HISTORY and PEDAGOGY of MATHEMATICS
HPM

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

No. 62 July 2006

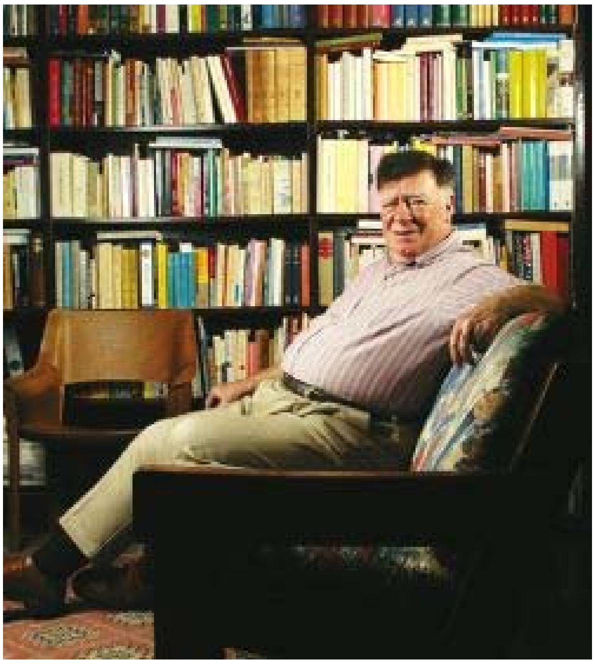
This and earlier issues of the Newsletter can be downloaded from our website
http://www.clab.edc.uoc.gr/hpm/

D'Ambrosio on ethnomathematics

In Newsletter 61 we published part of an interview with Ubiratan D'Ambrosio. He told us of his early involvement with HPM and his view of the importance of HPM's work. As part of Ubi's developing work on pedagogy of mathematics, he came to the view that the cultural context was vital to encouraging the development of a mathematics, and mathematical learning, among young people. He employed the term 'ethnomathematics' for this idea and we give here his early ideas about the ethnomathematics program that he explained in his interview with Maria Laura Magalhães Gomes.

Professor D'Ambrosio, would you like to say something more specifically about how you became interested in the idea of ethnomathematics and how it developed?

Ubi: It began as a consequence of the Karlsruhe ICME 3. That conference was decisive in the evolution of my ideas. In the late 70s and early 80s, my involvement with the history and sociology of mathematics, both of 'mathematicians' and of 'non-mathematicians', was intense. My work in Africa, particularly thanks to the UNESCO project in the Republic of Mali, and among Latin American traditional indigenous cultures, through projects of the Organization of American States, reinforced my interest in the history of mathematics 'not in the main stream', with special attention to the development of mathematical ideas in cultures where Mediterranean influences were not present. These were the main ideas which were later developed into what I defend as a new historiographical approach to a world history of mathematics, based on the concept of the cycle of knowledge and the basin metaphor. These ideas were synthesized in my talk in the First European Summer University on 'History and Epistemology in Mathematics Education', Université de Montpellier, France, July 1993.



In 1978, the International Congress of Mathematicians, in Helsinki, gave me an opportunity to further develop the importance of looking at cultures which are not in the mainstream and of developing the concept of cultural dynamics as an important instrument for the history of mathematics.

In 1979 I organized an international symposium on the 'The History of Mathematics Methods', at UNICAMP, Brazil. Among the speakers were Hassler Whitney, Jean Dieudonné, Alfred Tarski, Mario Miranda, Luis Santaló, Leopoldo Nachbin, Hermann Rohrer. This was, probably, the first meeting of this kind organized in Brazil. Soon after this, an invitation to participate in the workshop on 'History of Mathematics' at the Mathematisches Forschunginstitute, Oberwolfach, in October 1981, was an excellent opportunity to get more involved with the international community of historians of mathematics. At this meeting, with participants who were the most distinguished historians of mathematics, I was supposed to address mathematics of the XVII and XVIII centuries. I had been working in the history of the calculus of variations. But I was bold enough to venture into bringing something new, even if keeping the focus on the XVII and XVIII centuries. I talked about mathematics not of the main stream. I proposed to talk on 'Latin American mathematics in the conquest and early colonization'. When, a few months before going to Oberwolfach, I commented about my boldness with friends, the common reaction was "How can you give a talk about something that does not exist?"

My talk was, it goes without saying, a talk on ethnomathematics. Frankly, I was afraid of the reaction! This was very different from my courage, when returning to Oberwolfach in 1998, for the session on history of mathematics, to talk explicitly about ethnomathematics.

Although maintaining contacts with my colleagues of HPM, attending meetings in the USA and Europe, after 1976 I was much more devoted to building up my concepts of history, sociology and philosophy of 'mathematics not in the main stream', which were outlined in my talk at ICME 3, in Karlsruhe. I was looking into the implications of this broader view of the history of mathematics. Broader, since it recognized also the mathematics done by non-mathematicians. I was, indeed, building up the theory and practice of what I would later call ethnomathematics. There has always been a reaction to ethnomathematics, claiming that this is not mathematics. Indeed, it does not fit into the academic epistemological cage that identifies theories and practices as mathematics and as mathematicians. This is a major theme of the history of philosophy – how were disciplines established? – which has, since then, been attracting much of my attention. Since I recognize mathematics as the dorsal spine of Western, now planetary, civilization, it is my concern as an educator, as to how to close the gap between (professional) mathematics and its appreciation by the population in general. Mathematics, and the same is also true for science in general, should not be mystified in favour of the dominating power establishment. To demystify mathematics has been a major concern for me.

The approach to this kind of history I have in mind must be transdisciplinarian and transcultural. I believe that history benefits much from multicultural readings of narratives lost, forgotten or eliminated. The Program Ethnomathematics approaches history in this way. It looks into history and epistemology with a broader view, avoiding the denial and exclusion of the cultures of the periphery, of what prevails in society. The Program Ethnomathematics thus restores cultural dignity and offers the intellectual tools necessary for the exercise of citizenship. It also enhances creativity, reinforces cultural self-respect and offers a broad view of mankind.

I also believe that the Program Ethnomathematics offers the possibility of harmonious relations in human behavior and between humans and nature. It has, intrinsic to it, the *ethics of diversity*: respect for the other (the different); solidarity with the other and cooperation with the other.

According to Florence Fasanelli in her article about the first 25 years of HPM, the first Satellite Meeting of the group in Adelaide, in 1984, 'was a particularly memorable event, for it was at this meeting that Ubiratan D'Ambrosio outlined his thoughts on the need to develop three separate histories of mathematics: history as taught in schools, history as developed through the creation of mathematics, and the history of that mathematics which is used in the street and the workplace.' Florence Fasanelli added that, as a plenary speaker a few days later at ICME 5, you introduced the concept of ethnomathematics as compared to 'learned mathematics' to deal with these differences. Would you tell the Newsletter readers something about your talks concerning ethnomathematics in these two international meetings of 1984?

Ubi: Indeed, my great opportunity to present all these ideas came with the invitation to deliver the opening plenary lecture in ICME 5, in 1984, in Adelaide, Australia. My talk on 'Socio-cultural Bases for Mathematics Education' was decisive in establishing ethnomathematics as a research field. There were mixed reactions to my talk. Some disliked it so much that they ostensibly left the lecture hall. I did not notice. This was reported to me afterwards. Even the title, using the plural 'bases' was questioned! But the positive reaction, the enthusiastic applauses of the big audience, are among my good memories of this event. One of the consequences was the founding, in 1985, of the International Study Group on Ethnomathematics/ISGEm. Besides this plenary talk, ICME 5 represents, for me, an important moment for strengthening my involvement with history of mathematics.

A satellite meeting of the HPM was organized by Hans-Georg Steiner and George Booker, I believe. In my talk, which was a sort of preamble for my plenary talk, I propose three strands for the history of mathematics: history as taught in schools, history as developed through the creation of mathematics, and the history of that mathematics which is used in the street and the workplace. This is another form of looking into 'the mathematics of the mathematicians and the mathematics of the non-mathematicians' and, of course, to analyze what we teach in schools.

Indeed, the pedagogical proposal of ethnomathematics is the response to this and it leads to asking how valid are the current ways of teaching history. The ethnomathematical research program in history can be condensed into in three basic questions: 1. How did *ad hoc* practices and solutions of problems develop into methods? 2. How did methods develop into theories? 3. How did theories develop into scientific invention?

In spite of the efforts of mathematical educators, mathematics is still usually conceived mostly as a technical subject. School curricula do not usually approach mathematics as a cultural activity, and teachers are often unaware of the cultural aspect of mathematics. How could ethnomathematics contribute in teachers preparation programs and in school mathematics in order to make the cultural dimensions of mathematics more visible to people?

Ubi: Let me say, from the very beginning, that I do not believe in history of mathematics as a listing of individuals, results and dates. Nice pictures and anecdotes are frequently presented. Of course, these are important supporting material, but cannot be the core. Regrettably, this approach is common.

I see history of mathematics as an important instrument for understanding human knowledge and behaviour. It illustrates how human beings generate knowledge, how they organize this knowledge, both individually and socially, and how this knowledge is institutionalized and diffused. How can the ethnomathematics approach help? Simply, by the fact that ethnomathematics as a curricular subject is dynamic. It cannot be a folkloristic style course. To show numerical operations in the Maya system, or the interesting geometric patterns in different cultures, is a mere curiosity. Of course, this may be very refreshing and attractive, as are pictures and anecdotes. But this is not the objective of the ethnomathematical approach to history, which is a way to tackle the objectives mentioned above: to understand human knowledge and behaviour. Ethnomathematics is, essentially, research, developed in the form of projects. The objectives are attained through the analysis of the needs created by the surrounding environment, to see a motivation for this kind of knowledge and behaviour. The concept of 'surrounding environment' includes natural, cultural, social, economical conditions.

An example of bringing this into practice is visiting monuments, communities, builder's yards, professional workshops and by observing, registering, analyzing, in order to make sense of what was observed and registered. Where does the historical component come? General history talks about the surrounding environment in different places and times. So, the next step is to link what was observed, registered and concluded with the situation of other times and places. This is where we need a well prepared teacher of history of mathematics.

Of course, this reflects a vision of what is mathematics. I see mathematics as a specific form of knowledge generated, organized, institutionalized and diffused by social groups, in response to the basic drives of survival and transcendence. In its search for survival, groups developed the means to work with the most immediate environment, which supply air, water, food, the other individual, necessary for procreation, and everything else that is necessary for the survival of the individuals and of the group. These strategies are modes of behaviour and individual and collective knowledge, which include communication and, for the species *homo sapiens*, also language and instruments.

In the search for transcendence, the species *homo sapiens* develops the perception of past, present and future, and their linkage, and the explanations of facts and phenomena encountered in their natural and imaginary environment. These are incorporated in the memory, both individual and collective, and organized as arts, techniques, which evolve as representations of the real [models], the elaboration about these representations [artifacts], the organization of systems about explanations of the origins and the creation of myths and mysteries. Attempts to know the future [divinatory arts] encounter support in the memory, where we find the myths, the mysteries, history and the traditions, which include religions and value systems. The models result in (ethno)mathematics. The answer to the myths and mysteries associated with them are organized as arts, among them the divination arts, which give origin to systems of explanation and of knowledge, like astrology, the oracles, logic, the I Ching, numerology and the sciences, in general, through which we may know what will happen—before it happens!

Professor D'Ambrosio, what else would you like to say to the Newsletter readers?

I have attended many conferences of HPM and the related groups ICMI, ICHM and ICHS, which are, of course, connected with my line of work, and the Program Ethnomathematics relies on the intimacy of these four groups. I shall try to explain why.

I see the Program Ethnomathematics as a proposal to understand the adventure of the species since it differentiated from other mammals into hominids and finally to the species *homo sapiens*. In the process, the species developed ways to survive, in definite space (=here) and time (=now), and to transcend space (where) and time (when). In this process, the species developed *ad hoc* practices and solutions to the problems present in their immediate environment, generated methods and systems of knowledge (theories) and looked for explanations of facts, such as the same methods and their effectiveness, and of phenomena, as felt and observed. Such as the most surprising phenomenon of life and death, and heavenly phenomena. In the search for explanations, a perception of past and future is a natural development and a sense of enchaining past and future, hence of causality, came naturally.

This leads to inventions and to myths. All this means knowledge and behaviour, which are ways of dealing with space, time, of classifying, of comparing, of measuring, of quantifying, of inferring [≈*mathema*], which are is proper to the human species, to every human being. These ways are generated by individuals and socialized within a group and, through codes and techniques [≈*tics*], are shared and accumulated (assembled), and, as an assemblage, transmitted and diffused. The codes and techniques are, undeniably, contextual [≈*ethno*]. As an example, we have mathematics as an (not *the*) assemblage of some codes and techniques.

The Program Ethnomathematics [indeed, *ethno*+*mathema*+*tics*] aims at understanding the generation, organization and transmission/diffusion of ways of dealing with space, time, of classifying, of comparing, of measuring, of quantifying, of inferring, and of the consequent codes and techniques, in different contexts. I am convinced that this approach leads to viewing the other, individual or groups, with respect and it favours solidarity and cooperation.

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Conference reports

Session on Diversity of Mathematical Cultures in History

September 1-3, 2005, University of the Aegean, Rhodes, Greece

A Special Session on *Diversity of mathematical cultures in history* was organized by I.M. Vandoulakis (University of the Aegean, Mytilene) as part of the Meeting "Mathematical Education and Mathematical Cultures" organized by E. Avgerinos (University of the Aegean, Rhodes), Rhodes, September 1-3, 2005.

The Session was opened by two plenary lectures by Prof. Roshdi Rashed (Centre Nationale de la Recherche Scientifique, Paris) and Prof. Chikara Sasaki (University of Tokyo).

In his plenary lecture, entitled *The Transmission of Greek Mathematics into Arabic*, Prof. Rashed examined certain problems of transmission of Greek thought into Arabic, particularly in the fields of mathematics and optics. In his view, the emergence of Arabic science is incomprehensible without taking into account its Greek heritage; nor can Greek mathematics be understood without the examination of the part of Greek mathematics that survived in Arabic translations, such as Appolonius and Diophantus.

He recalled that the transmission of knowledge is not a process taking place on a geographical or cultural level, but essentially on a linguistic level, and stressed the connection between translation and research. The identity of translators and the works they translated are associated with the state and organization of research when they were translated.

A closer examination shows that interest in the Greek legacy, particularly the Hellenistic scientific legacy, was partly linked to the research activities in the Islamic disciplines – the science of language, jurisprudence, theology, history, hermeneutics, etc. – that were established during the early ninth century. The renowned House of Wisdom in Baghdad is associated with the activities of astronomers, such as Yahya ibn Mansūr, translators, such as al-Hajjāj ibn Matar – the translator of Euclid and Ptolemy – mathematicians, such as al-Khwārizmī, the Bānū Mūsa brothers, and Thābit ibn Qurra. The process of translations was large-scale, unsystematic, yet deliberately organized. The aim of the translations was not to write the history of science, but make available in Arabic, texts that were necessary for the training of researchers or the advance of research itself. For instance, the translation of Archimedes served to facilitate studies on the measurement of areas and volumes, not as a contribution to history of the respective field or for commentatory purposes. This fact underpins the choice of the text for translation, as well as the method and style of translation. Consequently, the underlying order behind the choice of works for translation and their succession makes sense only in reference to contemporary research activity.

In support of his view, he mentioned several examples, such as the transmission of the legacy of Diophantus, Nicomachus and Ptolemy, but focused on a detailed examination of two major examples, one from pure mathematics, that is the theory of conics, and another from applied mathematics, namely optics and catoptrics.

The first example concerns the attempts to construct, for practical needs, a technical device to produce a phenomenon that does not exist in nature – the burning mirrors. The investigations in this field go back to the Alexandrian mathematicians and continued by the Byzantines in the 6th century and the Arabs in the 9th century. The facts indicate that the Greek texts on burning mirrors were tracked down and then translated into Arabic when 9th century scientists were engaged in research in this field. The advance of these scientists over their forebears is the clearest proof of the link between research and translation.

The second example concerns Apollonius' *Conics*, which was considered the most difficult treatise of the Greek and Hellenistic mathematical legacy. In this case, the translations were in great demand among translators and scientists, who wished to develop research not only in the same field, but also in other relevant fields.

Prof. Sasaki, in his lecture *The New Horizon of the History of Mathematics in East Asia* presented the view that the hitherto historiography of mathematics was focused initially on Western Europe and, during the last quarter of the 20th century, on the Islamic world, whereas mathematics in East Asia was relatively neglected. This gave rise to the myth of a single linear development of mathematics from Babylonia and Egypt to ancient Greece, then to Arabic countries, then to Medieval Latin Europe and, finally to modern Europe and East Asia.

Sasaki suggests the new historiographical concept of "Eurasian Mathematics" to denote not only the fact that what is called "European mathematics" incorporates pieces of Asian mathematics, but also a complex process of their genesis and transformations from ancient Greek demonstrative mathematics, the Indian art of numerical calculations, the al-jabr of the Islamic civilisation, and their introduction and fermentation in medieval and Renaissance Europe during a long period. (See also Sasaki's *Descartes's Mathematical Thought*, Kluwer 2003.)

On the other hand, another important question is the introduction of European mathematics into China and Japan, from the 17th century (Jesuit missionaries Matteo Ricci (1552-1610), Carlo Spinola (1564-1622), and others). A more important phase of this encounter is the period after the Opium War in the 19th century, notably Alexander Wylie [偉烈亞力] (1815-1887) and Li Shanlan [李善蘭] (1810-1882). However, the phase of drastic adoption of Western mathematics was during the late 19th century Japan, when the centralised school system [学制] was established in 1872, and, five year later, the University of Tokyo [東京大学] and the Tokyo Mathematical Society [東京数学会社].

In an attempt to make a general comparison between the European and Chinese mathematical thought Sasaki distinguished axiomatic thinking and operation with idealised mathematical objects as characteristics of European mathematics, in contradistinction to Chinese mathematics, in which practical algorithmic calculations are conducted on concrete mathematical objects.

Among the other speakers were:

Demidov, Sergey (Russian Academy of Science, Moscow) *The confrontation between Moscow and Petersburg in history of mathematics*.

Morelon, Règis (CNRS, Paris) *La transmission des textes de Ptolémée du grec à l'arabe*.

Phili, Christina (National Technical University of Athens) *L.B. Alberti and Theodore Gazis: "Elementi di pittura".*

Papadopetrakis, Eftychios (University of Patras) *L'évolution d' «ecthèse» et son rôle, sur la structure logico-linguistique du langage mathématique des Grecs.*

Bellosta Hélène (CNRS, Paris) *La tradition arabe des «Données» d'Euclide.*

Crozet, Pascal (CNRS, Paris) *Al-Sijzi and the tradition of Euclid's "Elements".*

Nicolantonakis, Konstantinos (University of W. Macedonia) *On the method of extraction of square root in ancient Greek and Chinese traditions.*

Vandoulakis, Ioannis (University of the Aegean) *Concepts of constructivity: Markov vs. Brouwer.*

Abgrall, Philippe (CNRS, Paris) *Les «Éléments» d'Euclide dans la géométrie d'al-Quhi.*

From these papers, one was devoted exclusively to Greek mathematics (Papadopetrakis); two to the relation of Greek mathematics to European (Phili) or non-European (Nicolantonakis) traditions; four to Arabic mathematics and the reception of Greek mathematics by Arab scholars (Morelon, Bellosta, Crozet, Abgrall).

Two papers were devoted to modern mathematics, notably to the history of set theory and theory of functions and the different attitudes to them by the mathematicians of the Moscow and the Petersburg schools (Demidov) and to the history of logic and the foundations of mathematics, particularly the attitude of Markov to Brouwer's intuitionism (Vandoulakis).

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Oberwolfach Mini-Workshop: Studying Original Sources in Mathematics Education

Oberwolfach 1–5 May, 2006

Organised by
Fulvia Furinghetti, Genova,
Hans Niels Jahnke, Essen and
Jan van Maanen, Groningen.

Among the various possible activities by which historical aspects might be integrated into the teaching of mathematics, the study of an original source is the most demanding and the most time consuming. It requires a detailed and deep understanding of the mathematics in question, of the time when it has been written and of the general context of ideas, and language becomes important in ways which are completely new compared with usual practices of mathematics teaching. Thus, reading a source is an especially ambitious enterprise, but rewarding and substantially deepening the mathematical understanding.

In principle, the aims and effects which might be pursued by way of a source will not be different from those attained by other types of historical activities. However, there are some ideas which are specifically supported by reading mathematical sources.

a) Integrating sources in mathematics replaces the usual with something different: it allows to see mathematics as an intellectual activity, rather than as just a corpus of knowledge or a set of techniques. For example, Newton's letter to Leibniz of 1676 in which he described how as young man of 22 years he arrived at the general binomial formula (a cornerstone in his fluxional calculus) is a unique document for a process of mathematical invention progressing by bold generalisations and analogies.
b) Integrating sources in mathematics challenges the learner's perceptions through making the familiar unfamiliar. Getting to grips with a historical text can cause a reorientation of his views and thus deepen his mathematical understanding.

All too often in teaching, what happens is that concepts appear as if already existing and they are manipulated with no thought for their construction. Sources remind them that these concepts were invented and that this did not happen all by itself. As an example we might refer to Leibniz' version of the calculus. There are many experiences showing that students are motivated to really reflect about the limit approach to calculus when in contrast they study Leibniz' way of dealing with infinitely small quantities.

c) Integrating sources in mathematics invites the learner to place the development of mathematics in the scientific and technological context of a particular time and in the history of ideas and societies, and also to consider the history of teaching mathematics from perspectives that lie outside the established disciplinary subject boundaries. One of many examples from antiquity to the present is provided by Heron's textbook on land surveying called *The Dioptra*. Reading parts of it connects the topic of similarity to the context of ancient surveying technologies and shows the astonishingly high achievements of ancient engineers in this and other areas.

d) Reading a source is a type of activity which is oriented more to processes of understanding than to final results. The complete meaning of a historical text may remain open, and it occurs quite often that different readings of the same text prove possible. Of course, this does not entail arbitrariness. The reader has to give reasons in support of his interpretation. As an example we refer to the highly interesting story of negative and/or complex numbers. Reading sources about this topic poses in every case the question whether, and if yes, in which sense these creations were understood as legitimate numbers in different historical times.

e) When working with original sources at least three different languages interact in the classroom, the language of the source, the modern terminology of the mathematical topic in question and the everyday language which has evolved in the classroom. This requires of the learner competencies of translation and switching between these languages which are highly desirable from an educational point of view since communication between expert mathematicians and people who want a problem solved mathematically is one of the main problems of applying mathematics.

The presentations gave several rich examples of each of these points. And while the presentations were very varied, none of them were without ideas for practice or without theoretical considerations.

An important development in recent years is that more empirical research studies on the integration of original sources are being done, and a few of them were presented here. Michael Glaubitz presented a study with the title "Reading Al-Khwarizmi's Treatise on Quadratic Equations with 9th-graders". In his project, seven classes were given a workbook studying Al-Khwarizmi's method, while three classes were given another workbook with more "traditional" material. Kathy Clark presented "One Teacher's Experience with Personal Study and Curricular Inclusion". In her study, five secondary mathematics teachers in the US were given professional development sessions on the historical development of the logarithm, including Napier's 1614 *Mirifici logarithmorum canonis descriptio*. Thereafter, she studied in what way the teaching of these teachers was influenced by the experience. Katja Peters, in her talk "Perceiving history of mathematics", studied what happened when 22 eighteen year olds were given access to original sources in a research library, ranging from Adam Ries' *Rechnen auff der Linien und Federn* to F. Ritter's *Astrolabium* for a three day project. In addition to these contributions, Jan van Maanen presented the Ph.D. thesis of Iris van Gulik-Gulikers, which will be reported more fully in a future newsletter.

Other talks focused on theoretical issues (and even these had examples from practice). We all listened attentively to Abraham Arcavi's "Learning to listen: from historical sources to classroom practice". In collaboration with Masami Isoda, he has considered the way "listening" (in a broad sense) is essential both in teaching and in studying historical sources. Listening evaluatively is something else than listening attentively. Examples from work with teachers on the *Rhind Papyrus* were also given. Caroline Bardini and Luis Radford presented work on "Unknowns, Variables and Parameters", wherein the historical developments of these concepts were traced (focusing on Viète) and some videotaped lessons were shown.

In other talks, examples from the presenters' own practice were given, with theoretical comments. Evelyne Barbin discussed a list of eight different ways of working with original sources, and gave a wide variety of examples from her work with teachers. Adriano Dematté presented the book *Fare matematica con i documenti storici* (which will be published later this year) with original sources and material for students aged 12-18. He also discussed criteria on how to construct such a book. Wann-Sheng Horng gave examples of work on the history of Heron's formula in China with in-service teachers, and discussed the dual role of teacher and historian. Jan van Maanen discussed several activities he has carried out and at the same time noted the positive aspects of working on the really original book instead of a copy. Peter Rasfeld talked about work on the problem of points with 16 year old students, with use of the correspondence between Pascal and Fermat. Costas Tzanakis gave examples from three different areas, and discussed them in relation to the five points in the start of this report. The three areas were ancient Greek mathematical texts in the teaching of Euclidean Geometry, the concept of (instantaneous) speed (looking at Autolycos, Archimedes, Aristotle and Newton) and Hamilton's invention of quaternions (looking at Wessel, Hamilton and Cayley). Following up on this talk, Karin Reich discussed "The historical roots of vector calculus: J. W. Gibbs (1839-1902)" and put Gibbs into his historical context.

Two sessions were special, in that the audience was invited to take part in working on historical sources. David Pengelley's session (“A multi-week project on mathematical induction and combinatorics for university students, based on Pascal’s *Traité du Triangle Arithmétique*”) involved us in making sense of Pascal’s work on the triangle. Most of us had some problems understanding the terminology at first, but after a while we were ready to appreciate Pascal’s proofs on a range of subjects. Hans Niels Jahnke’s session (“Students working on their own ideas. Bernoulli’s lectures on the differential calculus (1692) in grade 11”) confronted the audience with Bernoulli’s calculus based on infinitely small quantities and even infinitely smaller quantities. Afterwards, Jahnke discussed the students’ reactions to this material.

In addition, Bjørn Smestad talked on “Curricula, textbooks and teachers – their roles in making history of mathematics part of mathematics education”. This talk gave an impression of the position of history of mathematics in classrooms around the world and in Norwegian textbooks. Smestad also talked on an ongoing interview study to get more information on teachers’ attitudes to history of mathematics.

One issue that often came up in the workshop was the problem of upscaling. There is no reason to believe that teaching which is done by an enthusiast with good results can easily be successfully repeated by the average teacher. It is a welcome development that new materials are being published, and that research is being done on projects where “average teachers” are doing the teaching (as in the studies by Glaubitz and Clark).

There seemed to be a consensus that the work-shop had been a wonderful experience. The weather was great throughout the week, the food was good and interesting, the surroundings were beautiful and the staff was very professional. Most importantly, the workshop worked on important questions and made us all more competent and more inspired for the work to follow.

For more details on the contributions, see the forthcoming abstracts in the Oberwolfach Reports (http://www.mfo.de/programme/schedule/2006/18c/OWR_2006_22.pdf).

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Espace Mathématique Francophone 2006

Sherbrooke (Quebec, Canada), May 27-31, 2006

After Grenoble (France) in 2000 and Tozeur (Tunisia) in 2003, the third meeting of the EMF conference took place in May 2006 at Sherbrooke University, in Quebec. This conference has the status of a regional satellite of the ICMI and provides an opportunity for researchers (in didactics mainly), teachers, teacher trainers, and education administrators to meet in order to compare educational systems and share experiences. Though most of the participants were from Quebec or France, many other countries had sent representatives: Algeria, Tunisia, Morocco, Mauritania, Burkina Faso, Senegal, Mali, Cameroon, Belgium, Switzerland, etc. The plenary talks covered a wide range of subjects**:** from the teaching of elementary mathematics in both French and Inuit languages to Canadian Eskimos, to the current trends in the teacher training in Maghreb.

One of the 8 sections discussed *the integration of historical and cultural perspectives in the teaching of mathematics*. A new curriculum is being implemented in Quebec, which apparently lays a strong emphasis on the history of mathematics (relevant information at math.uqam.ca/_charbonneau/GRMS04/). Some new web resources were developed on the occasion of this new curriculum (Euler.CyberScol.qc.ca/Pythagore/). Though the lack of appropriate teaching material and proper teacher training was pinpointed by many, it was agreed that the numerous IREM documents provide a reliable work basis**,** which is readily available to French speakers. However, the lively talks showed a discrepancy between, to say it roughly, the views in Quebec and in France as to the role of a historical perspective in the teaching of mathematics.

In Quebec, it seems that the main goal is to prepare children for citizenship in a multicultural society: teachers are to show mathematics as a collective endeavour, to which many different cultures contributed; the issue of gender stereotypes is to be tackled via information on women mathematicians. As for the French (to be more specific: in the sub-culture of the IREMs), the emphasis lies more on the mathematical concept**,** which is studied through historical texts: the main goal is didactical, though the other goals (changing the image of mathematics, reading texts from all parts of the world, etc.) are indirectly attained. This discrepancy also reflects the fact that the French curriculum is knowledge-oriented whereas the new curriculum in Quebec is skill-oriented.

The next meeting will be held in 2009, probably in a sub-Saharan African country. Proceedings (in French) for the 2006 meeting are to appear on CD in the fall of 2006. For further information, please visit: emf2006.educ.usherbrooke.ca

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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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Have you read these?

Armella, L. M. & Sriraman, B.: Structural stability and dynamic geometry: some ideas on situated proofs, *Zentralblatt für Didaktik der Mathematik*, Volume 37 (June 2005) Number 3, pp. 130-139

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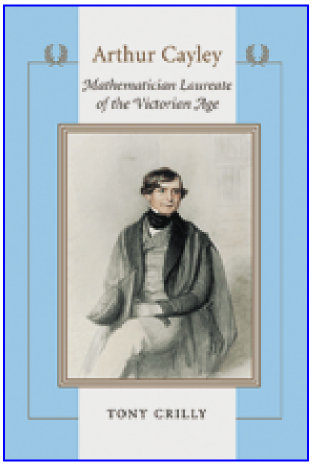

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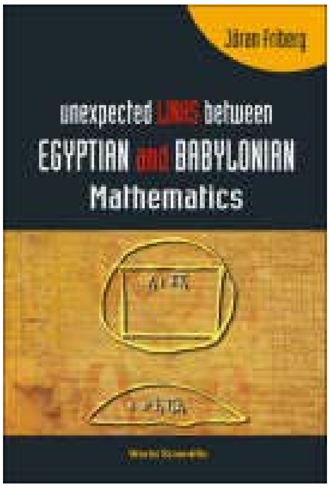

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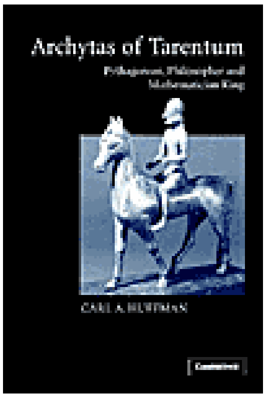

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Have you been here?

Archimedes: a web resource
This site is an example of what a good website should be. It was established in 1995 and is maintained by Chris Rorres of Pennsylvania. There are many pages offering attractive images, including animations, dealing with all aspects of Archimedes' life and contributions to science and mathematics. Moreover, the information is backed by careful scholarship and, where necessary, is suitably cautious. Strongly recommended.

http://www.mcs.drexel.edu/~crorres/Archimedes/contents.html

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/

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/

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/

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

BSHM Bulletin: A new look

The British Society for the History of Mathematics was established in 1971 but it was not until 1986 that the society published a regular newsletter to provide news of publications and activities throughout the world and to report on the society's own activities. The first issue comprised just 3 typed pages in A4 format. Some twenty issues later, the newsletter had grown to around 32 pages of laser printed A5 text. A brief history of the society, penned by Ivor Grattan-Guinness, can be read in the twenty-first anniversary issue of the Newsletter (1992).

Under the influence of John Fauvel, who was President of BSHM from 1992–1994 and Newsletter editor from 1995–2001, the Newsletter began to include a variety of articles mostly, but not all, arising from talks given to the society. In 2004, by which time the Newsletter had become more like a journal than simply a note to members about meetings, a change of name was in order and the spring issue of that year was renamed *Bulletin* and proudly displayed: Newsletter 50 = Bulletin 1.

A new change and a more professional presentation completes an organic growth over twenty years. The long-established journal publishers Taylor & Francis will now include BSHM *Bulletin* among its other journals. Editor Jackie Stedall comments that "this new step is significant not only for the *Bulletin* but for the society as a whole, marking a further stage in the development of the BSHM from an informal voluntary society … to producer of a recognized publication which we hope will be found in libraries and institutions across the world."

More information about the *Bulletin* can be found at the BSHM website http://www.bshm.org/ and a sample copy can be downloaded or ordered from Taylor & Francis at http://journalsonline.tandf.co.uk/ (or follow the link from the BSHM site).

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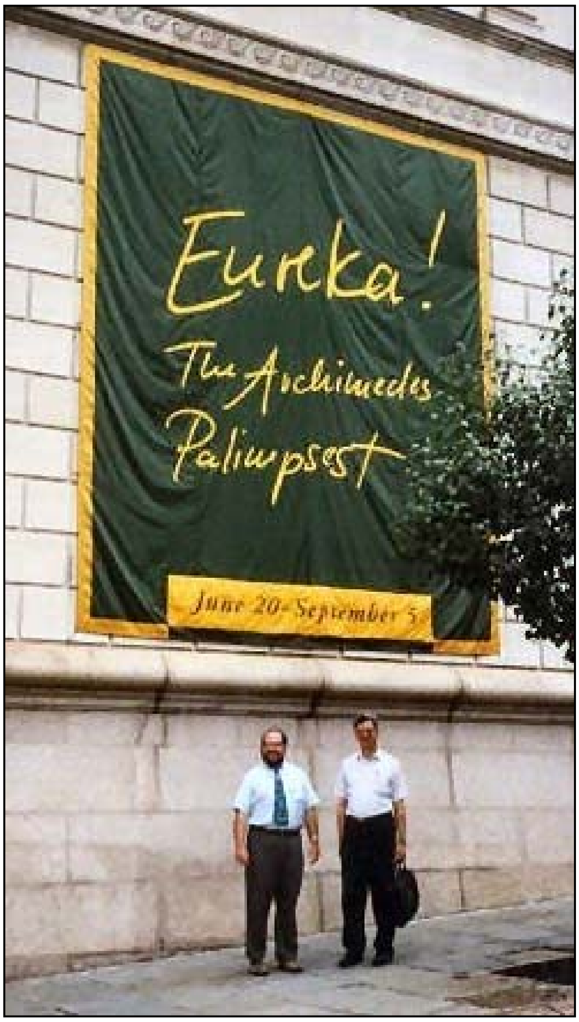
Institute in the History of Mathematics and Its Use in Teaching: Ten Years After

This summer marks the tenth anniversary of the first of three graduating classes from the Institute in the History of Mathematics and Its Use in Teaching (IHMT), offered by the Mathematical Association of America (MAA) from 1995 to 1999. The impact of the Institute was immediate, and has continued to grow over the years, until today its influence can be seen throughout the American mathematical community and beyond. Of IHMT's early and continued success, Institute Director Victor Katz says, "We certainly hoped it would be successful, but we have been very pleasantly surprised at the impact we have had. Certainly, even in the second year, it was clear that we were having a major impact in the mathematical community."

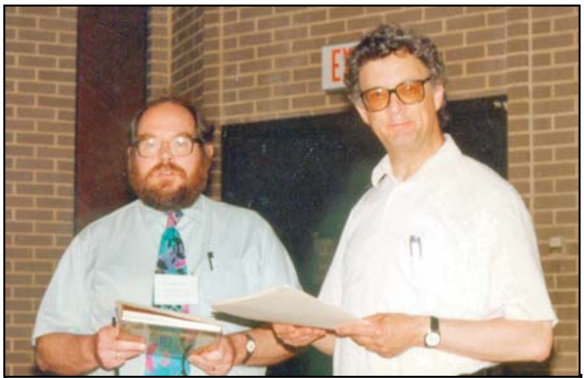
Held at American University (1995-97) and Catholic University of America (1998-99) in Washington, D.C., IHMT included three classes of about 40 college and university faculty members each, the first during the summers of 1995 and 1996, the second during 1996-97, and the third in 1998-99. Institute directors were Victor Katz, of the University of the District of Columbia; Steven Schot, of American University; and Fred Rickey, then of Bowling Green State University, Ohio, and now of the United States Military Academy, West Point, New York. Florence Fasanelli served as MAA liaison and was instrumental in obtaining the National Science Foundation grants that funded the Institute.

The goal of IHMT was to increase the presence of history in the undergraduate mathematics curriculum by preparing participants to teach undergraduate courses in the history of mathematics and to incorporate historical issues in all of their teaching. Although participants ranged from neophytes (like myself) to experts (Kim Plofker was in the first class), the typical IHMT participant was a college or university mathematics or mathematics education professor who had been teaching an undergraduate mathematics history course, but whose knowledge of mathematics history came mainly from secondary sources. IHMT exposed us to new research in mathematics history; introduced us to original sources; got us started on using mathematics history in all of our courses; and inspired many of us to do our own original research in mathematics history.



Each two-year course included:
- Lecture series by outstanding historians of mathematics (for instance, in 1999, Eleanor Robson on Mesopotamian mathematics, Harold Edwards on the history of number theory, and Karen Parshall on American mathematics);
- Instruction both in teaching history of mathematics courses and in using history of mathematics in mathematics courses;
- Survey course in history of mathematics from ancient to modern times;
- Historiography course;
- Original source reading groups;
- Group research projects;

- Field trips to rare book libraries and museums (for instance, in 1997, curator Peggy Kidwell showed us rare mathematics books and early American mathematical manipulatives at the Dibner Library in Washington, D.C., and, in 1999, we viewed the Archimedes Palimpsest at the Walters Museum in Baltimore, Maryland); and
- Reports by second-year participants on historical research and teaching experiences during the preceding academic year.



Fred Rickey & Victor Katz

Of the many types of activities offered at the Institute, Katz says, "The one that was surprisingly successful was having participants do mini-research projects in history. Many of the participants continued and expanded this work afterwards." Indeed, several participants published their work and many more gave talks on their projects at conferences. Participants published articles on the history of school mathematics topics, including subtraction (Pratt-Cotter and Ross), multiplication (Berg 2001), quadratic equations (Allaire and Bradley 2001), related rates (Austin *et al* 2000), and the Quotient Rule (Curtin 2005). Paul Pasles, of Villanova University, Pennsylvania, continued his project on American founding father Benjamin Franklin's work on magic squares, finding three little known squares and one previously unknown square (Pasles 2001). Shai Simonson, of Stonehill College, Massachusetts, has continued to study and translate the mathematics of Levi ben Gershon and has shared his work with teachers (Simonson *MT* 2000) and researchers (Simonson *HM* 2000).
Institute Director Fred Rickey identifies the original source reading groups as well as the research projects as being surprisingly successful, saying, "Perhaps the biggest surprise of IHMT for me was the interest that the participants took in reading original sources. Victor and I, as well as others whom we talked to about the planning, knew it would be a good idea to have people read some original sources so that they could come to appreciate what historians do. For the same reason, we designed the research projects into the plan. What surprised us was how many people took a serious interest in doing history themselves and how many decided that teaching history courses using original sources was a good idea. This pleased us very much." IHMT graduates have founded two very active original source reading groups. Ed Sandifer of Western Connecticut State University started the Readings in the History of Mathematics from Original Sources (ARITHMOS) group, while Dan Curtin of Northern Kentucky University and Danny Otero of Xavier University, Ohio, organized the Ohio River Early Sources in Mathematical Exposition (ORESME) Reading Group.

IHMT participants have been instrumental in founding and running other professional organizations and activities. Sandifer and Rob Bradley, of Adelphi University in New York, helped found the Euler Society (www.eulersociety.org), which holds annual conferences in the United States. In 2001, IHMTers helped found the MAA History of Mathematics Special Interest Group (www.maa.org/homsigmaa), which organizes mathematics history paper sessions, panels, and invited addresses at national MAA meetings, and also sponsors a student writing contest in mathematics history. Bradley and Patricia Allaire, of Queensborough College in New York, founded the Frederick V. Pohle Memorial Colloquium Series in the History of Mathematics at Adelphi University. Several IHMTers have participated in this monthly seminar series for New York City area mathematics historians. Many IHMT graduates have joined the Canadian Society for the History and Philosophy of Mathematics (CSHPM) and participate in its annual conferences, and IHMT graduate Bob

Stein of California State University, San Bernardino, is president of the HPM Americas Section.

Katz measures IHMT's success primarily in terms of its original goal of increasing the presence of history in the undergraduate mathematics curriculum, noting, "The greatest successes are simply that so many people are involved with the use of history in the classroom. You see this directly at every Joint Meeting. And so many people have written articles and books that started in their experience at IHMT. Of course, the other great success is in the new research in the history of mathematics which participants continued after IHMT." There have been lively and well-attended paper sessions on using history of mathematics in teaching, often organized by IHMTers, at every Joint Winter Meeting of the American Mathematical Society (AMS) and MAA since IHMT began. Most recently, IHMT graduates Dick Jardine of Keene State College, New Hampshire, and Amy Shell-Gellasch, currently of Germany, organized a contributed paper session on "Using History of Mathematics in Your Mathematics Courses" at the 2006 Joint Meetings in San Antonio, Texas. Over the past ten years, there has been a dramatic increase in the number of paper sessions, panels, invited addresses, and mini-courses on mathematics history and on its use in teaching at AMS, MAA, and National Council of Teachers of Mathematics national and regional meetings.

Examples of IHMT participants' innovations in both mathematics history and mathematics courses include the following.
- Next summer, Herb Kasube of Bradley University, Illinois, will teach his university's history of mathematics course for mathematics majors with the added attraction of readings from Newton's *Principia* and a trip to England to visit Oxford, Cambridge and Bletchley Park.
- Agnes Tuska of California State University, Fresno, developed group projects for her mathematics history course centered around mathematical videos. Groups of students view, critique, research, and then present math history-related videos.
- Lynn Reed has the students in her calculus courses at the Maggie L. Walker Governor's School in Virginia make annotated timelines and biographical scrapbooks.
- At the University of Redlands, California, a team of six mathematics majors (all but one of whom planned to become teachers) and I designed an activity-based mathematics history course for non-science majors. We offered MATH 115, Mathematics through its History, twice, and I have since offered the course twice more with different student teaching assistants. One of my teaching assistants, Rachel Balsam, went on to design and teach a mathematics history course for the gifted fifth and sixth graders in the Johns Hopkins University Center for Talented Youth program.
- Joanne Peeples of El Paso College, Texas, helped a team of students write and produce *Count Her In!,* a play about women in mathematics, both historical and modern. Her team of twelve women high school, undergraduate, and graduate students presented their play at the MAA's 2005 Summer MathFest in Albuquerque, New Mexico, where it received rave reviews.

Besides incorporating mathematics history into our own mathematics courses and creating teaching and performance opportunities for our students, IHMT graduates have developed instructional resource materials for others. For example:
- Shirley Gray of California State University, Los Angeles, founded and maintains the National Curve Bank, a mathematics website with strong emphases on both history and pedagogy (curvebank.calstatela.edu). Many IHMT graduates have contributed to the website and serve on its advisory council.
- Amy Shell-Gellasch and Dick Jardine co-edited the collection *From Calculus to Computers: Using the Last 200 Years of Mathematics History in the Classroom* (Bookstore at www.maa.org).
- IHMT graduate Fernando Gouvea and colleague William Berlinghoff from Colby College, Maine, wrote an elementary mathematics history text, *Math through the*

Ages: A Gentle History for Teachers and Others, now in its second edition (Bookstore at www.maa.org).

- Several IHMT participants served as team leaders for the Historical Modules Project, 1998-2001, which produced *Historical Modules for the Teaching and Learning of Mathematics,* a CD containing eleven book-length sets of historical lesson materials on topics such as geometry, trigonometry, and statistics (Bookstore at www.maa.org). The modules were written by teams of high school teachers (led by IHMT graduates); edited by project directors Victor Katz and Karen Michalowicz; and published by the MAA. Katz reports, "The Historical Modules project is having a definite impact---and it certainly had an impact on the teachers involved in writing and testing it." He cites as one example former high school teacher Kathy McGarvey Clark, who is completing a Ph.D. at the University of Maryland with a dissertation on the effectiveness of the use of history in teaching logarithms in a pre-calculus course (see also the Oberwolfach conference report in this issue).

Many IHMT participants, myself included, consider IHMT to be one of the most important professional experiences of our careers. In addition to gaining enough knowledge and confidence to teach my university's mathematics history course for mathematics majors and to design and teach the hands-on elementary mathematics history course described above, I also found what I had been looking for unsuccessfully for many years: an intellectual pursuit that is both personally engaging and directly related to my teaching. Patricia Allaire, one of six or so mathematics history Ph.D. candidates who participated in IHMT, recalls, "IHMT was a defining professional moment for me. I came fresh from passing exams and seeking a dissertation topic, and left well on the way to having one. When Helena Pycior spoke about British symbolical algebra, I knew I was home." She also cites the impact of IHMT on her teaching: "History now informs all my teaching. Even when I'm not being explicitly historical, history is always there in the form of an anecdote, background material, a face to go with a name, etc."

Besides the intrinsic interest of the subject matter, I believe what made the Institute so successful was the energy and enthusiasm of the directors, invited speakers, and participants; the cooperative spirit of inquiry we all shared; the expectation of serious work and the willingness of participants to do it; and the promise the Institute held to improve one's teaching and scholarship. This cooperation and commitment have persisted over the years, with many of us continuing to collaborate on various projects. Allaire reports, "At IHMT–95, my research mini-project with Antonella Cupillari was on Artemas Martin. Antonella and I have become great friends and collaborators. We have written and spoken together and individually on Martin." (See Allaire and Cupillari 2000.) Shirley Gray, who, in addition to founding the National Curve Bank, wrote an article with Ed Sandifer on the *Sumario Compendioso* (Gray and Sandifer 2001), identifies as highlights of IHMT the camaraderie of the participants and their commitment to learning mathematics history, saying, "IHMT created a nucleus of like-minded kindred souls who have continued to enjoy knowing and seeing one another after ten years. Most of the individuals who applied were those who could be expected to participate at any level of mathematics. However, almost all of us had degrees in pure mathematics, rather than history. For some innate reason, we simply wanted to know a great deal more about the subject we were teaching."

IHMT and Historical Modules Project Invited Speakers, 1995-2001

Tom Archibald, 19th century European mathematics
Marcia Ascher, ethnomathematics
Ron Calinger, historiography
Ubi D'Ambrosio, ethnomathematics
James Donaldson, African-American mathematicians

Bill Dunham, history of mathematical analysis
Harold Edwards, history of number theory
John Fauvel, mathematics of England and America
Judy Grabiner, Maclaurin and calculus
Judy Green, women mathematicians
Uta Merzbach, Gauss and his legacy
Karen Parshall, American mathematics
David Pengelley, teaching with original sources
Kim Plofker, Indian mathematics
Helena Pycior, British algebra
Eleanor Robson, Mesopotamian mathematics
Shai Simonson, mathematics of Levi ben Gershon


Eleanor Robson

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Augustus De Morgan (1806-1871), a great mathematician and a historian of mathematics

Augustus De Morgan was born in India, of British colonial parents, and Professor R. C.Gupta has written this tribute in recognition of the 200th anniversary of his birth.

Augustus De Morgan, born in India was the first president of the London Mathematical Society (LMS). He was a major mathematician of his time and a great teacher of mathematics, and equally a great historian of mathematics. This small note is meant as a tribute to him in the bicentenary of his birth, 2006.

De Morgan was born at Madurai, South India, on Friday, 27 June 1806. His father was associated with the East India Company and his great-grand father James Dodson's interest in mathematics is shown by his books *Anti-logarithmic Canon* (1742) and *Mathematical Repository* (1755). De Morgan lost the sight of his right eye in childhood, due to an infection, but this physical handicap did not prevent him from attaining excellence in intellectual activities and achievements.

De Morgan's early education was in England and he graduated from Trinity College, Cambridge in 1827. Among his tutors were George Peacock (algebraist), George Biddel Airy (astronomer) and William Whewell (philosopher and historian of science). De Morgan was a freethinker and he rejected the accepted views of orthodox religion and rebelled against the prevailing doctrines of established church. This prevented him from proceeding to the MA degree.

In 1837 De Morgan married Sophia Elizabeth, daughter of William Frend (1757-1841), who himself was a mathematician. Frend's *The Principles of Algebra* was published in London in two parts (1796, 1799). De Morgan was a man of principle and far above the narrow thinking of sectarian religions. Due to the rigid articles of the Anglican Church, he could not hold a fellowship at Cambridge or Oxford (because he declined to submit to the prescribed religious test).

Nevertheless, due to his excellent merit, De Morgan was unanimously selected as the founder Professor of Mathematics in February 1828 at the newly established 'The London University' which was subsequently called the University College of London. The University College offered the intellectual freedom so necessary for academic development, which contrasted with that of King's College, London (established in 1829) where attendence in lectures on theology remained compulsory.

De Morgan held the position (up to 1866) for most of his remaining life except for a short period of five years (1831-1835) when he had resigned, as a matter of principle, in protest against the unfair dismissal of one of his colleagues. De Morgan was a dedicated teacher and discharged his duties conscientiously. Many of his students became famous mathematicians such as J. J. Sylvester (1814-1897), Isaac Todhunter (1820-1884) and Francis Guthrie (1831-1899).

The idea of forming the London Mathematical Society ("to which discoveries in mathematics could be brought", according to De Morgans's wife, writing after his death) first came during a talk between two ex-students of University College – Arthur Cowper Ranyard (1845-1894), FRAS, and George Campbell De Morgan (1841-1867), a son of Augustus De Morgan. A meeting was convened on 7 November 1864 chaired by De Morgan. It was quite befitting that Prof. De Morgan should become the first President of the LMS, whose first regular meeting was held on 16 January 1865.

Under the presidency of De Morgan, the LMS was "very high in the newest developments" (i. e. the latest researches were presented and discussed). It may be mentioned that there had been an earlier Spitalfields Mathematical Society (which flourished from 1717 to 1845) at whose meetings smoking and drinking were permitted. On the other hand "not a drop of liquor is seen at our [LMS] meetings" claimed De Morgan. He had hoped that the LMS would cultivate and support every branch of mathematics (and its application) including the then neglected areas of Logical Mathematics (i.e. the connection between logic and mathematics) and History of Mathematics.

In November 1866, De Morgan resigned from the professorship, again on a matter of principle, because the policy of religious secularism (equality or neutrality) was betrayed by the Council in appointing a candidate. After that his health slowly deteriorated. The deaths of his son George (1967) and daughter Helen (1870) gave him further shocks. He breathed his last on 18 March 1871.

De Morgan contributed to the development of mathematics as well as logic. With the well-known 'De Morgan Laws', $(A \cup B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$, De Morgan clearly saw that the laws of algebra could be established without using those of arithmetic. His work greatly advanced that of Peacock and encouraged that of others such as W. R. Hamilton and George Boole.

A study of the history of mathematics is not only instructive and enlightening but is charming in itself. J. W. L. Glaisher even said that "no subject loses more than mathematics by any attempt to dissociate it from its history". According to Florian Cajori, "few contemporaries were as profoundly read in history of mathematics as was De Morgan" (*Hisory. of Mathematics*, 1980 ed., p. 331). De Morgan was a prolific writer. He wrote about 20 books, and about 200 articles on various topics. His book *On the Study and Difficulties of Mathematics* (London, 1831) is devoted to pedagogy. His famous *Treatise on the Differential Calculus* appeared in 1842. His *Arithmetical Books* (1847) is a descriptive catalogue of a very large number of books. His *A Budget of Paradox* (edited by his wife, 1872) is a mine of information on the history of mathematics.

Prof. R. C. Gupta, India

* * *

Narges Assarzadegan, a high school teacher of mathematics and geometry from Isfahan has sent us a note about a 12th century Persian manuscript which he has worked on. He also adds a photograph of an attractive geometrical based floor tiling, from Jame Mosque in Isfahan.

A unique Persian manuscript: Lubb Al-Hisab (Book on Reckoning)

This Persian manuscript was compiled in the 6th Hejira (AD 12th century) by Ali ibn Yusuf ibn Ali Munshi. The book contains 275 pages and is held in the central library of Teheran University. It is written in Persian but has never been translated into modern Persian. The following is a summary of its contents.

In the Introduction, the author describes some miracles and sayings of the Prophet from the quran and offers himself as a patron of learning. He says that he had compiled this manuscript at the request of some people and friends for the purpose of education and to solve real life problems. The main subjects of the book are: elementary arithmetic, algebra, discussion of number properties, ratio and proportion, geometry, areas of some shapes. Also there are real life problems, such as calculation of tax, tribute, division of daily bread, the rule of double false position, finding the square root and cube root, inheritance problems, etc.

The manuscript states that in the World of Islam, arithmetic and mathematics are not the product of abstract thoughts but are reflections of properties of real events and facts.

There are four chapters to the manuscript, as follows:

Chapter 1: multiplication, division, square roots, … (9 sections)
Chapter 2: ratio, all kinds of selling, double errors (3 sections)
Chapter 3: algebra (9 sections)
Chapter 4: geometry (12 sections)

Here is a translation of the third section of *Chapter* 4, section 12:

Conics

Conics are of two kinds: (1) the complete cone and (2) the frustum of a cone. The complete cone is a shape that starts with a surface and goes up until it reaches to a single point, like a spruce tree; a frustum of a cone is a shape that starts with a surface (the inferior base) but does not reach to a single point, but reaches to another surface, known as the superior base.

Conic area and volume

Example 1: Let a complete circular cone have a base circle of diameter $2r$ and circumference $2p$, the line joining the vertex to the centre of the circle be OH (the axis of the cone) and the line joining the vertex to the circle

circumference be OA, where O is the vertex, and the let S be the surface of the base (circle). The author gives these formulas:
Total surface area = $p \times OA + S$.
Volume of the cone = $1/3 \times S \times OH$.
Example 2: Let a square-based pyramid have OH perpendicular in the lateral face (triangle), base perimeter $2p$, axis OA and base surface area S, then
Total surface area = $p \times OH + S$.
Volume of the cone = $1/3 \times S \times OA$.
Example 3: Let a frustum of a cone have inferior base diameter $2r_1$ and superior base diameter $2r_2$, circumference of inferior base $2p_1$ and circumference of superior base $2p_2$, surface area of inferior base S_1 and surface area of superior base S_2, with OH the line joining the centres of the bases and AB the (shortest) line joining a point on the circumference of the inferior base to a point on the superior base, then
Total surface area = $(p_1 + p_2) \times AB + S_1 + S_2$.
For the volume of the frustum, let
$M = [(2r_1)^2 + (2r_2)^2 + (2r_1)(2r_2)]$, then
Volume = $M - M/7 - M/14$.

Narges Assarzadegan
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* * *

New Director of Freudenthal Institute

Jan van Maanen will start in June 2006 as the professor of mathematics education at the University of Utrecht. As such he will also be the director of the Freudenthal Institute, a centre of expertise in mathematics education, which is part of the faculty of mathematics and sciences of Utrecht University.

TSG29 Proceedings

The TSG29 of ICME-10 will be published as no.s 4-5 of vol. XLII/2006 of *Paedagogica Historica*.

International Journal for the History of Mathematics Education

IJHME is published electronically by Teachers College, Columbia University and in print form by COMAP. The first issue is due for September, the second for March 2007. Website:
http://www.tc.edu/centers/ijhmt/

* * *

Announcements of events

International Leibniz Congress - Unity in Plurality

July 24-29, 2006
Hannover, Germany
http://www.gwlb.de/Leibniz/Gesellschaft/Veranstaltungen/Kongress/Circular/

Symposium: Dissemination and Development of Physics and Mathematics in Bulgaria

October 15-16, 2006
Sofia, Bulgaria
Contact : G. Kamisheva,
gkamish@issp.bas.bg

17th Novembertagung

November 3-5
University of Edinburgh
An annual meeting of young researchers in the history and philosophy of mathematics from around the world.
http://www.17th-novembertagung.net/

International Symposium on "Policy and Practice in Mathematics and Science Teaching and Learning in the Elementary Grades"

November 8-10, 2006
Beirut, Lebanon
Mathematics Education into the 21st Century Project. For further information contact
arogerson@vsg.edu.au

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

July 19-24, 2007
Prague, Czech Republic
For more information,see the HPM Newsletter issues No58, 60 or the ESU-5 website 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 - 13, 2007
Charlotte, North Carolina, USA
The project is dedicated to the planning, writing and disseminating of innovative ideas and materials in Mathematics and Statistics Education. Papers are invited on all innovative aspects of mathematics education. For further information contact
arogerson@vsg.edu.au

ICME-11

July 6-13, 2008
Monterrey, Mexico

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@vsg.edu.au

Please note that the webpage http://www.mathedu-jp.org/hpm/index.htm is currently not updated due to technical reasons. Please use http://www.clab.edc.uoc.gr/hpm/ for the time being.

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

The Newsletter appears three times a year with the following deadlines for next year.

No.	Deadline for material	Sent to distributors
63	15 October 2006	1 November 2006
64	12 February 2007	1 March 2007
65	7 June 2007	1 July 2007

The Newsletter is the communication of the 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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