

# International Study Group on the Relations Between HISTORY and PEDAGOGY of MATHEMATICS NEWSLETTER

AN AFFILIATE OF THE INTERNATIONAL COMMISSION ON MATHEMATICS INSTRUCTION

No. 36 November 1995

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## Calendar

1996 January 10 - 13 Orlando  
Annual meeting of the American Mathematical  
Society and the Mathematical Association of  
America. (See inside for more details.)

1996 April 12 - 14 Lancaster, England  
HIMED 96, the annual History in Mathematics  
Education meeting sponsored by the British Society  
for the History of Mathematics. For more  
information, contact Steve Russ, Department of  
Computer Science, Warwick University, Warwick  
CV4 7AZ, U.K.

1996 April 25 - 28 San Diego  
Annual meeting of the National Council of Teachers  
of Mathematics and of the Americas Section of  
HPM. To participate in the HPM program, send  
your proposal to Erica Voolich, 244 Summer St.,  
Somerville, MA 02142; e-mail:

voolich@meol.mass.edu.

1996 July 14 - 21 Seville  
ICME - 8. (Eighth International Congress on  
Mathematical Education) To receive the first and  
second announcements, send your name and  
address to ICME-8, Apartado de Correos 4172, E-  
41080 Sevilla, SPAIN. ICME-8 can also be  
accessed on the World Wide Web:  
<http://icme8.us.es/ICME8.html>. (See inside for  
more details.)

1996 July 24 - 30 Braga, Portugal  
Quadrennial International HPM meeting in  
connection with ICME, also including the Second  
European Summer University on History and  
Epistemology in Mathematics Education. (See  
inside for more details.)

## From the Editor

The March, 1995 issue of this *Newsletter*  
contained an article on the History of Mathematics  
in Iran by Mohammad Bagheri. Due to an editing  
error, the author appeared to say that the book  
*Episodes in the Mathematics of Medieval Islam* by  
J. Lennart Berggren was "weak in the field of  
Islamic mathematics, including the Iranian  
mathematical legacy." Professor Bagheri was, in  
fact, referring to other books in this regard. The  
work of Professor Berggren is certainly the best  
available book in English on Islamic mathematics  
and contains a wealth of material on the "Iranian  
mathematical legacy." Not only does it contain  
much not available elsewhere, but also it is written  
in a delightful style which makes it accessible to  
undergraduates. I personally highly recommend the  
book and apologize to Professor Berggren for the  
unintended error.

## HIMED 95

Adrian Rice

This year, the annual HIMED (History in

Mathematics Education) meeting took place at the Bounds Green campus of Middlesex University on March 11. The topic of the one-day conference was *Courses and resources in the history of mathematics*. After a welcome from Tony Crilly, proceedings began with a talk by Ivor Grattan-Guinness, who described the activities of the new centre for the Cultural and Historical ASpects of Mathematics (CHASM), recently set up at Middlesex.

Three talks on the theme of "bridging the gap" followed. Sue Burns gave details of Nuffield's new A-level mathematics syllabus, which has a history of mathematics module (substantially written by members of the BSHM), David Kay (Westminster) discussed courses for adult learners, while John Annette (Middlesex) widened the scope of the session with a talk on recent developments in the history of ideas.

After a break for coffee, the meeting continued with four presentations concerning history and computing. Sarah Richardson (Warwick) began by discussing recent developments in teaching methods, followed by Jon Agar (Manchester) who talked about a new course on the history of computing and culture as well as giving details of Manchester's National Archive of Computing. Janet Burt, of King Alfred's College Winchester, then gave us some idea of how history has affected her notion of computing, and the morning was rounded off with Martin Campbell-Kelly talking on how his course on the history of computing at Warwick has changed over the past fifteen years.

Lunchtime was now upon us, and the meeting adjourned for an elaborate buffet prepared by the Bounds Green caterers. The food and friendly atmosphere were certainly conducive to lively lunchtime conversation, so much so that it was a major task to get everyone back into the lecture room for the next session! The afternoon was devoted to history of mathematics courses at universities with talks by Colin Fletcher (Aberystwyth), Peter Lee (York), Ekkehard Kopp (Hull), Gareth Jones (Southampton), and John Fauvel (Open University). Another very welcome speaker was our visitor from Valparaiso, Joel Lehmann, talking about his impressions of David Fowler's Newton course at Warwick.

The meeting ended with a spirited open discussion on points raised during the day, after

which the meeting concluded with a vote of thanks to the organisers and a general agreement to attend next year's residential HIMED 96 at St. Martin's College Lancaster, 12-14 April, 1996.

### **HPM Meeting in Cairns**

The International Study Group on the Relations Between History and Pedagogy of Mathematics held an international meeting in Cairns, Australia from June 30 to July 4, 1995. The primary focus of this gathering of some sixty participants from about a dozen countries was on the ethnomathematics of the South Pacific area. Thus the plenary talks addressed the mathematics of the native populations of Australia, New Zealand, Tonga, and Papua New Guinea. Uenuku Fairhall (Western Heights High School, Rotorua, New Zealand) and Bill Barton (University of Auckland) shared the initial plenary, discussing "Is Mathematics a Trojan Horse: Mathematics in Maori Education." The second plenary consisted of a video tape and subsequent discussion of "Garma Mathematics in Yolngu Schools: Mathematics of the Australian Aborigine." Gloria Stillman (James Cook University) discussed the "Geometrical Skill Behind the Tongan Tapa Designs" in the third plenary, and Alan Bishop (Monash University) asked "What Can We Learn from the Counting Systems Research of Dr. Glendon Lean" in his report on the late Dr. Lean's work on the mathematics of Papua New Guinea. Each of the plenary sessions generated extensive discussion, especially during the breaks and lunches. Some were followed up by further presentations on the same general topic.

There were more than two dozen additional presentations by the participants, some dealing with further questions of ethnomathematics and others dealing with a host of other topics. There were also two panel discussions, one dealing with the work of Ubi D'Ambrosio on ethnomathematics and one on further directions for HPM. One particularly interesting presentation was a plea for the construction of a Number Museum, by Graeme Cohen (University of Technology, Sydney). The aims of the Number Museum would be to expand the knowledge of the history and applications of numbers and counting on daily living and to assuage the fear of numbers. Among its objectives would be to show how different indigenous societies have created, named, and used numbers; to describe systems of counting and calculation used by different peoples of the world; and to develop an

understanding and intuitive sense of orders of magnitude. Other proposed exhibit topics would be computers and their history, numerology, cryptology, gambling, and many aspects of the theory of numbers. Those interested in contributing ideas for this museum are urged to contact Dr. Cohen by e-mail at [glc@maths.uts.edu.au](mailto:glc@maths.uts.edu.au).

The venue of the conference was the delightful Cairns Colonial Club, a tropical paradise with several palm-fringed swimming pools (complete with poolside bars). And, of course, since the meeting was in northern Queensland, the conference included an excursion to the Great Barrier Reef for diving, snorkeling and otherwise exploring this unique ecological area.

### **Annual Joint Mathematics Meetings in Orlando**

As has been the case frequently in recent years, there will be many items on the program of the annual AMS-MAA meeting in Orlando (January 10-13, 1996) which will be of interest to readers of this *Newsletter*. Among these will be a special MAA session devoted to The Uses of History in the Teaching of Mathematics. This session, scheduled on Thursday, January 11 at 7:00 - 10:00 pm, is organized by Florence Fasanelli (MAA), V. Frederick Rickey (Bowling Green State University), and Victor J. Katz (University of the District of Columbia); the speakers will all be participants in the Institute in the History of Mathematics and Its Use in Teaching. Some of the speakers will report on their research from the summer Institute, while others will discuss how they use history in teaching certain courses.

The MAA has also scheduled a minicourse on The Historical Development of the Foundations of Mathematics, organized by Robert Brabenec (Wheaton College), to meet on Wednesday and Thursday afternoons. The course is intended for anyone who teaches a history of mathematics course, who wants to introduce a unit on historical development in an existing mathematics course, or who is interested in this material for personal enrichment.

There will also be an AMS Special Session in the History of Mathematics, organized by Thomas Archibald (Acadia University) and Victor J. Katz. This session is scheduled for Friday afternoon, January 12 and Saturday morning and afternoon, January 13. There will be 21 speakers dealing with a multitude of topics in the history of

mathematics.

For information on registration, see the October issues of *FOCUS* or *Notices of the AMS*.

### **História e Educação Matemática: Deuxième Université d'Été Européen sur Histoire et Épistémologie dan l'Éducation Mathématique; ICME-8 Satellite Meeting of the International Study Group on the Relations Between History and Pedagogy of Mathematics**

#### General Information

From 24 to 30 July 1996 the city of Braga, in northern Portugal, will host a major international conference on mathematics education. The main purpose of this conference is to bring together mathematics teachers and educational researchers from all over the world, to share their insights and experiences in using history of mathematics in the mathematics classroom. This meeting is timed to follow the International Congress on Mathematics Education, ICME-8, which is being held in Seville, Spain, July 14-21, 1996, so that many possible international participants will already be in Europe. The distance from Seville to Braga is 420 km. If the demand is enough, a trip by bus from Seville to Lisbon will be scheduled for the afternoon of July 21. Thanks to the generosity of the University of Minho, the costs are set at a very low level to try to ensure that no participant is unable to attend on financial grounds. In addition, it is hoped that further funding can be found to support the attendance of teachers from the Third World.

More than 500 teachers and researchers have declared their intention to participate in this meeting, and the second announcement has been mailed to all of those people. This announcement has full details concerning the outline of the scientific program, the call for papers, registration fees, and information on accommodations in and near Braga. The second announcement also contains application forms to present papers, organize workshops, or suggest themes for panels. The deadline for registration with normal fees is January 31, 1996. The abstracts of papers must be sent before March 31, 1996.

Braga-96 has two particular dimensions:

- It is the second European Summer University - the first was organized by the Institut de Recherche sur l'Enseignement des

Mathématiques (IREM) and held in Montpellier, France, in 1993 - which is a movement to bring together teachers from many countries to develop their knowledge and share their experiences of history and epistemology in mathematics education.

- It is the principal quadrennial meeting of the International Study Group on the Relations Between History and Pedagogy of Mathematics. The previous one was held in Toronto, Canada, in 1992. This study group is devoted to understanding and promoting the use of history of mathematics in mathematics teaching.

The HEM Braga 96 meeting is organized by the Portuguese Associação de Professores de Matemática (APM) and by the Department of Mathematics of the University of Minho and is supported by the Portuguese Society of Mathematics and by the Rectory of the University of Minho.

#### Conference Themes

There will be two major themes:

- **MATHEMATICAL CULTURES ALL OVER THE WORLD.** It is the birthright of every young world-citizen to learn about mathematical ideas developed in each part of the world, and, depending on local conditions, this can be a significant dimension of mathematics education. It is hoped and intended that teachers from all parts of the world will be able both to contribute from their own knowledge and to take away new knowledge about the mathematics of other cultures to explore with their pupils back home.
- **MATHEMATICS, ARTS AND TECHNICS.** Mathematics has usually grown alongside and contributed towards the development of other arts, sciences and technologies. The connections can be explored historically both from the arts and sciences themselves and from the direction of applying mathematics in "mathematical modelling". Either way, it is immensely fruitful for students and teachers, leading to a fuller understanding of mathematics and increased enthusiasm for it.

Participants are encouraged to present papers and organize workshops on these two themes.

Besides these two major themes, the

following topics were proposed by members of the Program Committee as also particularly appropriate for presentation of papers and workshops in this conference:

- History of mathematics education - historical relations between school culture and society: How have cultural values and influences shaped mathematics instruction, modes of teacher training, etc.?
- Epistemological obstacles: At some stages, students find particular difficulties in understanding. Are these common to the development of the subjects historically?
- Views on mathematics: Questions such as whether mathematics is discovered or freely invented, to what extent it is socially constructed, etc., form a fascinating dimension for teachers and students where history is crucially important.
- Mathematics for all: Historical experiences of aspects such as racial and gender dimensions of mathematics learning can enable all students to benefit from their educational opportunities.
- Mathematical proof in history: A major feature of mathematics education has always been the grounds on which mathematical results are held or believed, and the varying importance attached to this aspect. Is this what distinguishes mathematics from other subjects, or not?

Themes are not a straightjacket, and contributions will be welcomed which do not fall readily into a theme, but are in accordance with the general objectives of the Summer University and of the HPM Study Group.

#### Subjects of the introductory lectures

There will be three streams in the subjects of the introductory lectures:

Stream A - Mathematics in cultures: History of mathematics in Africa, China, India, Islam, Greece, Babylon, and Egypt.

Stream B - Mathematics as a science: Histories of algebra, trigonometry, geometry, non-Euclidean geometry, calculus, statistics, probability, numbers, and proof.

Stream C - The connections between Mathematics, Arts and Technics: Histories of computation, navigation, mathematical machines, algorithms, games, music and math, art and math, and mathematical modelling.

#### Types of sessions

- **Introductory lectures:** These lectures are one of the components of the Summer University and are addressed mainly to the great number of secondary teachers who will participate in this conference. The duration of these lectures will be 45 minutes in order to accommodate a reasonable number of topics. Due to these time limitations, these lectures will give only a very general panorama on each subject, so it is expected that presentations of papers and workshops on the same topic will add depth to the lectures. The lecturers for these sessions will be chosen by the Program Committee.

- **Practical workshops:** In these sessions, teachers and researchers with experience in using history will share their knowledge and expertise on classroom activities with other teachers. These sessions complement the introductory history lecture series by showing what can be achieved for pupils in the classroom by a historically informed and enriched teacher. It is expected that these sessions will assume a practical character, and many of them will include the reading and study of original mathematical texts. There will be two durations for workshops, 90 minutes and 3 hours.

- **Paper presentations:** Participants are encouraged to present papers on themes that they are keen to explore and share with others. These might be in connection with poster sessions, or might be free-standing, and are a very good way for delegates to find others with common interests and enthusiasms. Paper presentations will be 25 minutes in length, followed by 10 minutes for questions.

- **Panels:** Panels are opportunities for group discussion and working together on a theme. They are designed to address themes and topics through exploration of participants' views and experiences. Subjects of panels will be announced in the program booklet. The panels will be organized by the Program Committee.

#### Language Policy

English, French and Portuguese will be the official languages of the meeting. If possible, there will be simultaneous translation in the plenary sessions. For the introductory lectures, paper presentations, and workshops, speakers must speak slowly and clearly, and are requested

- to speak in one of the official languages and have two sets of transparencies (if the speaking language is English, the other set will be in French, and vice-versa; if the speaking language is Portuguese, the other set could be English or French).
- to send to the Organizing Committee, not later than April 30, 1996, the transparencies to be translated into Portuguese.

Every room will have two overhead projectors. The speaking language and transparency languages of every session will be announced in the final program.

#### Other Information

The meeting will be held at the University of Minho, in Braga, an old imperial Roman city, situated in the north of Portugal, in the province of Minho. The river Minho, which has given its name to the region, is the natural border between the provinces of Minho in Portugal and Galicia in Spain. The population is slightly over one million. The climate in the region is mild and temperate; spring and autumn are very mild and pleasant; in winter the temperature rarely drops to 0°C and summers are not excessively hot. Travel and accommodation details are included in the second announcement.

Registration fees - around US\$ 80 - will include conference proceedings, daily lunch, conference dinner, and one excursion in the vicinity of Braga, to be chosen from among a few possibilities.

There will be a WWW Home Page for this meeting. The URL is <http://www.math.uminho.pt/hem/hem-braga96.html>.

#### Program Committee

Ubiratan d'Ambrosio (Brazil), Evelyne Barbin (France) (joint chair), Florence Fasanelli (USA), George Booker (Australia), Jean Doyen (Belgium), Maria Fernanda Estrada (Portugal), John Fauvel (UK) (joint chair), Fulvia Furinghetti (Italy),

Paulus Gerdes (Mozambique), Jesus Hernandez (Spain), Victor Katz (USA), Jan van Maanen (Netherlands), Carlos Sá (Portugal), Luis Saraiva (Portugal), Gert Schubring (Germany), Man-Keung Siu (Hong Kong), Eduardo Veloso (Portugal).

If you wish to receive the second announcement, please send a note to Eduardo Veloso, APM, Escola Superior de Educação de Lisboa, Rua Carolina Michaelis de Vasconcelos, 1500 Lisboa, PORTUGAL with your name, address, phone, fax, and e-mail. Please specify the language of your preference (English, French, or Portuguese). You may also send the information by fax to 351 1 7166424 or by e-mail to [veloso@telepac.pt](mailto:veloso@telepac.pt). In any case, to register you must send a completed registration form, included in the second announcement, to the address indicated in the form.

### ICME-8 in Seville

The Eighth International Congress on Mathematical Education will be held in Seville from July 14 to 21, 1996. There will be much of interest to readers of this *Newsletter*, including several sessions conducted by HPM itself. In addition, Topic Group 16, History of mathematics and the teaching of mathematics, will have two ninety-minute sessions. Each of the two sessions will have a panel discussion considering one of the two following poles relative to the use of history in mathematics education: the use of history in the classroom and the use of history in mathematics education research. The principal aim is to get some perspective on how history has been used; thus the material at the sessions will be based on actual experiments and/or research.

- The use of history in the classroom: an overview of the different approaches actually experimented with; methodological implications of each approach; positive and negative aspects.
- The use of history in mathematics education research: fields in which history has been actually used; methodological constraints; evaluation of the effective contribution of history.

For more information about the Topic Group, please contact Louis Charbonneau, Département de mathématiques, Université du Québec à Montréal, C. P. 8000, Succ. Centre-Ville, Montréal, QC H3C 3P8, CANADA; email: [charbonneau.louis@uqam.ca](mailto:charbonneau.louis@uqam.ca).

### Learn from the Masters

*Learn from the Masters*, edited by Frank Swetz, John Fauvel, Otto Bekken, Bengt Johansson, and Victor Katz has just been published by the Mathematical Association of America. It is designed for high school and college teachers who want to know how they can use the history of mathematics as a pedagogical tool to help their students construct their own knowledge of mathematics. Often, a historical development of a particular topic is the best way to present a mathematical idea, but teachers may not have the time to do the research needed to present the material this way. This book provides its readers with historical ideas and insights which can be immediately applied in the classroom.

The book is divided into two sections: the first on the use of history in high school mathematics, and the second on its use in university mathematics. So high school teachers planning a discussion of logarithms will find here the historical background of that idea along with suggestions for incorporating that history in the development of the idea in class. College teachers of abstract algebra will benefit by reading the three articles in the book dealing with aspects of that subject and considering their ideas for presenting groups, rings, and fields.

The articles are diverse, covering topics such as trigonometry, mathematical modeling, calculus, linear algebra, vector analysis, and celestial mechanics. Also included are articles of a somewhat philosophical nature, which give general ideas on why history should be used in teaching and how it can be used in various special kinds of courses. Each article contains a bibliography to guide the reader to further reading on the subject.

*Learn from the Masters* grew out of a conference in Norway which brought together mathematicians and mathematics educators from a dozen countries who were interested in the use of the history of mathematics as a pedagogical tool in the teaching of mathematics. Since the conference which provided the genesis of this book took place in Norway near the home where Niels Henrik Abel spent his final days, the book's title comes from a note scribbled in one of Abel's notebooks: "It appears to me that if one wants to make progress in mathematics, one should study the masters." The authors hope that readers will benefit from Abel's advice and show their students how they too can

Table of Contents.

Part I: History in School Mathematics

History of Mathematics Can Help Improve Instruction and Learning; The Role in the History of Mathematics of Algorithms and Analogies; Using Problems from the History of Mathematics in Classroom Instruction; Revisiting the History of Logarithms; Napier's Logarithms Adapted for Today's Classroom; Trigonometry Comes Out of the Shadows; Alluvial Deposit, Conic Sections, and Improper Glasses, or History of Mathematics Applied in the Classroom; An Historical Example of Mathematical Modeling: The Trajectory of a Cannonball

Part II: History in Higher Mathematics

Concept of Function -- Its History and Teaching; My Favorite Ways of Using History in Teaching Calculus; Improved Teaching of the Calculus Through the Use of Historical Materials; Euler and Heuristic Reasoning; Converging Concepts of Series: Learning from History; Historical Thoughts on Infinite Numbers; Historical Ideas in Teaching Linear Algebra; Wessel on Vectors; Who Needs Vectors?; The Teaching of Abstract Algebra: An Historical Perspective; Toward the Definition of an Abstract Ring; In Hilbert's Shadow: Notes Toward a Redefinition of Introductory Group Theory; An Episode in the History of Celestial Mechanics and Its Utility in the Teaching of Applied Mathematics; Mathematical Thinking and History of Mathematics; A Topics Course in Mathematics; Niels Henrik Abel (1802-1829): A Tribute.

*Learn from the Masters* (ISBN-0-88385-703-0) may be ordered from the Mathematical Association of America for \$23.00 (\$18.00 for MAA members) by calling 1-800-331-1622 within the USA and quoting the catalog code LRM/FAC. It can also be ordered by mail to the Mathematical Association of America, PO Box 91112, Washington, DC 20090-1112 or by fax to (202) 265-2384. There is a shipping charge within the USA of \$2.95 for one book and \$.50 for each additional book. For orders sent to Canada, there is a shipping charge of \$4.50 for the first book and \$1.50 for each additional book. Outside the USA and Canada, there is a shipping charge of \$3.50 per book for surface mail. If you want the order sent by air, the MAA will send you a proforma invoice.

## Empowering Students Through the History of Statistics

How can an historical perspective help students to gain a flavor of some of the most important and useful ideas in statistics? This volume, prepared by the British Society for the History of Mathematics in association with the Centre for Mathematics Education at The Open University, helps answer the question with a new collection of papers on using history in the statistics classroom, covering the range from primary to tertiary education. The author of each paper has focused where possible on some historical artifact -- a source text or graph or object -- and outlined its context, importance and classroom use. All of the papers have a human dimension, generally an individual from history with a problem to solve or a particular point of view to express. The book contains ideal source material for further student work at different levels, or the style could be adopted for other material of the teacher's choosing.

Table of Contents: Nick Bingham, *Randomness: some history*; Sue Burns and Peter Wilder, *Saving lives: a statistical investigation about Florence Nightingale*; Jan Dangerfield, *Karl Pearson and the  $\chi^2$  goodness-of-fit test*; John Fauvel, *Thomas Clarkson and the abolition of the slave trade*; Helen Gardner, *Atmospheric pollution: history and statistics in the primary school*; Alan Graham, *Florence Nightingale's contribution to statistics*; David Hand, *An episode in the history of measurement and statistics*; Mick McManus, *The Normal curve through its history*.

This 60 page book can be ordered by sending £6 per copy to Tracy Johns, CME, Open University, Milton Keynes MK7 6AA, U.K. Checks should be made payable in pounds sterling to "The Open University." The book is post free in the U.K. and Europe; add £2 per copy for airmail elsewhere.

## Mathematics in Africa

Several recent books by Paulus Gerdes of the Universidade Superior Pedagógico Moçambique have been translated into English and will be of interest to many readers of this *Newsletter*. The first of these books is *SIPATSI: Technology, Art and Geometry in Inhambane*; it deals with the woven handbags called *sipatsi* in Gitonga, a language spoken in Inhambane Province of

Mozambique. These handbags are among the most appreciated products of Mozambican basketry and are often brought home as souvenirs by visitors from abroad. This book discusses the various geometrical motifs present in the *sipatsi* and reveals the force of the imagination and the artistic and geometric creativity of the women and men who weave them.

*African Pythagoras: A Study in Culture and Mathematics Education* shows how diverse African ornaments and artifacts may be used to create an attractive context for the discovery and the demonstration of the Pythagorean Theorem and of related ideas and propositions. It demonstrates how many elements in various African cultures can be used as starting points for playing and doing interesting mathematics in and around the classroom, with the objective of showing students that the Pythagorean theorem in fact plays a role in their lives.

*Sona Geometry: Reflections on the tradition of sand drawings in Africa South of the Equator, Vol. 1* begins by analyzing and reconstructing the mathematical knowledge inherent to the tradition of sand drawings - called *sona* - executed by experts in the smoothed sand of Africa south of the equator: patterns of lines obeying geometric algorithms, embracing points of a reference grid. In addition to studying salient cultural values in the tradition of *sona*, such as symmetry and a preference for patterns composed of only one line, the book studies the particularities of diverse classes of *sona* and their chain rules, preserving certain characteristics. Two other volumes on *Sona geometry* in English will follow. They are already available in Portuguese. A version in French, entitled *Une tradition géométrique en Afrique - Les dessins sur le sable*, is now available from the publisher, L'Harmattan (Paris).

The main objective of *Women and Geometry in Southern Africa* is to call attention to some mathematical aspects and ideas incorporated in the patterns invented by women in Southern Africa. One aim of the book is to contribute to the valuing, revival and development of traditions which may otherwise vanish. An additional aim is to encourage research all over the region, such as that which led to the book on *Sipatsi* discussed earlier. Such research will contribute to a fuller realization of the mathematical potential of women (and men) in southern Africa and to the development of "a new educational system,

properly rooted in both society and environment, and therefore apt to generate the self-confidence from which imagination springs."

For further information on these books and to get details on ordering them, please write to Professor Dr. Paulus Gerdes, Universidade Pedagógica, P.O. Box 3276, Maputo, Mozambique or send a fax to 258-1-422113.

### **Institute in the History of Mathematics and Its Use in Teaching**

Would you like to teach a course in the history of mathematics? Does your college or university plan to offer such a course soon for prospective teachers to implement the recommendations of the MAA, NCTM, and NCATE? Do you want to learn how the history of mathematics will help you in teaching other mathematics courses?

If you answered "yes" to any of these questions, you are invited to apply to participate in the second MAA Institute in the History of Mathematics and Its Use in Teaching. It will take place at American University, Washington, DC, June 3 - 21, 1996, with work continuing through an electronic network during the academic year 1996-97. Participants will return to Washington for three additional weeks in June, 1997. The teaching staff of the Institute consists of well-known historians of mathematics, including V. Frederick Rickey, Victor J. Katz, Steven H. Schot, Ronald Calinger, Ubiratan D'Ambrosio, Judy Green, Uta Merzbach, David Pengelley, James Donaldson, and Karen Parshall. Activities at the institute include reading of original sources, survey lectures, small group projects, trips to rare book libraries, and discussions of methods of conducting a history of mathematics course and of using history in the teaching of other mathematics courses. Participants will also have the opportunity to interact with mathematicians who will be returning to the Institute for their second year.

Applications are strongly encouraged from faculty teaching at small institutions, at minority-serving institutions, and institutions that prepare secondary teachers.

For more information and application forms, contact V. Frederick Rickey at (419) 372-7452 or Victor J. Katz at (202) 274-5374; or preferably by e-mail: rickey@maa.org or vkatz@maa.org. Applications are due by March 15,



1996. Applicants will be notified of their acceptance or declination by April 15, 1996.

### Fast Divergent Sequences

R. C. Gupta

In ancient India, a method for forming a very rapidly divergent sequence was based on raising a number, say  $x$  ( $>1$ ) to its own power, i.e. to the power  $x$  itself, and then repeating the process with the result obtained each time. In this way, we get the first, second, third, etc. "super-powers" of  $x$ . The  $n$ th super-power of  $x$  is denoted by the notation  $x|<sup>n</sup>$ . Thus, we have the 1st super-power of  $x$  written and defined by

$$x|<sup>1</sup> = x^x (= y, \text{ say}).$$

The 2nd super-power of  $x$  will be given by

$$x|<sup>2</sup> = y^y (= z, \text{ say}).$$

Note that we can easily denote  $x|<sup>1</sup>$  simply by  $x|$ , just as  $x^1$  is written simply as  $x$ . Hence

$$x|<sup>2</sup> = (x|)^{(x|)} = (x|)| = (x^x)^{(x^x)}.$$

The third super-power of  $x$  will be given by

$$x|<sup>3</sup> = (x|<sup>2</sup>)| = (x|<sup>2</sup>)^{(x|<sup>2</sup>)} = z^z.$$

In general, the  $n$ th super-power of  $x$  is written and defined by

$$x|<sup>n</sup> = (x|^{n-1})^{(x|^{n-1})},$$

where  $n = 2, 3, 4$ , etc. For covering the case  $n = 1$ , we may write  $x|<sup>0</sup>$  for  $x$ . For example, with  $x = 2$ , we have

$$2| = 2^2 = 4$$

$$2|<sup>2</sup> = 4^4 = 256$$

$$2|<sup>3</sup> = (256)^{256},$$

which is a number that contains 617 digits! Thus we get a very rapidly formed, highly divergent sequence of numbers. The question is: What are such or similar other processes in the history of mathematics (whether ancient or modern)?

For some interesting properties and use of the ancient Indian function  $x|<sup>n</sup>$  defined above, see R. C. Gupta, "The First Unenumerable Number in

Jaina Mathematics," *Ganita Bharati* 14 (1992), 11-24.

### The Origin of the Choice of Sixty in the Ancient Near East

Don Faust

The origin of the choice of sixty as a numeration base in the ancient Near East is an open question of long standing. Although numerous factors have been suggested, such as the large number of factors of sixty and the advantage this offers in systems of weights and measures, or the 360 count (extended with the needed five or six days) for the solar year, the question remains unresolved. It seems likely, in fact, that numerous factors, extending over a long period of possibly thousands of years, combined to bring about the choice of sixty.

The conjecture that this choice is to be found, in part, in Upper Paleolithic and Mesolithic moon calendaring involving approximations to 59-day counts of two lunations, provides another factor which, as far as the author has been able to determine, has not before been cited. The author has a paper, which he would be happy to send to anyone requesting it, in the form of an informal communication, which elaborates this conjecture. In the communication, evidence is cited in favor of the conjecture, but, possibly more important, the communication provides a broad perspective about this question which reaches back to the Upper Paleolithic and includes ruminations about the *pairing-generated counter sets* of China and South America and which may hopefully encourage further discussion and research concerning this fascinating question in the earliest history of mathematics.

For a copy of the paper, interested readers may write to the author at IKATAN/IUPUI, Tenaga Nasional Berhad, Jalan Serdang, 43009 Kajang, Selangor, MALAYSIA.

### Have You Read?

Ronald Calinger, ed.

This column welcomes references from across the history or pedagogy of mathematics, as well as other works with sections that have potential for encouraging and motivating students to learn mathematics better or that enrich courses. Please send citations with complete bibliographic

information to the section editor c/o Department of History, Catholic University of America, Washington, DC 20064, U.S.A.

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