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

AN AFFILIATE OF THE INTERNATIONAL COMMISSION ON MATHEMATICS INSTRUCTION

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Calendar

Meetings with HPM components are highlighted.

- 1990 July 7–13 ..... Lille
  Fourth Summer School Session about the History of Mathematics. Contact Evelyne Barbin at address on front page. (See inside for further information.)

- 1990 August 8–11..... Columbus
  Summer meeting of the American Mathematical Society and the Mathematical Association of America. There will be events commemorating the 75th anniversary of the Association, including numerous historical talks. Contact MAA, 1529 Eighteenth St., NW, Washington, DC 20036 U.S.A.

- 1990 August 21–29 ..... Kyoto
  The International Congress of Mathematicians. Contact ICM-90 Secretariat, Research Institute for Mathematical Sciences, Kyoto University, Kitashirakawa, Sakyo-ku, Kyoto 606, JAPAN. There will be an HPM session at the meeting to be organized by Ryosuke Nagaoke. The time and place will be announced during the Congress.

- 1990 August 31– September 1 ..... Tokyo
  Tokyo History of Mathematics Symposium 1990. The topics of this meeting include the History of Modern Mathematics, Mathematical Traditions in the East, and the Interaction between Mathematical Researches and the History of Mathematics. Contact Professor Chikara Sasaki, Department of History and Philosophy of Science, College of Arts and Sciences, University of Tokyo, Komaba, Meguro-Ku, Tokyo 153, JAPAN.

- 1990 September 18–20 ..... Cambridge
  Joint meeting of the British Society for the History of Mathematics with the Thomas Harriot Seminar. Contact Dr. R. W. Bray, Department of Mathematics, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, U.K.

- 1990 October 5–6 ..... La Crosse
  Third biannual conference on Math-History. Contact J. D. Wine, Department of Mathematics, University of Wisconsin–La Crosse, La Crosse, WI 54601, U.S.A. (See inside for program information.)

- 1991 January 16–19 ..... San Francisco
  Annual Meeting of the American Mathematical Society and the Mathematical Association of America. Contact AMS, P.O. Box 6248, Providence, RI 02940, U.S.A. There will be a special session in the History of Mathematics. (See inside for more information.)

- 1991 April 17–20 ..... New Orleans
  Annual Meeting of the National Council of Teachers of Mathematics and the Americas Section of HPM. Contact NCTM, 1906 Association Drive, Reston, VA 22091, U.S.A. More details will be announced in the next newsletter.

- 1991 May 27–29 ..... Kingston
  Annual meeting of the Canadian Society for History and Philosophy of Mathematics. Contact Professor M. Malik, Department of Mathematics, Concordia University, 7141 Sherbrooke St. Ouest, Montreal, Quebec, H4B-1R6, CANADA

- 1991 July 1–3 ..... London
  The Bicentennial Conference on Computing, organized by the Institute of Electrical Engineers in collaboration with the National Museum of Science and Industry. The conference will mark the 200th anniversary of the birth of Charles Babbage and will be held at Imperial College, South Kensington, London. Contact IEE Conference Services, Savoy Place, London WC2R 0BL, U.K.

- 1991 August 3–7 ..... Coral Gables
  Eighth Interamerican Conference on Mathematics Education. Contact Patrick Scott, Programas Latinoamericanos de Educación, Faculty of Education, University of New Mexico, Albuquerque, NM 87131, U.S.A.

- 1992 August 9–13 ..... Toronto
  International meeting of HPM preceding ICME-7. Details to be announced later.

- 1992 August 16–23 ..... Quebec
  Seventh International Congress on Mathematical Education (ICME-7). Contact Congrès ICME-7 Congress, Université Laval, Quebec, QC, G1K 7P4, CANADA or via fax to (418) 656-2000.)

From the Editor

Victor J. Katz

I want to thank those of you who sent in $ 5 in response to my appeal in the last newsletter so that they could receive the newsletter by first class mail. Unfortunately, only a very few did respond, so there was not enough money available to open a checking account. Therefore, I am returning the money to those who sent it in. Naturally, once I suggested that the newsletter did arrive quite late, issue # 19 received prompt treatment from many post offices. Thus, I think we should continue trying to use third class mail. If you seem to get the newsletter later than others you know, you might want to contact your own post office.

As you may notice, we have added two new country representatives to our distribution system, one in Italy and one in South Asia (India, Pakistan, Sri Lanka, etc.). We still need representatives in Eastern Europe and the Soviet Union, various parts of Africa, and East Asia. If you would like to volunteer, pleas contact me. There is very little work involved and you get to contact all sorts of interesting people. Until such time as local representatives are found, I solicit readers in the U.S. or Western Europe who could take on the (small) expense of handling the mailing for some of the countries mentioned.

I want to thank all of the contributors to this newsletter and again to solicit articles from other readers. As you see by the calendar, there are many meetings coming up in the near future. I would appreciate reports on activities at those meetings which would be of interest to HPM readers from any of you who attend. I also welcome reviews of any of the articles or books listed in Have You Read.

HIMED 90

David Kullman

HIMED 90 (History in Mathematics Education) took place at Beaumont Hall, University of Leicester, April 7–9, 1990. The conference was organized by Neil Bibby, John Fauvel, and Steve Russ for the British Society for the History of Mathematics and sponsored by Apple Computer U.K. Ltd. Speakers from eight countries, representing levels of education from the primary grades through college, discussed ways of bringing history of mathematics into the mathematics classroom.

The theme was sounded by John Fauvel (The Open University) in a keynote address, "Using History in Mathematics Education." He pointed out that, while admonitions to include some history in the school mathematics curriculum have been spoken for more than a century, explicit objectives in this area are still largely lacking in the U.S. and U.K. Making use of history in a mathematics course is hard work for pupils, teachers, and historians alike, and our lists of

reasons why history is a good thing for mathematics students to know need to be translated into practical classroom units.

Fauvel's opening remarks were followed by an international panel on "The Experience of History in Mathematics Education." Several speakers showed how historical materials can enhance pupils' motivation to learn mathematics. Gary Brown (College of St. Benedict, Minnesota, USA) told how history and philosophy of mathematics can be integrated into core curriculum college mathematics courses taught from a cultural and humanistic point of view. Patricia Perkins (City of London School for Girls) related her experiences using historical materials to provide a cultural heritage emphasis as a motivating factor in teaching mathematics to females. Helen Gardner (Bently Drive Primary School, Walsall) told how stories from the history of mathematics can ease the mathematical trauma for pupils in a multicultural environment. Peter Ransom (Northumberland High School) testified to the effectiveness of history of mathematics in providing high school students with a broader general knowledge of mathematics, appreciation of the pioneers, alternative methods of solving problems, and a stimulus to thinking.

Three of the panelists endorsed the idea of having students read original sources. Abraham Arcavi (Weizmann Institute of Science, Israel) told how he uses this approach in courses for the training of mathematics teachers, and Jack Astin (Ampleforth College) described a sixth form mathematics course in which illustrative problems are drawn from old arithmetic texts. Evelyne Barbin (Université du Maine, Le Mans, France) told how IREMs (Institutes for Research on the Teaching of Mathematics) in France have developed units for secondary school students in which original mathematics texts provide a historical perspective for the mathematical content. An English translation of volume I of *The IREM Papers*, edited by John Fauvel, was available for HIMED 90 participants to purchase.

David Fowler (University of Warwick) warned of some risks involved in trying to become an expert on the history of mathematics: historical research is time consuming; historical truth is seldom easy to discern; you realize that there is usually more than one solution to a mathematical problem; and you are expected to give simple answers to all kinds of complex questions about the history of mathematics.

Additional practical experiences with historical materials were shared by teachers from three countries. Ivan Jacobsen (Statsggymnasiet, Aarhus, Denmark) presented some ideas for introducing historical projects into the high school mathematics curriculum. His outline included ideas for topics, background and tools needed by the teacher, and typical student reactions. Maryvonne Hallez (IREM, College Paul-Bert, Paris) gave examples from Gauss, Huygens, Euler, and Archimedes that could be used with high school students. Jan van Maanen (Christelijk Gymnasium, Utrecht, Netherlands) presented a problem from L'Hospital's textbook, involving a weight and pulley, that he had used as the basis for a final oral exam in a differential calculus course. (This prompted some discussion of what the nature of assessment in the historical portions of a mathematics course ought to be.)

After dinner there was a "show-and-tell" session. David Sigmaster (South Bank Polytechnic, London) presented a richly illustrated lecture on "Recreational Problems Down the Ages." It emphasized the multicultural nature of many recreational problems and gave examples of contemporary textbook problems with origins in antiquity. Derek Farman (Stalham High School, Norwich), in a talk titled "MacHistory," showed how a Macintosh computer with hypercard could be used to generate historical classroom materials.

The second day was centered around eleven workshops that were intended to be interactive, collaborative sessions leading to tangible classroom ideas. The topics and their presenters were: *Historical projects in the multicultural classroom* (Costel Harnasz); *History in teaching numeracy* (David Kaye); *Adapting IREM materials for British use* (Chris Weeks); *Making educational tools from 17th century Dutch texts*

(Jan van Maanen); *Teaching mathematics with the help of 16th century Dutch arithmetic books* (Marjolein Kool); *Word problems and equations from ancient Egyptian and medieval texts* (Ron Hilfer); *The SMP history of mathematics module* (Mike Dampier); *How Pythagoras and Euclid can refresh parts of the British national curriculum* (Peter Ransom); *Computers and history in the mathematics classroom* (Derek Farman); *New perspectives on the introduction of calculus, with a case study on integration* (Ruth Farwell and Chris Knee); *An example of problem solving from the history of probability* (David Kullman).

Additional suggestions for using history in the mathematics classroom came from the contributed papers. Lutz Führer (Albert Einstein Gymnasium, Hameln-Afferde, Germany) outlined some strategies to make mathematics more interesting to more people. Examples from the work of Eratosthenes, Archimedes, and Cardano were used to show students that school mathematics "stems from before yesterday." Ron Hilfer (Tabor Community School, Lower Galilee, Israel) described junior high school units on ancient numeration systems, calculations in ancient Egypt, and the nature and computation of pi. Yannis Thomaidis (Lycée Ilioupolis, Thessaloniki, Greece) spoke on historical digressions in Greek geometry lessons. Topics such as angle trisection, Ptolemy's theorem, and Aristarchus' astronomical measurements were used to motivate students in an otherwise formal, deductive geometry course.

George Joseph (University of Manchester) and Claudia Zaslavksy (New York, USA) advocated a multicultural approach to correct a European bias in the history of mathematics. Joseph, speaking about "History in the Multicultural Classroom," pointed out that mathematical sources in non-European cultures are frequently other than manuscripts. His examples, involving number and calculation, were chosen from Indian mathematics. Zaslavsky, in an illustrated lecture on "World Cultures in the Mathematics Class," showed slides of mathematical artifacts from African and Native American cultures. Examples included round houses, symmetry patterns, and mancala-type games.

The conference featured more than speeches. Several vendors had displays of resources for the history of mathematics, and there was an exhibition of historical mathematics texts from the library of the Mathematical Association. Conference participants also had an opportunity to view *The Hill on the Dark Side of the Moon*, a 1983 Swedish film about Sofya Kovalevskaya.

Sessions on the third day were devoted to consolidating earlier ideas and giving participants a sense of direction for future work. Neil Bibby (University of Exeter) and Peter Ransom discussed ideas for using topics from the history of mathematics to meet particular objectives in the new British national curriculum. John Fauvel led a general discussion on "What Can We Learn from the International Experience?"

Leo Rogers (Digby Stuart College) talked about what is available in the way of resources. In addition to the traditional books and manuscripts, there may be comic books, films, theater, and fiction. Leo also enumerated four "cardinal sins" for the historian of mathematics: do not believe anything automatically; priority claims are usually meaningless; do not judge past events by modern standards, speculations are not facts.

In closing, Steve Russ (University of Warwick) focused on plans for the future. This conference was characterized as an "awareness exercise," putting people in touch with each other and with resources. Some action groups (primarily within the U.K.) were formed to follow up on particular concerns and ideas. Proceedings of HIMED 90 will be published, and a follow-up meeting is being planned for 1992 at Nottingham.

World Cultures in the Mathematics Class

Claudia Zaslavsky

Excerpts from the illustrated presentation at HIMED 90

The mathematics education community in the United States is embarking upon a program to reach *all* students. As stated in the *Curriculum and Evaluation Standards for School Mathematics* (NCTM): "It is crucial that conscious efforts be made to encourage all students, especially young women and minorities, to pursue mathematics."(p. 68) Recognition is given to the varied backgrounds and interests of the students: "Students should have numerous and varied experiences related to the cultural, historical and scientific evolution of mathematics. (p. 5) Students' cultural backgrounds should be integrated into the learning experiences." (p. 168)

The ethnic groups that have lived longest in the Americas — and who have been most oppressed — are the Native peoples and the Africans who were brought to the New World in chains, to serve as slaves to European plantation owners. Now their descendants are determined to reassert their cultural heritage.

It is not only children of "minority" groups who benefit from the inclusion of topics relating to their heritage. Students in our "global village" must learn to respect and appreciate the contributions of peoples in all parts of the world. Educators are beginning to recognize the value of infusing mathematics with the achievements of world cultures, to "multiculturalize the curriculum." (Bishop, D'Ambrosio, Gerdes)

In this presentation I shall describe some of the mathematical practices of African peoples and of the indigenous peoples of the Americas, suitable for incorporation in the curriculum at the primary and middle grade level.

All peoples have developed numeration systems to the extent of their needs. The English language system of numeration and most European systems are based on grouping by tens and powers of ten. Why is ten commonly used as a base? Is it because we have ten fingers (digits)? The peoples of West Africa and Middle America, as well as the Inuit of the far north, group by twenties. In some languages, such as Mende of Sierra Leone, the word for twenty means "a whole person" — all the fingers and toes.

Children can learn about numeration systems by examining the construction of larger numbers. In the Yoruba (Nigeria) language, for example, the name for 65 means "take five and ten from four twenties," using the operations of multiplication and subtraction, rather than multiplication and addition, as in most European languages. These are different solutions to the same problem, one just as good as the other. (Zaslavsky, *Africa Counts*, 207)

Finger gestures to express numbers are commonly used by people who do not speak each other's languages. These gestures may be related to the number words, or, again, they may be quite different. When the indigenous peoples of North America were pushed westward by European settlers, tribes speaking different languages were thrown together. Of necessity, they developed systems of finger signs, including signs for numbers. (Zaslavsky, "It's OK")

The peoples of Middle America developed their own systems of written numerals, dating back at least two thousand years in the case of the Maya. The systems were based on twenty and powers of twenty, and included the use of zero, positional notation, addition, and the repetition of symbols.

Another aspect of number is the ability to do mental arithmetic. The year 1990 marks the 200th anniversary of the death of the slave Thomas Fuller, known as the African Calculator. Shipped to North America in 1724 at the age of fourteen, he developed remarkable powers of calculation, although he was forbidden access to any kind of schooling, as were all slaves, and he could neither read nor write. Late in his life he was used by anti-slavery advocates to demonstrate the mental capacity of Black people. (Fauvel & Gerdes)

[Slides illustrated geometric patterns in Navajo rugs — the "first American tapestries" — Bakuba (Zaire) embroidered cloth, and wood carvings. Examples of diverse shapes in architecture ranged from simple round houses of nomadic peoples to the pyramids of ancient Egypt and Middle America. A discussion of games of

chance and games of skill, in particular the universal African "mancala" game, rated one of the best in the world, concluded the slide presentation. The audience appreciated photographs of children engaged in these activities.

Conclusions: The introduction of multicultural, interdisciplinary perspectives into the mathematics curriculum has many points in its favor:

- Students become aware of the role of mathematics in all societies. They realize that mathematical practices arose out of a people's real needs and interests.
- Students learn to appreciate the contributions of cultures different from their own, and to take pride in their own heritage.
- By linking the study of mathematics with history, language arts, fine arts and other subjects, all the disciplines take on more meaning.
- The infusion into the curriculum of the cultural heritage of people of color builds their self-esteem and encourages them to become more interested in mathematics. As one eleven-year-old boy wrote in his evaluation of a classroom activity based on African culture: "As you probably don't know I feel very strongly and am in deep thrust [sic] with my black people, and the math has made me feel better." There is little to be added to this heart-felt comment!

Bishop, A. J., *Mathematical Enculturation* (Dordrecht: Klüwer, 1988).

D'Ambrosio, Ubiratan, "A research program and a course in the history of mathematics: Ethnomathematics," *Historia Mathematica* 16 (1989), 285–6.

Fauvel, John & Gerdes, Paulus, "African slave and calculating prodigy: Bicentenary of the death of Thomas Fuller," *Historia Mathematica* 17 (1990) (to appear).

Gerdes, Paulus, "On culture, geometrical thinking and matheamtics education," *Educational Studies in Mathematics* 19 (1988), 137–162.

National Council of Teachers of Mathematics, *Curriculum and Evaluation Standards for School Mathematics* (Reston, 1989).

Zaslavsky, Claudia, *Africa Counts: Number and Pattern in African Culture* (Brooklyn: Lawrence Hill Books, 1979).

Zaslavsky, Claudia, "It's OK to count on your fingers," *Teacher* 96 (1979), 54–56.

HPM in Salt Lake City

Erica Voolich

On April 17 and 18, 1990 the Americas Section of HPM held its annual meeting in Salt Lake City preceding the annual meeting of NCTM.

Stefano Luzzatto (Marlboro College, Marlboro, VT) asked the question "Is Philosophy Detrimental to Education?" The philosophy of math has been dominated for the last century by the ideas of Frege and Russell. All questions are reduced to questions of axiomatic systems and this has influenced both math and math education. Unfortunately, it is not always the best pedagogy to teach concepts in the order that they occur deductively. The logical definition is only a part of the meaning of a concept. The meaning of a concept can by found in its entire history. For example, an irrational number for the ancient Greeks had to do with incommensurable magnitudes; today one must construct a different meaning to meet the definition of irrational number. As teachers, we ought to be influenced by Hegel who did not want to define primitive terms using formal logic but rather was concerned with the process of their development. Ideas are related not by their external structure but by their negation and synthesis. Ideas derive their meanings from their relationship to each other. When we develop courses, we should look at the concepts, at how they relate and at counterexamples, instead of always presenting the students with a straight deductive course.

Ubiratan D'Ambrosio (Universidade Estadual

de Campinas, Campinas, Brazil) presented "Let me talk again about Vitruvius." Vitruvius' *Ten Books of Architecture* have lasted 15 centuries, a contradiction to the popular claim that he was not a successful writer, architect, and scientist. An example of the relevance of his teachings is in Book I: here Vitruvius discusses what an architect must know. One thing Vitruvius mentioned is the need to study the course of the winds. This is interesting advice for us today; recently, the houses which were built of fragile materials in the slums of the Caribbean resisted the hurricane force winds better than the modern city buildings because of the builders' wisdom of knowing the wind patterns. If you look at the ten books, you can see that Vitruvius was concerned with the entire man-made environment and manipulation of nature. Vitruvius fills the gap between Greek and Medieval mathematics: and in order to understand the history of mathematics in the western world, you need to understand Vitruvius. He knew and understood the importance of the Greek achievements and applied them in practical mathematics. For example, he looked at perspective and symmetry (Book VII) in building buildings. He proposed a curriculum for the educated person: mathematics, science, music (a study of order, perfections and precisions, for example the tension of strings. Who understands the use of artillery? The musician who can adjust the tension of the ropes.). For centuries people have studied Vitruvius and incoporated most of his ideas into their books on architecture. The Roman presence was important in Europe until the 16th or 17th century and led to the devleopment of technology. Had mathematicians and scientists only been studying the ideas of the Arabs and Greeks, and not the Romans, probably there would not have been the technological advances.

Steven H. Heath (Southern Utah State College, Cedar City, UT) presented "My Favorite Theorems from the *Elements* of Euclid." Euclid still makes interesting reading. It is a good foundation for further study of mathematics. One can easily develop an appreciation of why it is such an important book. Euclid develops many ideas in geometry and number theory. Some ideas were not fully developed but the groundwork was clearly laid. For example, Euclid did not use a value for π, but the concepts were there through ratios. Also, there are indications of trigonometric ideas although they are not specifically stated in modern termunology (III, 35 and 36).

V. Frederick Rickey (U.S. Military Academy, West Point, NY) shared his research on the question that students perenially ask: "Why do we use m for Slope?" One popular explanation is that m is the first letter of the French word *monter* (to climb), but Descartes and Fermat, who supposedly used this word, never discussed the idea of slope. Jan de Witt (1623–1672) includes a discussion of lines in *Elemente curvarum linearum* and gives four cases of what we would call the slope-intercept form, but no mention of the word "slope." Maria Gaetana Agnesi (1718–1799) in *Instituzioni Analitiche* talks about the equations of straight lines, but still there is no mention of slope. In the 1869 Analytic Geometry text by George Howison, the equation $y = mx - b$ is used. This is the earliest reference that Rickey can find that uses m, but Howison does not use the word "slope." This was not an influential analytic geometry textbook: was m an arbitrary choice or did it originate somewhere else? The first use of the word "slope" that Rickey can find is in A. S. Hardy's *Elements of Analytic Geometry* (1897) where the author says, "The tangent which the line makes with the axis of x is called the slope." Rickey would like people to check old textbooks and see if there is any reference to m prior to 1869 and to "slope" prior to 1897.

William L. Campbell (U. of Wisconsin–Platteville, Platteville, WI) led a discussion on "Teaching the History of Mathematics." The major point of interest in the discussion was on the type of assignments given. Some of the assignments described were term papers on people and topics, papers covering different eras, a summary and review of a journal article for presentation, a summary note aimed at piqueing inter-

est, and biographies placed in historical settings. Besides the textbook, other sources mentioned were Fred Rickey's calendar, interlibrary loan, old textbooks (compare material with discoveries of the day), and classical problems. There was an unanswered question of whether it would be worthwhile to put together a booklet including advice, ideas tried, references by topic, and texts.

Math–History Conference in La Crosse

The Department of Mathematics at the University of Wisconsin – La Crosse is sponsoring the third biannual conference on Math-History on the 5th and 6th of October. The invited (hour) speakers are Irving H. Anellis (Modern Logic Publications and Des Moines Area Community College), "The Roots of Mathematics and Mathematics Education in Russia in the Age of Peter the Great;" Thomas Drucker (Dickinson College), "The Roots of Model Theory;" Charles Dufy (Massachusetts Maritime Academy), "N. I. Lobachevsky;" and Helena Pycior (University of Wisconsin – Milwaukee), topic to be announced. The contributed (half-hour) papers include Robert Brabanec (Wheaton College), "A Tale of Two Mathematicians - Fourier and Cantor;" Valentine A. Bazharov (Kazan State University, USSR), "A History of Mathematics at Kazan State University;" Charles Ford (St. Louis University), "Crisis in the Moscow School of Mathematics;" Nathan Houser (Indiana University), "The Difference a Notation Can Make;" Gerald Meike (Wright State University), "A Lesson of (Mathematical) History;" Michael Miller (University of Northern Iowa), "Curves from Ancient Times;" William S. Mutch (Northern Michigan University), "The Historical Development of Jordan Content in Lebesgue Measure;" J. M. Pardiero (Universidad de las Palmas de Gran Cararia), topic to be announced; Walter S. Sizer (Moorehead State University), "Mathematics Before the Age of Writing;" Helen Skala (University of Wisconsin – La Crosse), "A Concise History of Cryptology;" John A. Synowiec (Indiana University Northwest), "Harmonic Analysis, Partial Differential Equations and Symbolic Methods, Interacting Still;" and Ali Zakeri (University of Wisconsin – La Crosse), "A Mathematician Who Enjoyed Life, Omar Khayyam." In addition to the speakers, there will be a panel discussion on the use of history in mathematics education.

For more information on the meeting, contact J. D. Wine at the address below or phone him at (608) 785-8393 or (608) 785-6602. Registration fee is $30 until September 26 ($40 including the banquet). Registration for full time students is $10. Checks may be made payable to UW – La Crosse and sent to Math-History Conference, Department of Mathematics, UW – La Crosse, 1725 State St., La Crosse, WI 54601.

Summer School in Lille

The Inter-I.R.E.M. Commission "Epistemology and History of Mathematics" is organizing the fourth Summer School Session about the History of Mathematics in Lille, France from 7 to 13 July, 1990. The Summer School Session is opened to teachers of secondary schools, high schools, universities, and to inspection members, in mathematics, physical sciences, and history. The contents of the session include the historical construction of mathematical knowledge in its scientific, cultural, philosophical and social context, the didactic contributions of epistemology and mathematics history including epistemologic obstacles and the role of problems, rigour, demonstration, conjecture and error, the relations between sciences, technologies, cultures, and societies, and the introduction of a historical perspective in teaching, including pedagogic steps, educative action plans, and interdisciplinary action. For further information, contact Evelyne Barbin at the address on the front page. Her telephone is 43 83 32 15.

Canadian Society for History and Philosophy of Mathematics

Victor J. Katz

The annual meeting of the CSHPM was held on May 31-June 1, 1990 at the University of Victoria in Victoria, British Columbia. There was a special session on history and pedagogy of mathematics.

The keynote speaker was Judy Grabiner (Pitzer College, Claremont, CA) whose topic was *Was Newton's Calculus a Dead End? Maclaurin's Place in British and Continental Mathematics*. Professor Grabiner's thesis in her talk was that Maclaurin's *Treatise of Fluxions*, his answer to George Berkeley's criticisms of the foundations of calculus, far from being "praised by all, read by none" was in fact extremely influential in the developemnt of the calculus on the continent by such figures as Clairaut, D'Alembert, Euler, and Lagrange. Five examples of this influence were given, including the development of real-valued functions via both power series and inequalities, the treatment of maximums and minimums, the gravitational attraction of ellipsoids, the Euler-Maclaurin summation formula, and the study of elliptic integrals. Maclaurin's geometry, included in the first of the two books of his *Treatise*, was a source of intuition for his development of various analytic techniques which enabled him to find the solution to many significant research problems.

Israel Kleiner (York University, Toronto, Ont.), in his talk *Themes in the Evolution of Number Systems*, discussed eight themes which he uses in various courses and which involve historical ideas. These included "Beyond the Complex Numbers," "The Algebraic-Transcendental Dichotomy," "Transfinite Numbers," "Personality of Numbers," "One, Two, Many," "Discovery, Use, Understanding, Justification," "Numbers and Geometry," and "Numbers and Analysis." In a different vein, Charles Jones (Ball State University, Muncie, IN) discussed his research on *The Beginnings of the New Math Movement: The Ball State Program*. It was there that many of the ideas were developed which were subsequently incorporated in the work at the University of Illinois from where "New Math" grew.

Sam Kutler (St. John's College, Annapolis, MD) attempted to answer the question *Why Study Ancient Mathematics?* with various examples from Greek and modern mathematics showing how an understanding of the former can help with the latter. Erica Voolich (Wheelock College, Boston, MA) demonstrated her *Multicultural and Historical Approach in the Elementary Classroom* by discussing several examples she has used to enliven her classes beginning in the first grade. These included materials from India and China, among other places. Victor Katz (University of the District of Columbia, Washington, DC) gave various examples of *Non-Western Mathematics in the University Classroom*. These included calculation in base 20 and with relation to various moduli in Mayan culture, indeterminate equations and the use of the Euclidean algorithm from India, numerical equation solving and its relation to synthetic division from China, the use of calculus-like techniques in solving cubic equations from the Arab world, and ideas from graph theory taken from cultures in the South Pacific, central Africa, and South America. The final speaker in the special session was V. Frederick Rickey (Bowling Green State University, Bowling Green, OH) who showed how *Old Calculus Problems Make for a Lively Course*. His examples included material from the eighteenth century works of Johann Bernouili, Nicholas Saunderson, and Maria Agnesi, as well as problems from nineteenth century American texts of Edward Courtenay and William Peck, the latter of which seems to be the first work in which the students were asked to find explicitly the equation of a tangent line to a given curve.

The proceedings of this special session will be published as part of the *Proceedings* of the meeting. The simplest way to procure this volume, which will be available in the spring of 1991, is to join the Canadian Society. For information on membership and on ordering the proceedings of the 1988 and 1989 meetings, con-

tact Professor M. Malik, Department of Mathematics, Concordia University, Montreal, Quebec H4B-1R6, CANADA. Next year's meeting of the Canadian Society will be at Queen's University in Kingston, Ontario from May 27 to 29. The theme of the special session will be Women in Mathematics. More details will be available in the next newsletter.

HPM Conference in Campinas

Due to the recent changes in the Brazilian economy and the resultant uncertainty in the availability of resources, it was deemed advisable to postpone the conference on "Using History in the Teaching of Mathematics" scheduled for June 26–28, 1990 in Campinas, Brazil. The organizers intend to reschedule the conference at a later date.

AMS Meeting in San Francisco

There will again be a special session in the History of Mathematics at the annual meeting of the American Mathematical Society in San Francisco on January 16–19, 1991. It is being organized by Victor Katz, David Rowe, and Florence Fasanelli. Most of the papers will be by invitation, but if you have a paper which you would like to present, get in touch with one of the organizers at the soonest possible opportunity. Though there is no particular theme for the session, a good guideline is that the paper be of interest to mathematicians in general and not just to historians of mathematics. Among those who have tentatively agreed to speak are Barnabas Hughes, Joseph Dauben, and David Zitarelli. More details will be announced in the next newsletter.

Modern Logic

Pre-publication inspection copies of the first issue of *Modern Logic*, an international journal of the history of mathematical logic, set theory, and foundations of mathematics, are now available. To obtain a copy free of charge, write to Irving H. Anellis, Modern Logic, Box 1036, Welch Avenue Station, Ames, IA 50010-1036, U.S.A. *Modern Logic* is planned as a quarterly and volume 1, no. 1 is expected to be ready for shipping in June, 1990. Subscriptions (payable to *Modern Logic*) are US$ 35 (– US$ 15 for air mail delivery outside the Americas) for individuals and US$ 100 for libraries and institutions.

PRIMUS

A new journal, *PRIMUS – Problems, Resources, and Issues in Mathematics Undergraduate Studies*, will begin publication in March, 1991. It will be a forum for the exchange of ideas in mathematics education at the college level. *PRIMUS* will be a refereed quarterly, devoted to dialogue among those interested in undergraduate mathematics. This includes those who prepare students for college level mathematics, those who teach college level mathematics, and those who receive students who have been taught college level mathematics. It will be a forum for exchanging problems and activities for undergraduate coursework, a place to discuss the emerging issues of mathematics education, a resource broker, a source of ideas and activities, and a place to foster discussion and provide historical documentation of developments to improve mathematics education. The editor, Brian J. Winkel of the Department of Mathematics, Rose-Hulman Institute of Technology, Terre Haute, IN 47803, U.S.A., is very interested in bringing the history of mathematics to the college classroom. He encourages those who have 'how to' and 'success stories' on how they bring history into the instruction milieux to share their material with his readers. Manuscripts (in triplicate) should be sent to him at the above address. Subscriptions are US$ 34 per year (four issues) in the U.S. and US$ 40 outside of the U.S. and can be entered by sending a check made out to *PRIMUS* to the above address.

The Mathematical Preparation of Teachers of Mathematics

The Committee on the Mathematical Education of Teachers of the Mathematical Association of America is currently preparing a new set of Recommendations for the Mathematical Preparation of Teachers of Mathematics. The proposed standard 6, Developing Perspectives of Mathematics, is of special interest to HPM. The following is the current working draft of this standard:

The mathematical preparation of teachers must provide experiences in which they:

- explore the dynamic nature of mathematics and its increasingly significant role in social, cultural, and economic development;
- investigate the role of individuals and their contributions in the development of ancient, modern, and current mathematical topics;
- come to appreciate the contributions made by various cultures to the growth and development of mathematical ideas;
- outline the historical development of major concepts in school mathematics.

Historical and cultural aspects of mathematics should be a part of the collegiate experiences of mathematics teachers. These experiences should include, but not necessarily be structured by, a chronological approach to the development of mathematical ideas. The emphasis should be on concepts and their interrelationships.

Historically, much of mathematics has developed because of the need to solve problems in areas outside of mathematics. Early techniques and formulas for measurement were followed much later by an axiomatic development of Euclidean geometry. Calculus was used to solve problems in the sciences for two hundred years prior to its theoretical development. The need for record keeping and the organization and interpretation of data in increasingly complex societies gave rise to the development of statistical theories. On the other hand, mathematicians through history have created or extended many areas of mathematics for the sheer enjoyment of exploring mathematical ideas, never dreaming that years later these mathematical ideas would become immensely useful to people in business and industry. Throughout history the interplay of mathematics and other areas, as well as the interplay of different areas within mathematics has been essential in the development of mathematics and continues to be so today.

Mathematics should be presented as a truly human endeavor, with a close look at the women and men who have contributed to mathematics through history and who are playing important roles in mathematics today. Teachers must develop an appreciation of mathematicians as people, with a wonderful diversity of personalities, idiosyncrasies, backgrounds, and interests. However, the emphasis should remain on the development of mathematical ideas. Moreover, the mathematical ideas should not be rooted in the past. Prospective teachers need to be aware of the striking new developments in mathematics and its applications taking place today. They should appreciate the contributions of mathematics to society and the impact of mathematicians on society.

Prospective mathematics teachers should have opportunities to become acquainted with some current literature in mathematics and biographies of some 20th century mathematicians. They should be aware of how the search for solutions to problems has created, and continues to create, new mathematical ideas.

Prospective mathematics teachers should study the development of mathematical ideas particularly relevant to the school curriculum. They should understand the historical development of mathematical notation and terminology and trace the origins of some of the major topics in arithmetic, algebra, geometry, trigonometry, calculus, number theory, probability, statistics, discrete mathematics, and the development of the computer.

Please send all comments and suggestions on

the above standard to the chair of the writing team, Professor James R. C. Leitzel, Mathematics Department, The Ohio State University, 231 W. 18th Ave., Columbus, OH 43210, U.S.A. Professor Leitzel emphasizes that this is a working draft of a suggested general standard which will not be tied to any particular grade level. It would be especially valuable to get comments from non-U.S. readers who could compare this standard with similar standards (if they exist) in their own countries.

Doctoral Thesis in Brazil

In November, 1989, Clovis Pereira da Silva defended a doctoral thesis in the Department of History of the University of Sao Paulo on "Una Historia Social do Desenvolvimento da Matematica Superior no Brasil de 1810 a 1920" (A Social History of the Development of Higher Mathematics in Brazil from 1810 to 1920). This is the first doctoral thesis in Brazil in the History of mathematics. The work of Clovis Pereira da Silva, who teaches in the Department of Mathematics of the Federal University of Parana, in Curitiba, covers the period of the monarchy and early republic after Brazilian independence. The thesis lists and analyzes 22 doctoral theses in mathematics defended in Brazil in that period. Besides, introductory chapters cover mathematics in Portugal and in Brazil during the colonial period (16th, 17th, and 18th centuries).

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, D.C. 20064, U.S.A.

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