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

AN AFFILIATE OF THE INTERNATIONAL COMMISSION ON MATHEMATICS INSTRUCTION

No. 41 July 1997

Calendar

1997 July 25 - 30 Liège, Belgium
Twentieth International Congress of the History of Science. The main theme of the congress will be Science, Technology and Industry. HPM will contribute sessions. Those interested can contact Sergio Nobre (Av. 24, 1515 C.P. 178, Dep. Mat. UNESP, Rio Claro SP, Brazil or via e-mail sernobre @rcb000.uesp.ansp.br). For general information, contact XXth International Congress of History of Science Congress Office, Centre d'Histoire des Sciences et des Techniques, Université de Liège, Avenue des Tilleuls 15, B-4000 Liège, BELGIUM; tel: 3241669479; fax: 3241669547.

1998 January 6 Baltimore, U.S.A.
HPM and the International Study Group on Ethnomathematics (ISGEm) will jointly sponsor a conference in honor of the 65th birthday of Ubiratan D'Ambrosio. The meeting will take place at the Omni Hotel in Baltimore, Maryland, USA. For more details see this issue, page 7.

1998 August 17-21 Chungbuk, Korea
The first ICMI-East Asia Regional Conference on Mathematics Education (ICMI-EARCOME 1) will be held at the Korea National University of Education, Republic of Korea, from August 17 through August 21, 1998. The themes of ICMI-EARCOME 1 are: Technology and Mathematics Education, Comparative Study on Mathematics Education, History and Pedagogy of Mathematics, Mathematics and Society, Mathematics Education in Primary School, Secondary School and University, Teacher Training, Gifted Education. the program will include Invited Lectures, working Groups and Topic Groups. In each Group, keynote speeches and paper presentations will be given. Abstracts and recommendations will also be proposed. Exhibitions of textbooks, computer softwares and other types of material are being planned as well. The conference languages will be English and Korean. But all oral presentations in Korean will be translated into English.

For more information about ICMI-EARCOME 1 please contact: Professor Hyunyong Shin, Department of Mathematics Education, 363-791, Korea; tel: 82-431-230-3721; fax: 82-431-233-3256, e-mail: shin@knuecc-sun.knue.ac.kr.

1999 May 30- June 4 Manila, Philippines
8th Southeast Conference on Mathematics Education (SEACME-8). The theme is; Mathematics for the 21st century. The conference will cover topics such as: Mathematics content in elementary, secondary and tertiary level schools; Teaching approaches and methods for the next century; Assessment Methods, Mathematics for special groups; Mathematics in the workplace; Educational technology; Alternate delivery systems; Mathematical modeling. The contact persons are Milagros Ibe, Chair and Catherine Vistro-Yu, Secretary. All proposals should be sent to:
SEACME-8 Secretariat, Mathematics Deparument, Ateneo de Manila University, Loyola Heights, Quezon City 1108, P.O.Box 154, Manila 0917, Philippines.

From the Editor
Gerard Buskes

The back issues 33, 34, 35, 36, 39 and 40 of this newsletter can now be viewed on the Internet at http:/www.kingsu.ab.ca/~glen/cshpm/hpmnews.htm.

Institute in the History of Mathematics and its Use in Teaching: A Report.
Alphonse Buccino (Contemporary Communications)

As members of HPM know, one of the major obstacles to skillful integration of historical studies with mathematics teaching is the lack of formal preparation for mathematics faculty on major findings, journals and evolving research methods in historical and contextual studies of mathematics. The Institute in the History of Mathematics and Its Use in Teaching (IHMT) is a major step in addressing this need. IHMT is co-directed by Victor Katz and Fred Rickey under the sponsorship of the Mathematical Association of America (MAA), and supported by the National Science Foundation. IHMT has presented three three-week summer programs, in June of 1995, 1996 and 1997, respectively to two groups of forty faculty members in U.S. colleges and universities. Each group of forty had two intense three week experiences which were held on the campus of American University in Washington, D.C. .

THE PROGRAM

The IHMT program included the following major components:

- *Overview of the History of Mathematics*, a broad and deep view of mathematics and its history through survey lectures and presentations on special topics.
- *Teaching History of Mathematics Courses* through examination of syllabi, discussion with historians of mathematics, and experiencing exemplary teaching by award winning staff of IHMT.
- *Using History in Mathematics Courses* through experience with historians of mathematics and the experience of exemplary experts.
- Reading *Original Sources* to learn how the great masters of the past created new mathematics while gaining experience with resources for historical scholarship.
- *Historiography* for deeper insights into the nature of history of mathematics, the work of the historian of mathematics, and the issues and themes of scholarship in historical studies of mathematics.
- *Participants Presentations* to promote colleague interaction and mutual support.
- *Special Topics in Historical Studies of Mathematics* to learn the scope of historical studies of mathematics and their use in teaching.
- *Field Trips* to understand special collections, sources, and resources for historical studies of mathematics and how to access them.
- *Mentoring, Communications, and Presentations.*

THE STAFF

Co-directors Victor Katz (University of the District of Columbia) and Fred Rickey (Bowling Green State University), together with Steven Schot (American University) were the core staff of IHMT. Ronald Calinger (Catholic University) lectured on Historiography each of the three summers. Florence Fasanelli (MAA) was responsible for coordinating the project from proposal preparation to execution. She also served as lecturer along with the following

visitors:

W. Thomas Archibald (Acadia University)
Ubiratan D'Ambrosio (University of Campinas)
James Donaldson (Howard University)
William Dunham (Muhlenburg College)
Judith Grabiner (Marymount University)
Uta Merzbach (Smithsonian Curator Emeritus of Mathematics)
Karen Parshall (University of Virginia)
David Pengelley (University of New Mexico)
Helena Pycior (University of Wisconsin)

The Participants

The eighty participants represented a cross-section of colleges and universities in the U.S.: public and private, two-year and four-year colleges, and masters and doctoral granting universities; small liberal arts institutions and large regional and national universities. Each participant had an interest in the history of mathematics and its use in teaching. One or two had a great deal of prior experience teaching history of mathematics, some had none at all, but most had a little experience with such teaching. NSF rules limited participation to U.S. faculty members, but there were a few international visitors and two high school teachers of mathematics who also participated.

Impact

Two kinds of evaluation have been undertaken. One was *formative*, asking participants about their reactions to the IHMT experience *per se*, and suggestions for improvement. These data show a very high level of positive response to the IHMT experience. Virtually all: had high praise for the core staff and lecturers; had their expectations met or exceeded; gained practical experience to enhance their teaching henceforth; got new insights into the nature of history of mathematics and its use in teaching; gained a great deal of self-confidence in approaching history of mathematics, teaching it and using it; and many found new professional interests, for scholarship as well as teaching, growing out of the IHMT experience.

As can be expected from the scope and the range of the program, each of the three summers was an intense experience including as such did, a heavy regimen of demanding activity. Nevertheless, while participants worked hard, virtually all appreciated the total experience and were glad it included all that it did. They were particularly responsive to being treated as scholars and gaining background and tools for professional enhancement.

The other kind of evaluation is *summative*, intended to assess the impact of IHMT based on subsequent activity of the participants. These data are still being gathered and analyzed, so it is premature to say much here. Additional information will be available upon completion of the project. For the moment, it does appear that IHMT is having substantial impact, as the formative evaluation results discussed above would indicate. For example, history of mathematics classes are shifting from a some-time offering on a variable basis, to a regularly scheduled offering at most of the institutions of the participants. There are also some serendipitous impacts. An example here is institution-wide initiatives, such as writing across the curriculum, which are being developed at many institutions to improve the undergraduate experience for students. In these initiatives, each department is asked to participate. In the case of mathematics, History of Mathematics is usually the contribution of choice to such initiatives. Moreover, history of mathematics is having a significant impact through mathematics courses designed to meet general arts and sciences requirements for undergraduates. Other significant impacts are emerging and will be reported upon completion of data collection and analysis.

Report of the CUNY Mathematics Discussion Group Conference, March 1997

Nkechi Agwu

The CUNY Mathematics Discussion Group (CMDG) organized a conference entitled *The History of Mathematics and Science and its Uses in Teaching: A Multicultural Approach*. This conference, which was the third meeting in the series of 1996-97 annual meetings of the CMDG, was held at the Borough of Manhattan Community College (BMCC) on March 14 and 21, 1997. It was co-sponsored by the BMCC Teaching Center and the Mathematics Department, and funded primarily by a CUNY Office of Research and University Faculty Development Grant awarded to the organizers, Nkechi Agwu and Geoffrey Akst of the Mathematics Department of BMCC.

The session on March 14 saw the following presentations: *The Roots of Mathematics: A Worldwide Story* (keynote presentation) by Victor Katz; *Reading*

and Writing for ESL Science Majors by Gloria Silverstein; *Ethnomathematics* by Marla Reid; *Cauchy's Calculus and Education* by Barbara Lawrence; *Proto Mathematical Forms Reflected in the Igbo Calendar* by Jon Ukaegbu; *Using History to Enrich a Liberal Arts Course for Students with a Weak Elementary Algebra Background* by Pat Allaire; *Galileo's Use of Rhetoric* by George Ouwendijk; *Summario Compendioso. 1556 The 1st Book of Mathematics Published in the Western Hemisphere in Mexico City* by Ed Sandifer; *On the quadrilaterals of Brahmagupta and Kummer* by Ravi Kulkani; *Using Primary Materials with Future Teacher Educators* by Daniel Chazan; *What is happening to Mathematics? Observations in Historical Context* by Al Buccino.

The presentations on March 21 were the following. *The Pythagorean Theorem and Chinese Mathematics: Liu Hui's Commentary in the Jui Zhan Suan Shu* (keynote presentation) by Joseph Dauben; *History of Science: Exploring Changing Meanings of Evidence and Interpretation in a first year Science Course* (panel discussion) by Ezra Shahn (moderator), Robert Costello, Marten de Boer and Erika Petersen (panelists). *A Babylonian and Greek Talk About Numbers* by Peter Flusser; *The Existence of Math and Science in Aspects of African History* by Nicholas Ofiaja; *The Guggenheim Aeronautical Lab at Caltech and the Development of the Rocket Motor (1936-1946)* by Benjamin Zibit; *Historical and Student Intuitions of an Area in the Context of the Riemann Integral: Sweeping Out or Chopping Up* by Bronislaw Czarnocha; *What was God doing before Creating the World?* by Abel Franco; *The History of Computing* by Richard Chorley; *Incorporating Environmental History into the Teaching of Undergraduate Survey Courses in World Civilization: One Instructor's Thoughts and Experiences* by Brian Bonhomme; *Leibniz's Binary System and the Chinese Changing Book* by Yibao Xu; *Use of History in PreCalculus or High School Level Math* by Agnes Tuska; *History of Mathematics: For Liberal Arts Students, for Mathematics Majors, And As A Major* by Bruce Chandler.

The keynote presentation on March 14, 1997 by Victor Katz, examined problem situations from algebra, geometry, trigonometry, combinatorics and number theory that arose in different places at different time periods, and the development of mathematical ideas to solve them. The keynote presentation on March 21, 1997 by Joseph Dauben, provided an exploratory discussion of the nature of early Chinese mathematics, especially geometry, considered largely in terms of The Gou-Gu Theorem (The Pythagorean Theorem).

Approximately 150 participants attended the conference. Overall, participants were pleased with the wide variety of topics presented and expressed an interest in attending future CMDG conferences focusing on the same theme. Aspects of the conference were reported in the April 1997 issue of the PSC-CUNY Clarion (the monthly newsletter of the Professional Staff Congress of CUNY), the April 1997 issue of Igbo Basics Periodical, and the forthcoming newsletter (number 19) of the African Mathematical Union Commission for the History of Mathematics in Africa. Presentation abstracts are given in the conference brochure. For a copy of the conference brochure or if you are interested in forming a Focus group for the History of Mathematics in the New York city region, please contact Nkechi Agwu, Department of Mathematics, Borough of Manhattan Community college, 199 Chambers Street, New york, NY 10007, (212) 346-8547 (voice), (212) 346-8550 (fax), nmabrn@cunyvm.cuny.edu (email).

Report on the HPM Meeting in Minneapolis, Minnesota, April 1997

Erika Voolich

The Americas Section of HPM held its annual meeting in Minneapolis Minnesota in conjunction with the National Council of Teachers of Mathematics on 18 April 1997.

The majority of the meeting was devoted to a discussion led by Victor Katz on the ICMI study document: *The Role of the History of Mathematics in the Teaching and Learning of Mathematics*. (See the previous issue of this newsletter.)

We started with participants sharing ways that they use mathematics history in their classes. There were examples from middle school, high school, teacher preparation and college mathematics classes. In middle school, one person spoke of using daily tidbits of history and sharing these with students in teacher's preparation class; another mentioned mathematics birthday cards. In high school, one person shares curriculum ideas with the ancient civilization teacher, another tells stories of Pythagoras and the ancient Greek philosophers. There was concern expressed that mathematics history is not an integral part of the teacher preparation curriculum, that it is treated as an add-on. There is need for more emphasis on the role of women and other cultures. One person expressed a desire to work on curriculum so that college students would think of mathematics as mathematicians. People told of using projects and

investigations in classrooms at all levels. In consideration of time the group chose to focus the rest of the discussion on two of the ICMI questions.

WHAT ARE THE PARTICULAR FUNCTIONS OF A HISTORY OF MATHEMATICS COURSE OR COMPONENT FOR TEACHERS? (Question 3 of the ICMI document).

Many spoke of feedback from students in mathematics history courses. Right after taking the course, students say the course was difficult and time consuming, a couple of years later they talk about the value of having had the course. Some future teachers worry about time and how they can possibly fit in anything more, others see it as a way to enrich their classes. The mathematics history courses can model how to bring the topics into the classroom. In Sweden, history is studied through projects and the question is how to train the teachers.

Studying mathematics history heightens awareness of various ways to solve problems and indicates why students might have difficulties with some topics; it helps dispel the myths that mathematics is esoteric and not useful and that mathematics is only proof and rigor.

There was an interest expressed in having materials available with information about what works in what context and why. This led into a discussion about how does one know whether what one is doing is successful and how to know whether something that works in one person's classroom will transfer to another's.

DOES THE EXPERIENCE OF LEARNING MATHEMATICS IN DIFFERENT PARTS OF THE WORLD, OR CULTURAL GROUPS IN LOCAL CONTEXTS, MAKE DIFFERENT DEMANDS ON THE HISTORY OF MATHEMATICS. (Question 6 of the ICMI document.)

What is meant by the "demand" on the history of mathematics? Do we really mean the reporting of the history of mathematics? Sometimes we want to use history to encourage a particular group, however we need to have everyone benefit from learning of the contributions of all groups. How much cultural background do you need to provide an understanding of African mathematics, for example? A related issue is that not all mathematics or mathematics history is recorded. If we see the same mathematics in different cultures, can we assume that everyone understood it the same way? How do we want our students to understand it? What people have chosen to record, changes over time.

The rest of the meeting was devoted to two presentations. Beatrice Lumpkin (author) spoke on *Ethnomathematics in the History of Mathematics -- Two Examples from Ancient Egypt*. The development of mathematics, outside the context of school mathematics and its applications, has been assigned to the broad field of study called ethnomathematics. Most textbooks on the history of mathematics study the history of school mathematics, and the work of professional mathematicians. This restriction can lead to missing very important developments in the history of mathematics. Two such examples from ancient Egypt come from bookkeeping records and construction plans, rather than mathematical texts. These examples concern the concept of zero and the use of fractions. Both examples can have useful application to teaching these concepts today.

Karen Dee Michalowicz (Langley School, VA) spoke on *Celebrating Native American Mathematics -The Anasazi, The Mayans and the Inca*. Native Americans in the recent past have been viewed by many as unsophisticated, heathen peoples. It is important that our students, especially Hispanic and minority students, become aware of and appreciate the cultural and scientific achievement of the people who inhabited the "New World" before the "Age of Discovery". In fact, the NCTM Standards lists in its very first goal, Learning to Value Mathematics: *Students should have numerous and varied experiences related to the cultural and historical evolution of mathematics*.... She discussed how she introduces her middle and secondary school students to the advanced lunar and solar calendar of the Anasazi, the highly developed numeration system of the Mayans and the numerical codes of the Inca quipu.

There was a short business meeting. We suspended dues for this year. We applied to NCTM to hold a conference within a conference (CWIC) at the Washington D.C. convention next April. We have not heard whether our proposal was accepted. CWIC is an all day session to attract teachers to an in depth study on using history in the mathematics classroom. We might have similar sessions at regional NCTM meetings. Victor Katz would like to hear from others willing to volunteer to organize such sessions. On 6 January 1998, there will be a joint Ethnomath-HPM meeting in the Baltimore Omni Hotel to honor the 65th birthday of Ubi D'Ambrosio. (See elsewhere in this newsletter.) There will be a series of presentations on topics dealing with his interests; please send any proposals to Victor Katz.

Report on the 23rd Annual Meeting of the CSHPM, June 1997

Hardy Grant

The 23rd annual meeting of the Canadian Society for the History and Philosophy of Mathematics (CSHPM) was held on June 7-8, 1997 at Memorial University, St. John's, Newfoundland. As usual, the meeting was part of the two-week-long gathering of Canadian "Learned Societies", which in turn was this year part of Newfoundland's commemoration of the landfall there of John Cabot in 1497.

Jointly with the Canadian Society for the History and Philosophy of Science (CSHPS), the CSHPM held a special session on *Mathematics and Science*. The invited speaker Rudiger Thiele of Leipzig, gave an overview, graced by rare archival illustrations, of the life and work of Euler, with reference to the wider setting of mathematics and science in the Enlightenment. A number of other speakers also contributed to the special session. Alan Baker used the histories of infinitesimals and of quaternions to highlight aspects of the "indispensability argument" that would justify mathematics through its necessary role in scientific theories. Roger Godard discussed the history of the least squares method from the (comparatively neglected) point of view of its use of linear algebra. Sharon Kunoff, reporting joint work with Barbara Bohannon, outlined various approaches to the study of the three-body problem from the 18th to the 20th century. Siegfried Thomeier's paper on Gauss stressed the latter's "practical" inventions, especially an electromagnetic telegraph, and the relation of these interests to his work in mathematics and the pure science.

Other papers focused on social-historical or philosophical questions. Drawing on Anthony Wallace's anthropological construct of the mazeway, Aditi Gowry outlined a model for analyzing challenges to, and reformulations of, the foundations of mathematics. Elaine Landry, argued that distinguishing between ontological realism (the claim that mathematical entities exist) and semantic realism (the claim that statements about mathematical entities are meaningful) removes the need to distinguish between platonism and formalism. Michael Pool proposed new interpretations of Descartes' *mathesis universalis* and of his account of perception, and argued that the latter contains roots of both Kant's and Hilbert's philosophies of mathematics.

Several papers addressed purely "internal" issues in the history of mathematics. Fran Abeles offered evidence that C.L. Dodgson ("Lewis Carroll") was among the leading 19th-century writers of texts on determinants. Bill Anglin traced the history of the Bachet equation.

$$y^3 = x^3 - k$$

, from Diophantus to its first complete solution by Alan Baker in 1968. John Dawson reported investigations of the personal papers, including diaries, of Oskar Morgenstern, whose contacts ensure that his archive is among other things a valuable resource for the history of 20th century mathematics. Hardy Grant sketched the history of attempts to factor large integers. Michael Millar examined Newton's construction (c. 1670) of the 7th part of a right angle by a segmental, rather than an Archimedean "areal", neusis procedure.

The remaining talks typify the splendid breadth and variety that characterize this Society's programs. Amy Ackerberg-Hastings described geometry education in the early-19th-century United states, with special attention to the British and French textbooks, then in use. Rebecca Adams, in work presented here by Matt Corrigan, discussed the history of mathematical studies of phyllotaxis, in particular the possible connection between the fractal geometry aspects and the Fibonacci sequence. Ed Cohen considered various 20th-century proposals to reform the Gregorian calendar, including some modifications of his own. Peter Griffiths described the mathematics underlying the projection maps of Etzlaub (1511) and Mercator (1569) in the light of some later work in trigonometry by Edward wright. Jacques Lefebvre described the role of mathematics in the work of the great novelist Robert Musil, finding that mathematics is presented there as useful and worthy of study, yet also as embodying an "obscure evil force".

The Society's annual meeting endorsed continuation of a trial cross-membership arrangement with the CSHPS. The next meeting will be in Ottawa at the end of May 1998. The special theme for that meeting was discussed, but not decided; it is likely to involve the mathematics of the late nineteenth century.

Report on HPM Course in Iceland, June 1997

John Fauvel

A good illustration of the practical influence and benefits of the international movement to explore the relations between history and pedagogy of mathematics was seen in Iceland in early summer 1997. From June 2nd to 4th a short course on history of mathematics was presented to Icelandic mathematics teachers by Evelyne Barbin, John Fauvel and René Guitart. The origins of this event lie some years earlier, when in 1992 Danièle Fernandez, a high school mathematics teacher in Reykjavik, attended the HPM meeting in Toronto organized by Florence Fasanelli, Craig Fraser and Israel Kleiner. She was so impressed by this event that she determined to create a similar opportunity for Icelandic mathematics teachers to be introduced to some aspects of the history of their subject and have an opportunity to consider its use in their teaching.

With the support of the Icelandic Science Teacher's Association, Danièle's vision was eventually realized in 1997 when three foreign historians of mathematics, who are also involved in the HPM movement, came to Iceland to lead sessions for a group of twenty-four mathematics and physics teachers from across the country. This is the first time that such an event has taken place in Iceland. The sessions were held at the University of Iceland in Reykjavik, and consisted of a blend of lectures and workshop activities with primary texts, on topics ranging from Babylonian mathematics to potential theory, but centering mainly on mathematics of the seventeenth century.

The teachers worked intensively and seemed to value and enjoy engaging with the mathematics and science of earlier times. Developing an awareness of historical developments as a further resource for the teacher may be especially valuable in the Icelandic situation, where it can be hard to motivate pupils in mathematics. In recent years, for example, the University of Iceland has graduated about four students in mathematics annually, which is not really enough to refresh and supply even the teaching force. So anything which might contribute to a more vigorous enthusiasm for mathematics in schools and colleges is worth exploring. At present the curriculum for Icelandic schools is under fresh consideration, and it may well be that with due advice and encouragement from informed and interested parties, Iceland will adopt the same curricular solutions as Denmark and Norway have already done, and incorporate positive support for history within the teaching framework.

Announcement of Conference in honor of the 65th birthday of Ubiratan D'Ambrosio

Victor Katz

The International Study Group on the Relations between History and Pedagogy of Mathematics (HPM) and the International Study Group on Ethnomathematics (ISGEm) will jointly sponsor a conference in the honor of the 65th birthday of Ubiratan D'Ambrosio, professor of mathematics emeritus at the University of Campinas in Brazil, to take place on Tuesday, January 6, 1998 at the Omni Hotel in Baltimore, Maryland, USA. This is the day, preceding the opening of the annual joint meeting of the American Mathematical Society and the Mathematical Association of America. We welcome contributed papers from anyone whose work has been influenced by Professor D'Ambrosio in the areas of ethnomathematics, history of mathematics, or mathematics education. One page proposals should be sent, preferably by e-mail, to Victor J. Katz: vkatz@maa.org. They can also be sent by regular mail to Victor J. Katz, Mathematical Association of America, 1529 18th St. N.W. Washington, D.C. 20036. The deadline for receipt of proposals is September 1, 1997. We also welcome the attendance of all mathematicians and mathematics educators who wish to honor Professor D'Ambrosio. To register for the conference, send your name, addresses (mail and e-mail) and phone numbers, along with a check for US $50, to Karen Dee Michalowicz, 5855 Glen Forest Drive, Falls Church, VA 22041, USA. The check should be made out to HPM. The registration fee is chiefly to cover the cost of a festive birthday dinner in the evening. Housing arrangements for the conference should be made through the American Mathematical Society in accordance with their normal procedure for annual meetings. Forms for this purpose will be available in the Notices of the AMS and in Focus, the newsletter of the MAA.

Have You Read?

Ronald Calinger, ed.

This column seeks references from across the history and historiography of mathematics, the

pedagogy of mathematics, and the sociology of mathematics. It also attempts to cite books or articles, containing sections on these subjects that have the potential for encouraging and motivating students, along with possibly improving the learning of mathematics and research in it, or that may 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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