by Jacques Peletier, Johannes Buteo, Guillaume Gosselin or Pedro Nunez was hardly studied before the twentieth century. And for each of these authors Bosmans was the first to provide an in-depth analysis of their work and to assess their significance within the history of algebra. Even concerning authors that have been studied more intensively in recent times, Bosmans often was a pioneer, as testified by Dijksterhuis on Simon Stevin: "It was only in the first decades of the twentieth century that the study of Stevin was undertaken in a thorough an systematic way, the leader of this movement being the meritorious Belgian historian of mathematics, Father Henri Bosmans S.J." (Dijksterhuis 1955, I, 14). Also for Jesuit scientists and missionaries such as Jean-Charles della Faille, Gregorius de Saint-Vincent, Achile Gerste, Jean de Haynin, Théodore Moretus, F. de Rougement, André

Tacquet, Antoine Thomas and Ferdinant Verbiest, Bosmans was the first to study their works and provide reliable biographical information from manuscripts and archives. For several sixteenth- and seventeenth-century authors and works, Bosmans's contributions are often still the only available sources today. For example, as far as I know, nothing has been published about Gilles-François de Gottignies's four intriguing work on algebra, since Bosmans in 1928.

Although Bosmans worked and published on single authors, his analyses display a deep insight in the broader scope of the development of mathematics. This is especially clear for the development of symbolic algebra in the sixteenth century. On five occasions, in his articles on Frisius, Peletier, Nunez, Gosselin and Girard, he pointed out the importance of the solution of linear problems with multiple unknowns for the development of a symbolic equation. He expresses his discontent with the lack of a methodical overview, for which he blames the long history of the subject. This was for me a reason to take up the subject and so it happened that Bosmans's perception became an important source of guidance for my own research (Heeffer 2006b). The development of the second unknown in the sixteenth century, as referred to by *Regula quantitatis*, became a driving force for the development of algebraic symbolism, operations on equations and as such, for the very concept of a symbolic equation. Bosmans always took great care to understand and explain the original symbolism of authors such as Nunez, Buteo, Gosselin and Stevin. Usually he showed problem solutions in their original symbolism and then discussed the reasoning steps in modern symbolism, always respecting the historical context of the sources. Many of his peers, like Eneström or Maximilian Curtze, only used modern symbolism and in doing so missed out conceptual changes and subtle differences between modern and historical methods of solving problems.

We hope that by opening up Bosmans's work in an on-line archive, there will be a revived interest in his publications. This has happened already for his work on Jesuit missionaries in China but his work as a historian of mathematics merits a wider audience.

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Albrecht Heeffer, Belgium
albrecht.heeffer@ugent.be

* * *

Proceedings of HPM2004 & ESU4

When the Proceedings of HPM2004 & ESU4 (revised edition) arrived by mail, I immediately skimmed through the hefty 640-page volume. Such an act called to mind the many pleasant hours spent on the serene campus of Uppsala Universitet during the week of July 12-17 in 2004. That is quite characteristic of the HPM & ESU conferences, where usually a medium-sized heterogeneous group, comprising university mathematicians, mathematics educators, school teachers of mathematics and historians of mathematics, come together to learn from each other, to discuss among each other, to argue with each other, and of course also to renew old acquaintances and make new ones in a relaxed and friendly atmosphere. It confirms my belief that a regard for history of mathematics can generate in a person a warm, gentle, humane, open and reflective attitude that shows up not just as an intellectual commitment in the discipline but in other aspects of life as well.

The volume contains the texts of almost all (with a few only in the form of a brief abstract) presentations delivered at the conference, with seven plenary lectures (one of which was not delivered at the time because the speaker could not come), two sessions of panel discussion and numerous workshops or contributed talks. A reading of the titles of these eighty items in the contents page reveals the variety and breadth in coverage of the presentations so that any reader is likely to find some items that particularly catch his or her fancy. These items range from general aspects such as the role of history of mathematics in the teaching and learning of mathematics, historical or philosophical or epistemological issues, to specific aspects such as topics on mathematics and cultures, mathematics in science and technology and arts, didactical material on selected topics. An additional inclusion of special interest to the HPM group is a detailed history of the first twenty-five years of the ISGRHPM (International Study Group on the Relations between the History and Pedagogy of Mathematics) from 1976-2000 prepared by Florence Fasanelli and the late John Fauvel, complemented by a brief history of the first four ESU (European Summer University on the History and Epistemology in Mathematics Education) prepared by Evelyne Barbin, Nada Stehlikova and Costantinos Tzanakis.

As pointed out in the *Preface*, the contributions reflect well the spirit of HPM, which is "much more than the use of history in the teaching of mathematics" but is "the conception of mathematics as a living science, a science with a long history, a vivid present and as yet unforeseen future". The conviction of HPM is to regard this conception of mathematics not only as "the core of the teaching of mathematics" but also as "the image of mathematics [to be] spread out to the outside world". A more careful reading of the volume will confirm this. In view of the vast, varied and rich content of the volume (thanks to the effort of the contributors and the editors), a reviewer can hardly do justice to the volume in a short article. I will therefore focus on only one aspect, which I feel is very important, because the 'sustained development' of the endeavor of the HPM group depends heavily upon it. This is the aspect on teacher's education. Section 3 is devoted to this one aspect, but many items in other sections also pertain to this important aspect.

A survey of the classroom practice of teachers of mathematics in secondary schools in Hong Kong, reported in the article *"No, I don't use history of mathematics in my class. Why?"* (Man-Keung Siu), tells us that very few teachers integrate history of mathematics in their teaching. This phenomenon is not peculiar to a single place, as the article *History of mathematics in the TIMSS 1999 video study* (Bjørn Smestad) tells us that the history of mathematics does not constitute an important part of teaching in the seven countries/regions participating in the TIMSS 1999 Video Study.

There seems to be no dearth of materials related to history of mathematics for use in the classroom, as can be seen from most items that appear in this same volume, not to mention the many more items referred to in the bibliographies of them. Other than interesting accounts on specific topics or (translated) excerpts from original texts which can be assimilated into lectures or exercises, such materials also include tools and computer software (e.g. the articles *From Euclid to Descartes, to … CABRI* (Ercole Castagnola), *Why we use historical tools and computer software in mathematics education: Mathematics activity as a human endeavor project for secondary schools* (Masami Isoda), *John Blagrave, gentleman of Reading* (Peter Ransom), *Using materials from the history of mathematics in discovery-based learning* (Oleksiy Yevdokimov)), puzzles (e.g. the articles *The Chinese tangram and its applications in mathematics teaching* (Hing-Keung Leung), *The way of Luoshu: An examination of the magic square of order three as a mathematical and cultural artifact* (Frank J. Swetz)), play scripts (e.g. the article *Once upon a time mathematics…(Part 2)* (Caterina Vicentini)), etc. But why would teachers still hesitate to integrate history of mathematics into their classroom teaching?

In the article *"No, I don't use history of mathematics in my class. Why?"* the author discusses this phenomenon by giving sixteen unfavorable factors that may lead to such kind of hesitation. Any enthusiastic promoter of HPM will ultimately have to confront these unfavorable factors. It is clear that the production of more didactical materials with a historical dimension ready for use in the classroom will foster the cause of HPM. The question is: "How and by whom are these didactical materials to be produced?" In fact, there are already this kind of didactical materials available, such as that introduced in the workshop *Historical modules for the teaching and learning of mathematics* (Victor Katz and Karen Michalowicz – the sad passing of Karen Dee in July of 2006 was a great loss to the HPM community, and she would be greatly missed and warmly remembered). More is obviously needed. Passive reliance on ready-made didactical materials produced by others will not be good enough. All teachers should realize that they themselves can contribute actively. Furthermore, treating ready-made didactical materials as recipes to follow is not as helpful either. Without a reasonable amount of immersion in history of mathematics a teacher cannot really acquire the essence of it, and will lack the self-confidence to integrate history of mathematics in their teaching, especially in the company of a class of zealous and inquisitive students, who may compel the teacher to leave a prepared path but thereby bring benefit to everybody in the class. In view of some of the aforementioned unfavorable factors, teamwork is needed and 'esprit de corps' is to be built up.

A more optimistic note comes from the "corps" led by Wann-Sheng Horng in the form of two articles: *Teachers' professional development in terms of the HPM: A story of Yu* (Wann-Sheng Horng) and *Mathematics teachers' professional development: Integrating history of mathematics into teaching* (Yi-wen Su). Besides describing what the group has carried out in studying ancient texts and in preparing worksheets and modules for use in their classrooms, the authors also emphasize the facet of personal growth of individual members as a teacher in the process of collaborative study. This is the kind of 'esprit de corps' that we need, and that HPM is fostering.

Finally, in connection with this theme on teacher's education I find a message in the article *Learning mathematics without culture or history in Bangladesh: What can we learn from developing countries?* (Wendy S. Troy) worth thinking about:

"I realize that from these experiences, the mathematics classroom is not the only place to do this but that history, geography and religious studies lessons may take pupils closer to the background of mathematical 'discoveries' than ever we can achieve by giving a historical snippet in a maths textbook…. A good start would be if the history of mathematics, science, language, art and religion were included in the humanities teaching of history and geography. Then maths teachers would have a greater pool of examples and resources to draw on when teaching mathematics topics in class."

During the Uppsala conference my wife and I stayed in a small cozy hotel (Hotell Muttern) which is an interesting two-storey hexagonal building and which prides itself on having no two rooms with the same shape. (We stayed in a room that is pentagonal in shape!) Just like the rooms in Hotell Muttern, no two students nor two teachers are the same. Herein lies the variety, liveliness and difference in emphasis, in the teaching and learning as well as in the integration of history of mathematics in the classroom.

Man-Keung SIU, Hong Kong
mathsiu@hkucc.hku.hk

Descriptive Geometry in England

Abstract

The history of Descriptive Geometry in England is related not only to the technique itself, or how the treatises relating to it were translated into English, but also to the establishment of the architectural and the engineering professions in Britain. The following is a brief sketch of the developments, showing how the technique was introduced into the English educational system, but soon afterwards was replaced by a system invented by a 'mathematician and architect' Peter Nicholson, who drew extensively upon his knowledge of the graphical communication known to stone-masons.

The man who invented a technique on which all the modern graphical communication is based and initiated a fundamental change in the teaching of such subjects was the French mathematician Gaspard Monge (1746-1818). The background to his understanding of mathematical concepts is largely explicable by the general development of mathematical education in France at the time.

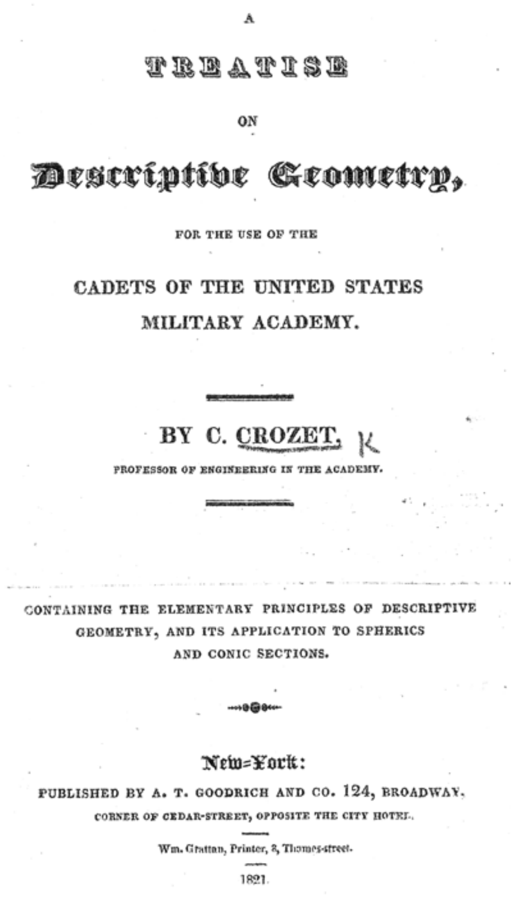
Gaspard Monge 1746-1818

The first treatise on the technique of Descriptive Geometry was published only after the French Revolution. On the 20th January 1795 (1st pluv.III) at the École Normale, Monge gave his first course in Descriptive Geometry. The text of this course came from the stenographic notes of the lessons given, and these were first published in the Journal of the École in 1795, before being transformed into a book in 1799. The book came out in numerous editions and the technique has been taught in both the schools of France and across the world ever since. England, it is fair to say, is probably one of the few countries of Europe where the technique has not survived the initial interest and translation – in its original form. I will, however, show that Descriptive Geometry did play an important role in initiating a search for a universal system of graphical communication which could be adapted to the needs that were deemed to have existed in England at the time.

The process of modernising education by making it more applicable to industry was to be adopted in Britain at the beginning of the 19th century. Scientific advance became to be regarded as not only a matter of necessity, but also of national security and prestige.

Géométrie Descriptive was translated into English in 1809, presumably for military purposes, as there are no publications to be found in English libraries to suggest that the work was made public. Nevertheless, we now have knowledge that a number of private copies of translation of the technique were circulating among the artisans and architectural draughtsman at the beginning of the 19th century.

The lack of interest shown upon the translation of the technique into English is partly due to its having been translated during the period between the Napoleonic wars, so the technique itself was regarded as the invention of one of the most prominent republican educationalists. The competition between the two nations - English and French - in matters not only of war but of prosperity and industry during the intervals of peace is an important element to be considered.


A

TREATISE

ON

Descriptive Geometry,

FOR THE USE OF THE

CADETS OF THE UNITED STATES

MILITARY ACADEMY.

BY C. CROZET,

PROFESSOR OF ENGINEERING IN THE ACADEMY.

CONTAINING THE ELEMENTARY PRINCIPLES OF DESCRIPTIVE GEOMETRY, AND ITS APPLICATION TO SPHERICS AND CONIC SECTIONS.

New-York:

PUBLISHED BY A. T. GOODRICH AND CO. 124, BROADWAY, CORNER OF CEDAR-STREET, OPPOSITE THE CITY HOTEL.

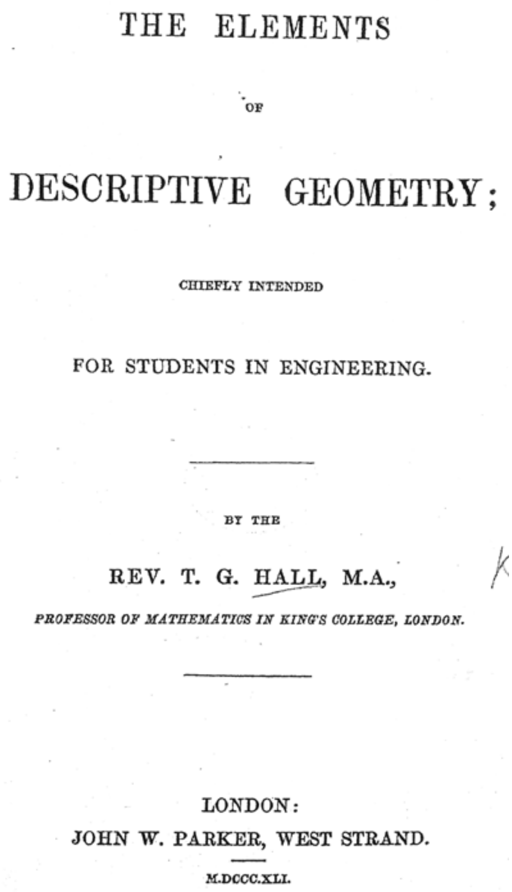
Wm. Grattan, Printer, 8, Thames-street.

1821.

Claude Crozet [1790 - 1864] wrote *A Treatise on Descriptive Geometry for the use of the Cadets of the United States Military Academy*

The lack of a suitable translation and instruction into the technique by one of the 'original' students was another result of the wars in which the French and English were engaged in at the time. A different destiny was to await the technique in the United States of America, where Claude Crozet, one of Monge's pupils, introduced the study of descriptive geometry in 1816. It had not hitherto been taught in the US, and Crozet prepared the first American textbook on the subject. Both at West Point and at the Virginia Military Institute with which he was later associated, descriptive geometry have continued to be taught up to the present time. Because Crozet actually transferred the technique from first hand experience, and published his own interpretation – a treatise on the subject – his treatment took root.

On the other hand, and it seems that this was because there was no tacit, first-hand experience of the technique in England, those aspects of the technique which were not written about in the treatises could not be transferred successfully to the syllabi of the English schools. There was no-one like Crozet who was able to perform a similar service in Britain.


THE ELEMENTS

OF

DESCRIPTIVE GEOMETRY;

CHIEFLY INTENDED

FOR STUDENTS IN ENGINEERING.

BY THE

REV. T. G. HALL, M.A.,

PROFESSOR OF MATHEMATICS IN KING'S COLLEGE, LONDON.

LONDON:

JOHN W. PARKER, WEST STRAND.

M.DCCC.XLI.

The first book on Descriptive Geometry in England was published by Rev. T. G. Hall of King's College, London.

Architectural schools in London and Descriptive Geometry

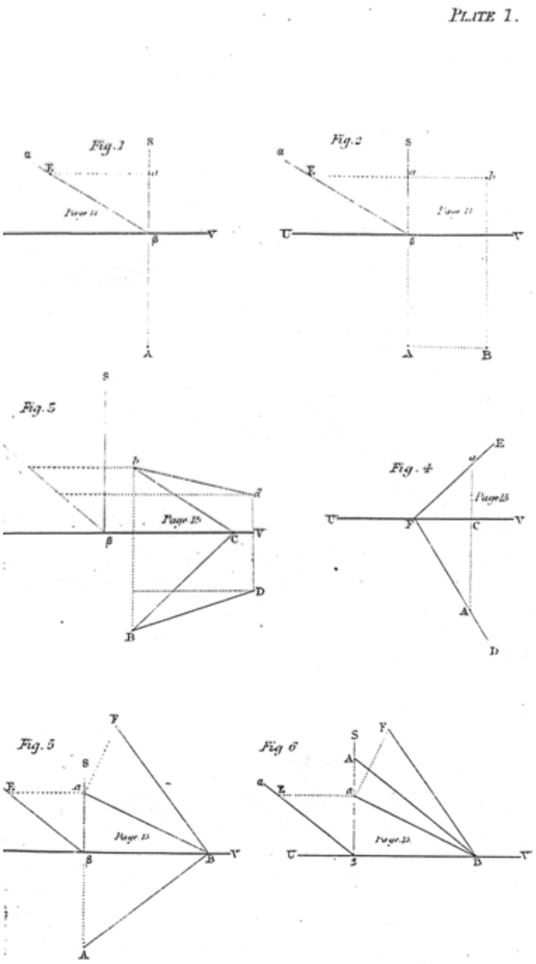
When the first two architectural schools – one at the University College London and one at King’s College London, were founded in 1841, the first comprehensive manual on Descriptive Geometry was published. No complete work on the subject appeared in English until then, but in 1841 Rev. T. G. Hall of King's College, London, published *The Elements of Descriptive Geometry, chiefly designed for students in Engineering*, which mentioned Thomas Bradley as the first one to give lectures on Descriptive Geometry, at the Engineering Department of King's College in London, during the 1839-1841 sessions. These lectures were also part of the syllabus for studying architecture at the same school. Hall’s (like Bradley’s) use and description of the technique, was, however, only a summary of what had already been published in other countries on the subject, most notably in France.

The technique began to be taught in its original form, but failed to attract any real following. A claim was made by Hall (1841) and later by Heather (1851), that if only a representation of the final solution or design was more pictorial, the technique would be suitable to the English way of presenting and teaching space. It was deemed to be an abstract technique, difficult to grasp and of little value to the English in their efforts to establish a universal language of graphical communication across the syllabi of the engineering and architectural professions. In fact, the purpose of Descriptive Geometry was never to provide a final pictorial image in a geometrical form. Instead, its aim was to take the user through the method through which the given geometrical form was to be generated. This was however, seldom made clear enough in the treatises which appeared in English language, and even when it was, it was not considered to be an acceptable teaching tool.

Peter Nicholson (1765-1844). He was born in Prestonkirk, East Lothian on 20th July 1765, a son of a stonemason.

The ‘British System of Projection’

The technique which came to be known as ‘British System of Projection’ [see Guinness, Andersen, 1994] incorporated some of the principles of Descriptive Geometry and was closely linked to the practice of stone-cutting. Its inventor was Peter Nicholson (1765-1844), who regarded as both an architect and a mathematician.



Nicholson’s explanation of his technique appeared first in his *Treatise on Stonecutting* in 1822, published in London.

Nicholson’s invention of Parallel Oblique Projection introduces a third plane of projection inclined towards the first plane, by which he thought to have satisfied the two most important objectives of orthographic projection. Firstly, in Nicholson's technique, measurements are easily extracted from the drawing and the view of the object is less 'abstract' – in other words, it gives a picture, which delineates the main characteristics of the object in its entirety, not in various planes. Secondly, Nicholson's system offers an optional possibility of introducing more inclined auxiliary plans which enable the user to transfer objects freely to positions that are most appropriate for certain purposes. However, Nicholson's system had another feature which added value to its applicability in the syllabi of the architectural and engineering schools of England at the time. Nicholson drew upon his experience of the stonemasons' craft and based his technique on what was at the time the accepted language of graphical communication among the building craftsmen.

Nicholson's method was, by the 1860s, fully accepted and taught at both the professional (the engineering and the architectural) schools and in the Mechanics' Institutes under the name of 'Descriptive Geometry'. The treatises on it were republished many times by Binns and Bradley [see Bibliography], but as Nicholson's system of projection became widely adopted, any reference to its inventor disappeared in the manuals and syllabi. And so, Descriptive Geometry did, briefly, find a place in the educational system of English architects, engineers and even mathematicians, but in a much modified form; unlike its French counter-part neither the techniques nor its inventor gained due recognition or prominence.

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Snezana Lawrence

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Announcements of events

5th European Summer University on the History and Epistemology in mathematics education (ESU-5)

July 19-24, 2007

Prague, Czech Republic

Main themes of the ESU-5

1. History and Epistemology as tools for an interdisciplinary approach in the teaching and learning of Mathematics and the Sciences
2. Introducing a historical dimension in the teaching and learning of Mathematics
3. History and Epistemology in Mathematics teachers' education
4. Cultures and Mathematics
5. History of Mathematics Education in Europe
6. Mathematics in Central Europe

Panels

1. *The emergence of mathematics as a major teaching subject in secondary schools*
Gert Schubring (Germany) coordinator, Hélène Gispert (France), Livia Giacardi (Italy),
2. *Mathematics of yesterday and teaching of to day.*
Evelyne Barbin (France) coordinator, Abraham Arcavi (Israel), Luis Radford (Canada), Fritz Schweiger (Austria)

The web site

For the detailed programme, the overall time-schedule, the abstracts of all activities, the list of registered participants and more information on accommodation, visit the ESU-5 website at **http://www.pedf.cuni.cz/kmdm/esu5**

Mathematics Education In A Global Community *(9th International Conference of The Mathematics Education into the 21st Century Project)*

September 7-12, 2007

Charlotte, North Carolina, USA

See Newsletter 63 for more information.

The First Century of the International Commission on Mathematical Instruction (1908–2008): Reflecting and Shaping the World of Mathematics Education

March 5-8, 2008

Accademia dei Lincei and Istituto dell'Enciclopedia Italiana, Rome, Italy

This symposium in Rome will celebrate the centennial of the International Commission on Mathematical Instruction (ICMI). Starting from a historical analysis of principal themes regarding the activities of the ICMI (reforms

in the teaching of the sciences, teacher training, relations with mathematicians and with research, and so on), discussions will focus on identifying future directions of research in mathematics education and possible actions to be taken to improve the level of scientific culture in various countries. The program includes plenary sessions, invited short talks, and working groups. More information can be found at the symposium website:
http://www.unige.ch/math/EnsMath/Rome2008

5th International Colloquium on the Didactics of Mathematics

April 17-19, 2008
Department of Education, University of Crete, Rethymnon, Crete, Greece
http://www.edc.uoc.gr/5colloquium
Call for papers
Deadline for *Abstract submission*: 10 September, 2007. Abstracts should not exceed 500 words (approximately, one A4 page).
Deadline for *Full Text submission*: 10 November, 2007. Full texts will be reviewed by the members of the International Scientific Committee.
Notification of acceptance: by 10 January, 2008.

ICME-11

July 6-13, 2008
Monterrey, Mexico
http://www.icme11.org.mx/icme11/

HPM 2008

History and Pedagogy of Mathematics
The HPM Satellite Meeting of ICME 11
Plans are being made to call an HPM Meeting to follow ICME-11 due to take place in Monterrey on July 6-13, 2008. Further information will be posted on the HPM website as soon as it becomes available.

Models in Developing Mathematics Education *(10th International Conference of The Mathematics Education into the 21st Century Project)*

September 12-18, 2008
Dresden, Germany
For further information contact
arogerson@inetia.pl

* * *

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 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.

Distributors:

If you wish to be a distributor in a new or unstaffed area please contact the editor.

Area	Name and address	Email address
Argentina	Juan E. Nápoles Valdés, Lamadrid 549, (3400) Corrientes, ARGENTINA	idic@ucp.edu.ar
Australia	G. FitzSimons, Faculty of Education, P.O.Box 6, Monash University, 3800 Victoria, AUSTRALIA	gail.fitzsimons@education.monash.edu.au
Austria	Manfred Kronfellner, Institute of Discrete Mathematics and Geometry, Vienna University of Technology, Wiedner Haupstr. 8-10, A-1040 Wien, AUSTRIA	m.kronfellner@tuwien.ac.at
Belgium and The Netherlands	Sylvia Eerhart, Freudenthal Instituut, Aïdadreef 12, 3561 GE Utrecht, THE NETHERLANDS	S.Eerhart@fi.uu.nl

Canada	Thomas Archibald, Mathematics Department, Acadia University, Wolfville, NS B0P1X0, CANADA	Tom.Archibald@acadiau.ca
China	Ma Li, Linkoping University, ITN, SE - 601 74 Norrkoping, SWEDEN	mali@itn.liu.se
Eastern Europe		
France	Evelyne Barbin, Centre François Viète, Faculté des sciences et des techniques, 2 Chemin de la Houssinière, BP 92208, 44322 Nantes cedex, FRANCE	evelyne.barbin@wanadoo.fr
Germany	Gert Schubring, Inst. f. Didaktik der Math., Universitaet Bielefeld, Postfach 100 131, D-33501, Bielefeld, GERMANY	gert.schubring@uni-bielefeld.de
Iran	Mohammad Bagheri, P.O.Box 13145-1785, Tehran, IRAN	sut5@sina.sharif.edu
Israel	Ted Eisenberg, Mathematics Department, Ben Gurion University of the Negev, Beer-Sheva 84105, ISRAEL	eisen@math.bgu.ac.il eisenbt@barak-online.net
Italy	Giorgio T. Bagni, Department of Mathematics and Computer Science, University of Udine, Polo Rizzi, via delle Scienze 206, I-33100 Udine, ITALY and Marta Menghini, Dipartimento di Matematica (Universita` La Sapienza), Piazzale A. Moro 5, 00185 Roma ITALY	bagni@dimi.uniud.it marta.menghini@uniroma1.it
Japan	Osamu Kota, 3-8-3 Kajiwara, Kamakura Kanagawa-ken, 247-0063 JAPAN	kota@asa.email.ne.jp
Malaysia	Mohamed Mohini, Department of Science and Mathematical Education, Universiti Teknologi Malaysia, 81310 Johor, MALAYSIA	mohini@fp.utm.my
Mexico	Alejandro R. Garciadiego, Caravaggio 24, Col. Nonoalco Mixcoac Del. Benito Juárez 03700 México, D. F. México	gardan@servidor.unam.mx
Morocco	Abdellah El Idrissi, E.N.S. B.P: 2400 Marrakech, C.P: 40 000, MOROCCO	a_elidrissi@hotmail.com
New Zealand	Bill Barton, Mathematics Education Unit, Dept of Mathematics and Statistics University of Auckland, Private Bag 92-019, Auckland, NEW ZEALAND	b.barton@auckland.ac.nz
Other East Asia	Gloria Benigno, Department of Education, Culture and Sports, Region X, Division of Misamis Occidental, Oroquieta City, PHILLIPINES	glorya4444@yahoo.com
Scandinavia	Sten Kaijser, Department of Mathematics, P.O. Box 480, SE- 751 06 Uppsala, SWEDEN	sten@math.uu.se
South America	Marcos Vieira Teixeira , Departamento de Matemática , IGCE - UNESP, Postal 178 13 500 - 230 Rio Claro, SP BRAZIL	marti@rc.unesp.br
South Asia	Prof. R. C. Gupta, Ganita Bharati Academy, R-20, Ras Bahar Colony, Jhansi-284003, U.P. INDIA	
South East Europe	Nikos Kastanis, Department of Mathematics, Aristotle University of Thessaloniki, Thessaloniki 54006, GREECE	nioka@auth.gr
Southern Africa	Paulus Gerdes, Mozambican Ethnomaths Research Centre, C.P. 915, Maputo, MOZAMBIQUE	pgerdes@virconn.com
Spain and Portugal	Carlos Correia de Sá, Departamento de Matemática Pura; Faculdade de Ciências da Universidade do Porto; Rua do Campo Alegre, 687 P - 4169 - 007 Porto; Portugal	csa@fc.up.pt
Taiwan	Wann-sheng Horng, Math dept NTNU, 88 Sec.4, Tingchou Rd., Taipei, TAIWAN	horng@math.ntnu.edu.tw
Turkey	Funda Gonulates, Bagazici Universitesi, Egitim Fakultesi, Bebek- Istanbul, TURKEY	oprukcuf@boun.edu.tr
United Kingdom	Sue Pope, St Martin’s College, Lancaster LA1 3JD, UNITED KINGDOM	s.pope@ucsm.ac.uk
United States of America		

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66	12 October 2007	1 November 2007
67	12 February 2008	1 March 2008
68	7 June 2008	1 July 2008

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Editors:
Chris Weeks, chris.weeks@virgin.net (Downeycroft, Virginstow, Beaworthy, GB - EX21 5EA, Great Britain)
Bjørn Smestad, bjorn.smestad@lu.hio.no (Faculty of Education, Oslo University College, Postbox 4 St. Olavs plass, N-0130 Oslo, Norway)
Nikos Kastanis, nioka@math.auth.gr (Department of Mathematics, Faculty of Sciences, Aristotle University of Thessaloniki, Thessaloniki 541 24, Greece)