

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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1994 July 18 - 22 Blumenau, Brazil
Second Iberoamerican Congress on Mathematics Education. For information, contact Maria Salett Biembengut or José Valdir Floriani, Fundação Universidade Regional de Blumenau, Rua Antonio de Veiga, 140, Caixa Postal 1507, CEP 89012900, Blumenau SC, BRAZIL; Phone: 55 473 23 0422; fax: 55 473 22818.

1994 July 25 - 27 Blumenau, Brazil
International meeting of HPM. (See inside for more details.)

1994 August 3 - 11 Zurich
International Congress of Mathematicians. For information, contact ICM 94, International Congress of Mathematicians, ETH Zentrum, CH-8092 Zurich, SWITZERLAND; Phone: 41 1 632 52 30; fax: 41 1 252 91 84; email: icm94@math.ethz.ch.

1994 August 15 - 17 Minneapolis
Mathfest, including the summer meetings of the Mathematical Association of America and the American Mathematical Society. For details, contact Hope Daly, AMS, P.O. Box 6887, Providence, RI 02940.

1994 August 16 - 20 Shanghai
ICMI-China Regional Conference on Mathematics Education. The conference theme is Teacher Preparation in Mathematics. For information, contact Zhang Dian-zhou and Zhang Zhen-ya, Department of

Mathematics, East China Normal University, Shanghai 200061, PEOPLE'S REPUBLIC OF CHINA; tel: 86-021-257-1095; fax: 86-021-257-8367.

1994 August 27 - 28 University Park, Pa.
Conference on History of Mathematics in Honor of Boris Rosenfeld. (See inside for more details.)

1994 October 13 - 16 New Orleans
Annual meeting of the History of Science Society. For information, contact the Program Co-Chairs, Clark Elliott, University Archives, Harvard University Library, Cambridge, MA 02138, U.S.A. Phone: 617-495-2462; or Richard Kremer, Department of History, Dartmouth College, Hanover, NH 03784, U.S.A. Phone: 603-646-2228; fax: 603-646-2810; email: richard.kremer@dartmouth.edu.

1994 October 14 - 15 Indianapolis
Midwest Math History Conference. This is one of a series of biannual math history conferences. It will take place on the campus of the University of Indianapolis. There will papers detailing original research in the history of mathematics and also those of an expository or educational nature. For information, contact Allan Swett, Department of Mathematics, University of Indianapolis, 1400 E. Hanna Avenue, Indianapolis, IN 46227; Phone: 317-788-3320; Email: swett@gandlf.uindy.edu.

1994 November 28 - 29 Osaka
Fifth Five Nations Conference. This conference is sponsored by the Mathematics Education Society of Japan and the Three Universities Mathematics Education Society and will be held at Osaka International House. Among the themes of the conference are the effects of technology on mathematical content, methodology, and curriculum, the connection of school mathematics and college mathematics, and the cultural history of mathematics. For more information, contact Professor Shoichiro Machida, Department of Mathematics, Saitama University, 255 Shimo-okubo, Urawa Saitama 338, JAPAN; Phone: 81-48-858-3205; Fax: 81-48-858-3213.

1995 January 4 - 7 San Francisco
Annual meeting of the American Mathematical Society and the Mathematical Association of America. (See inside for details on sessions of interest to readers.)

1995 April 6 - 9 Boston
Annual meeting of the National Council of Teachers of Mathematics and of the Americas Section of HPM. More details will be forthcoming in the next Newsletter.

1995 June 30 - July 4 Cairns, Australia
International meeting of HPM. The tentative theme of the meeting is the mathematics of native peoples. More information will be forthcoming in future Newsletters.

1995 October 29 - November 3 Minneapolis
Third International History, Philosophy and Science Teaching Conference. (See inside for more details.)

1996 July 26 - 31 Braga, Portugal
Quadrennial International HPM meeting in connection with ICME. Details will be forthcoming in future Newsletters.

From the Chair

John Fauvel

How to spread the HPM message? And why? An enthusiasm for HPM can sometimes sound rather evangelistic, a missionary kind of activity which benefits the promoter rather more than the recipient. But in fact the more that teachers from all around the world are involved in HPM concerns, the more pronounced the benefits in all directions.

The recent visit to the UK of Ubiratan D'Ambrosio is a case in point: he arrived, as Peter Ransom points out

in his HIMED 94 report, on a day when a leading British Sunday newspaper carried a strange attack on modern mathematics education, particularly directed at the ethnomathematics which Ubi has done so much to promote. Ubi's talk at Winchester was therefore timely. By getting people to think about the mathematics education that arises from taking seriously the needs and experiences of Brazilian street children, he focussed our attention on the moral perspective inherent in ethnomathematics, and the considerable pedagogic benefits for all that come from exploring the local mathematics of every culture and sub-culture.

As I write these paragraphs, a delightful booklet from Mozambique has arrived: *Sipatsi: Technology, art and geometry in Inhambane*, by Paulus Gerdes and Gildo Bulafo. This analysis of Mozambican handbag patterns, with its detailed suggestions of educational and mathematical explorations for, say, a "geometry and symmetry" course -- anywhere in the world -- might have been designed as living refutation of the absurd British journalist's shallow and unthinking perception of ethnomathematics and its history.

On my recent visit to Portugal I was pleased to discover so much interest in using history in the mathematics classroom. One aspect of this is a pride in the great navigational triumphs of the past, and sharing these afresh with each youthful generation. But of course the schoolrooms of Lisbon, like those of London or New York, are increasingly populated by children whose ancestors came from Africa and elsewhere: the forebears of a Lisbon child -- in some areas of Lisbon -- are almost as likely to have been Mozambican basket-weavers as pilots for Henry the Navigator. This has consequences for mathematics education; and problems, perhaps, which the HPM movement is well-placed to help solve through its international experience, knowledge and contacts.

My visit to Portugal was in connection with the 1996 HPM meeting in Braga: 26-31 July 1996. This is our major meeting which takes place every four years as a satellite of ICME, the International Congress of Mathematics Education. ICME is in Seville, Spain, in July 1996, and our meeting in northern Portugal takes place after that. The themes of our conference are likely to include navigational mathematics and the age of discoveries, historical support for the mathematical needs of minorities, and a detailed exploration of various non-European mathematical cultures.

We are hoping that many participants at ICME will stay on for HPM, particularly considering that for many the air-flight to Europe will be the major cost of attending the Congress. The University of Minho -- in a delightful setting in a very beautiful part of Portugal -- is offering most generous terms for board and lodging, because the government and the university authorities are very supportive of our kind of event. The HPM organisers are trying to raise money for supporting the stay of teachers from countries far from Portugal. Only if this can be achieved will we be able to benefit from the experience of teachers whom we usually cannot meet for reasons of international economics.

The Braga meeting is in fact two meetings in one: a further dimension is that it will be the second European Summer University (following on last year's most successful Montpellier meeting). Among the implications of this -- apart from its being an even richer meeting intellectually, with even more participants -- is that we hope that a main back-bone of the meeting will be a series of introductory lectures on the history of mathematics. This is one of the great needs expressed by teachers when they are just beginning to find out about the history of mathematics.

1996 may seem a long way off now, but will come upon us all too quickly! It is worth giving a little thought to your future hopes and travel plans, even while contemplating all the exciting and rewarding meetings that are scheduled in the meantime, notably Blumenau this summer and Cairns next year.

Americas Section of HPM Meeting in Indianapolis

Erica Voolich

The Americas Section of HPM met in conjunction with the National Council of Teachers of Mathematics (NCTM) Annual Meeting in Indianapolis, Indiana on 15 and 16 April 1994.

Frank Swetz (Penn State Harrisburg) spoke on "History and Pedagogy: Historical Connections." He gave examples from old mathematical works which provided insights into the evolution of good pedagogy. He identified several instances of historical mathematical pedagogy and discussed their implications. Diane

Mason (Northeast Missouri State University) spoke on "Exploring the Tree of Mathematics." She pointed out that mathematics is like a tree grown by God which mankind has been invited to explore. Many heroes of mathematics have explored portions of the tree, some climbing to higher branches than their predecessors and others exploring adjacent branches. She spoke about having students explore this tree of mathematics as a genealogist explores a family tree not just by name and date but also by characteristics. Students should see the leaves grown on the branches as individual theories and results discovered by mathematicians who have explored the tree before them. Students should see the tree from the eyes of these mathematicians and sense their frustrations and disbelief of their own discoveries to realize this is a normal part of the exploring mathematics. Students should realize mankind's knowledge of the tree is still growing and there is still much mathematics to be explored.

Mary Houston (Fauquier County Public Schools, VA) spoke on "Enhancing Today's Mathematics Classroom Using Ancient Games from Various Countries." This was a collection of mathematics related games which have been played in various countries for centuries and have a historic link to the past. A few of these games and their rules have been rediscovered in the past ten years with the joint cooperation of archaeologists, scientists, and mathematicians. These games not only provide a historical perspective on how the people of these countries spent their leisure time but also provide crosscurricular connections for the enhancement of mathematical skills/strategies taught in the classroom today. Barnabas Hughes (California State University, Northridge) spoke about "Newton's Derivative Unveiled." He pointed out, perhaps with tongue in cheek, that Isaac Newton wrote about what we call the derivative in a way that lends itself to a physical representation of the derivative that Hughes demonstrated.

Claudia Zaslavsky (New York) gave a slide presentation and talk on "Patterns in African Culture." She demonstrated how many African cultures incorporated repeated patterns into architecture, textiles and everyday objects. She indicated how the topics can be introduced into the curriculum at elementary, middle and secondary grade levels. Gloria Sanok (Packanack School, NJ) gave a slide presentation and talk on "Math and Islamic Art." She demonstrated how Islamic art can provide students with a visual and intuitive introduction to the study of the concepts and principles of geometry. Both mathematics and art are human creations. They are greatly influenced by culture. One of the finest manifestations of the Islamic civilization is its art.

At the business meeting the constitution was approved. The following officers were elected: Charles Jones (President), Erica Voolich (Vice President), Karen Dee Michalowicz (Secretary), Sherry Cox (Treasurer), Victor Katz (Newsletter Editor), and Barnabas Hughes (Historian). We agreed to continue the process of becoming formally affiliated with NCTM. Karen Dee Michalowicz will take care of this. We agreed that it is time to begin collecting dues to support the organization rather than rely on the generosity of people and institutions. The dues were set at \$10 per year. Sherry Cox will take care of setting up the formal membership structure. Checks made out to HPM should be sent to her at 532 C Fleetwood Ct., Kingsport, TN 37660. She can also be reached by email: slcox@aol.com. (Until arrangements for foreign exchange from the remainder of the Americas can be worked out, this dues structure only applies to members in the United States.) A friend of Barnabas Hughes has agreed to cover our basic expenses for this year. Erica Voolich has agreed to put the program together for the annual meeting in 1995 and will act as delegate to the next NCTM meeting which will be held in Boston. We agreed that we would join the International HPM in sponsoring the HPM meeting in Blumenau, Brazil in July 1994.

From the President of the Americas Section

Charles V. Jones

The study of the connection between history and pedagogy is not yet a discipline. History often facilitates both teaching and learning mathematics, but no broad agreement on the utility of history in pedagogy exists. The relationship remains at best intuitive, personal and anecdotal.

HPM can help change this situation. The pedagogy of mathematics is undergoing critical reevaluation. As a deeper understanding of the complexity of learning emerges, an opportunity to more closely link history also emerges. Learners need to be actively engaged in their learning so they know mathematics as an experimental science. To achieve this kind of learning, students need to appreciate the essential role of guessing -- especially of guessing wrong -- and to be provided feedback on their progress. They need to see

mathematics in the context of their own needs, thereby exercising ownership of the mathematics they study.

All of these features of learning can be found in the history of mathematics. The historical process of mathematics consists of trial-and-error activities in finding solutions to problems. New developments in mathematics appear in context, whether that context be an analogy to levers by Archimedes, or a conjecture of Fermat or Goldbach, or the computational complexity of a nonlinear dynamical system. Culture provides even deeper contexts from broader imperatives, such as warfare, commerce, aesthetics, and the like.

I have been intrigued, as have many others in HPM, by the parallels between history and pedagogy -- how introducing history seems to motivate mathematical learning. Can the similarities between the processes of history and the processes of learning be systematically explored? Can a framework be constructed for linking history and pedagogy? Can a theory be constructed that goes beyond the surface phenomenon that intrigues us?

I think such a theory is worth pursuing. A model that, in my view, holds great promise derives from information theory. Aristotle said that history is idiosyncratic. We now have mounting research that confirms that learning by individuals is idiosyncratic. And certainly we know that the cultures in which learning occurs are idiosyncratic. In spite of the respective idiosyncrasies, however, they share an important feature: pedagogy, history, and cultures *progress by bringing a higher degree of organization to information*. Could it be that information theory -- the organization of information -- is the *sine qua non* of history and pedagogy? I have been getting new insights about history and learning by exploring this model.

Whether this information-based model bears results, I think that the process of looking for some theoretical structure is the right direction to take. Perhaps some other analogy or metaphor can generate a disciplinary approach. Whatever the model, it should be possible to establish more clearly how the small, historical steps have been made in developing mathematics and then to interpret these steps into our understanding of the processes of learning.

Such a goal could be the mandate of the International Study Group on the Relations Between History and Pedagogy of Mathematics. The important prerequisites for success are in place: communication networks among scholars. Through our *Newsletter* and at our meetings (which occur regularly) a discussion would identify issues, sharpen concepts, communicate results, and thereby give rise to a direction (or several directions) for scholarship. Research in pedagogy and history, reflections on teaching and learning experiences, case studies, theory and practice would all become part of the "study of the relations between the history and pedagogy of mathematics."

From the Editor

Victor J. Katz

The *Proceedings of the 7th International Congress on Mathematical Education*, recently published in two volumes by Les Presses de L'Université Laval, contain much of interest to readers of this *Newsletter*. In particular, they contain summaries of the discussions of all of the working groups at ICME7. In light of Charles Jones' ideas above, it is of interest to read the second paragraph of the material from Working Group 13, which dealt with "The Place of Algebra in Secondary and Tertiary Education":

"Anna Sfard, who provided a retrospective on the history of the development of algebra and then showed how this history can be used as a source of insight on the learning and teaching of algebraic concepts, focused on some recurrent phenomena in the development of abstract ideas. She looked at turning points in the formation of algebraic thinking: the transition from arithmetic to rhetorical and syncopated algebra, the introduction of algebraic symbolism, and the emergence of abstract algebra. These turning points were examined not only for the mechanisms which put such developments into motion but also for the nature and the source of the cognitive difficulties which invariably surface whenever a crucial step forward is to be made. The point of departure for this pattern-finding is her theoretical model according to which the formation of mathematical knowledge is a more or less cyclic process -- a process in which transitions from one level to another follow some constant course. In this particular scheme, mathematics is viewed as a hierarchy in which what is conceived operationally, namely as a computational process, on one level is reified into an abstract object, or conceived structurally, on a higher level. Sfard's psychological observations

were reinforced with data coming from a wide range of empirical studies."

The complete text of Sfard's remarks in the Working Group, as well as the entire discussion to which they led, will be published in the book *The Place of Algebra in Secondary and Tertiary Education*, edited by Carolyn Kieran. As Charles notes, it is these kinds of studies for which HPM could well be a forum. If any reader has references to similar studies of how the understanding of history is critical in the learning and teaching of other mathematical concepts, especially studies based on empirical data, please submit them to the editor for publication in future issues.

HIMED 94

Peter Ransom

HIMED 94 was superb. From lunch on Monday to after lunch on Thursday the atmosphere was electric: 70 people, including 26 from abroad, doing and discussing mathematics. The conference struck just the right balance between plenary and workshop sessions. Together with the other aspects -- an excellent exhibition of history work in the mathematics classroom (thank you, Ray Godfrey!), a book display on related topics ably managed by Costel Harnasz, highly appropriate late night movies (Stand and Deliver, a blockbuster of a film that had its audience on the edge of their seats over the result of a maths test, was shown on the second evening), the exhibition of fine mathematics books in Winchester College, and Helen Gardner's rich and exemplary maths trail -- the meeting left me feeling mentally refreshed and charged with many exciting ideas.

On the first evening Frank Swetz gave a plenary talk on The Chinese derivation of the volume of a sphere. To keep people awake after a busy day and a great evening meal (and when one has just flown in from the USA) is no mean achievement. I had recently read an article of Frank's in *Mathematics Teacher* (National Council of Teachers of Mathematics), so was not unprepared for the skilful blend of history and pedagogy; his talk had just the right & helpful balance of readable overhead transparencies and audience participation. (By the way, the answer to the question that might be in your mind is that $V = (9/16)d^3$ was an early Chinese result.)

The HIMED programme provided five workshop sessions, each of 90 minutes, in which there was a choice of up to six strands:

- instruments and trigonometry
- ethnomathematics and multicultural mathematics
- teacher training and educational issues
- art and mathematics
- recreational mathematics as heuristic motivation
- mathematics for equal opportunities

My interest lay mainly in the first strand, as in the past I have used old instruments (sundial, cross staff, quadrant and sextant amongst others) to enhance the teaching of geometry. This year I cast the net further: Statistics from the Stone Age was my offering, and with the help of my collection of flint implements, participants set up a database, did some statistics (well, they would have done had there been more time), and finished by making some flint tools of their own.

What made the conference so excellent was the variety of activities. Various sessions offered ideas for the 11-16 classroom. One superb example of this was given by Marjolein Kool of the Netherlands. She spoke on Sixteenth-century mathematics in the twentieth-century classroom, outlining the reasons why she used this approach and at which stage in the process of learning mathematics the historical themes are best used. Several examples from a 1568 manuscript of Peter van Halle were examined. These had been used in a Dutch primary school. Problems taken from history are useful at any stage provided that the teacher puts them in a good didactical framework: they serve best as open problems, which provoke pupils to develop their own strategies, to discuss and evaluate different methods and to be creative. Marjolein also led a workshop in which we used a practical experiment to get data. This was based on Archimedes' calculation of the amount of gold in King Hiero's crown. (Remember how Archimedes ran naked down the street crying Eureka!/? Thank goodness we didn't have to repeat that part of the experiment.) By finding the volume of water displaced by 100 g of gold (actually clay), silver (actually gypsum), and the "crown," we calculated the

amount of gold in the crown.

The best double act I have seen this decade was the presentation by Eduardo Veloso and Ana Vieira from Portugal. I attended their second session, concerning the use of the cross-staff and other navigational instruments of the Age of Discovery. When we were put in the situation of having to calibrate a cross-staff in the 15th century instrument maker's shop, because we were the senior apprentice and our master was off ill (too much vinho verde?) we really had to think how to apply our basic mathematics to a practical situation. To be allowed to take our instruments away with us was a privilege, as they had been prepared from oak: I have used my cross-staff since for finding the altitude (or declination) of stars while trying to improve my basic astronomical knowledge. The worksheets, materials and books on the voyages of discovery that were distributed ensured that those present went away with far more than simply feeling they had experienced something special. Portugal should be proud of her ambassadors!

Nor was this the only outstanding Portuguese session. A different kind of workshop was Maria Fernanda Estrada's "How to use history of maths in the education of teachers: a pedagogical experience." Sometimes you go to a session not knowing what it will be like, and still come away disappointed; this was not one of those! The somewhat dry and uninformative abstract had not at all prepared me for the liveliness and fun of a session that almost took my breath away. Maria Fernanda explained how she encouraged prospective mathematics teachers to introduce some history into their mathematics teaching. We saw on video some of the all-singing all-dancing (literally) lessons we wish we had the time to plan. Some of her students had organised historical playlets to introduce some mathematics, others had organised exhibitions in local libraries with the help of their pupils, and there was even a ballet written and performed about 9! Maria Fernanda is the local organiser-in-residence of the HPM meeting in Braga, Portugal in July 1996: on the evidence of this session it is going to be a romp.

The last workshop I attended was another double act, from the Netherlands this time: Gerry Verhaegh and Anko Haven describing their experiences with Babylonian mathematics in the European classroom. These two Dutch teachers authored some of the material for the Nuffield A level history of mathematics option, and very exciting material it is: they have an admirable knack of dealing with the pupils on just the right level of seriousness and involvement. It was very pleasant to have the opportunity to work on some of these questions, and hear Gerry and Anko explain the reasoning behind what they hoped students would achieve.

At other times we had the sessions that made you really think about what and why we teach what we do. Jan van Maanen (also from the Netherlands) gave a stimulating plenary talk entitled "Must mathematical progress mean the loss of geometrical insight? A moral for teachers." He explained how looking at seventeenth- and eighteenth-century mathematical developments helps us to understand modern issues in mathematics education. Something which concerned Christiaan Huygens was the danger that new mathematical developments such as the calculus produced answers very effectively but at the expense of understanding the underlying geometry. Do we see the same thing happening in the twentieth century with the use of calculators?

A plenary perspective which also made us think was that of Bob Burn, from Exeter, who gave an entertaining session on "History for the anti-history teacher." This had a lot of people reflecting (often hilariously) on examples from the past, and helped set the mood for the conference through talking such good sense with a wicked sense of humour.

Another highlight of the conference was a speaker who had come further even than Frank Swetz. Ubiratan D'Ambrosio arrived in this country from Brazil on the very day there was an extraordinarily confused attack in *The Observer* on modern mathematics education, and on Ubiratan's field of expertise, in particular, Ethnomaths. This is the maths we pick up by chance in day-to-day life, said to be as valid, if not more so, than the maths we're taught in school. So a lot of people were eager to hear what he had to say. This plenary re-emphasised the crucial importance -- despite the fears of *The Observer's* columnist -- of ensuring our mathematics is relevant to people's needs. How (and what) would you teach a Brazilian street child that came to your mathematics classroom only sporadically? "It follows," wrote the *Observer* columnist in ironic mode, "that classroom teaching merely confuses and demoralises the pupil." But we can look around us and see mathematics throughout our culture. If we can communicate the love and use of mathematics in ways

that are seen to be relevant to the user then we go some way to solving something more than just a mathematical problem.

It was a pity this conference had to end, but congratulations to the organisers -- programme organisers Pat Perkins and John Fauvel, and local organiser-in-chief Irith Shillor -- for putting together a much appreciated programme and memorable conference. Where is the next HIMED to be?

Oude Wiskunde in Modern Onderwijs

Jan van Maanen

The official title of this meeting, held on June 4, translates as "Old Mathematics in Modern Teaching," which is rather nice. It was a one day meeting organized by the Dutch "Working-Contact for the History and Social Function of Science" and held at the University of Utrecht. The meeting was attended by about 100 individuals, 100 being the maximum capacity of the lecture room. In the audience were mostly school teachers, but there were also a few university faculty.

John Fauvel, of the Open University in England, spoke on "Hé nee, niet alweer die ouwe zool! The value and the use of history in teaching mathematics." Using the history of mathematics in the classroom is not a recent fad -- J. L. Lagrange was a great advocate. After Fauvel enumerated the many ways history can be used in the classroom, he pointed out that the teacher is critical for the success of the project. Both her knowledge and her confidence are vital. He gave examples of how history can be adopted to the locale where the teacher and students come from (from Newton in England to Bernoulli in The Netherlands). But also history can give lessons to individual students, from blind students idolizing Saunderson and Euler, to gay students having Hardy and Turing as models, to Black students following in the path of Bankeer and Muhammad ibn Muhammad.

After Fauvel's talk three parallel 75 minutes workshops were held: Marjolein Kool (Domstad Polytechnic, Utrecht) on "The height of towers in the 16th century" (about how to rework historical problems so that you can use them in teaching, with examples from 16th century manuscripts, explaining different methods to measure heights), a workshop moderated by Jan van Maanen (University of Groningen) under the title "How to start, where to search, and what wheels have already been invented" (several participants presented work they did in using history to teach mathematics; also methodological problems were discussed) and a workshop about "How does the teacher learn it" led by Thijs Notenboom (Faculty of Education, Utrecht Polytechnic), in which the course material of Utrecht Polytechnic was presented and samples of it were worked through.

During lunch there was a display of secondary sources on the history of mathematics. It included a course for adults based on historical materials (Paul Tempelaar), a collection of mathematical stamps (Hessel Pot), and many books in a variety of languages. This material was appreciated by all.

Fred Rickey (Bowling Green, Ohio) presented "History: A vital tool for the calculus teacher." He presented ideas on teaching that he has used himself, including how to use historical materials on the first day of the term, the mistake that Leibniz made about the product rule, the development of the logarithm that originated with Gregory of Saint Vincent in 1647, and Torricelli's ingenious computation of the volume of the solid obtained by rotating the hyperbola around the x-axis. His presentation was illustrated with many title pages and pictures.

V Coloquio Internacional de Filosofía e Historia de las Matemáticas

This Fifth International Colloquium on the Philosophy and History of Mathematics took place from June 6 to June 17 at UNAM in Mexico City. The first week of the meeting consisted of three courses: Philosophy of Mathematics, by Dr. Francisco Rodríguez-Consuegra (Universidad de Barcelona, España); History of Mathematics, by Dr. Alejandro Garcíadiego Dantan (Universidad Nacional Autónoma de México, México); and Pedagogy of Mathematics, by Dr. Luz M. Santos (Depto. de Mat. Educativa, CINVESTAV, IPN, México). The second week of the meeting contained research talks in the history and philosophy of mathematics. A fuller report on the meeting will be included in the next *Newsletter*.

CSHPM in Calgary

The Canadian Society for History and Philosophy of Mathematics met in Calgary, Alberta from June 8 - 10. The keynote speaker was Karen Parshall (University of Virginia), who spoke on "The Emergence of the American Mathematical Research Community: 1876-1900." Two other speakers also contributed to the theme of the special session on the history of mathematics in the United States and Canada: Thomas Archibald (Acadia University) presented "Some Highlights of the History of Mathematics in Canada prior to 1945" and Louis Charbonneau (Université du Québec à Montréal) spoke "De l'École polytechnique de Montréal au département de mathématique de l'Université de Montréal (1873-1920)."

Among the other speakers were Katherine Hill (University of Toronto), "Oughtred's *Clavis Mathematicae* and the Introduction of Algebra into England;" James Tattersall (Providence College), "The Early History of the Lucasian Chair;" Jacques Lefebvre (Université du Québec à Montréal), "Noël Durret's Contribution (1644) to the Diffusion of Viète's Analytic Art in France;" Gregory H. Moore (McMaster University), "The Origins of Vector Spaces and Modules;" Thomas L. Bartlow (Villanova University), "Errors in History of Mathematics Textbooks -- The Case of the Petersburg Paradox;" Glen van Brummelen (The King's University College), "From Drudgery to Invention: Astronomical Computation in Medieval Islam;" M. A. Malik (Concordia University), "Mathematization of Mootion from Ancient to Renaissance Times and the Beginning of the Calculus;" and R. Rajagopal (York University), "Indian Mathematics after Islamic and British Occupations."

International HPM Meeting in Brazil

There will be an international meeting of HPM in Blennau, State of Santa Catarina, Brazil, to take place July 25-27, 1994. The host will be the Fundação Universidade Regional de Blumenau (FURB). The organization is part of the program of activities of the Seminario Nacional de Historia da Matematica, housed at the Universidade Federal do Parana, in Curitiba (see *Historia Mathematica* 20 (1993), 318-319). The meeting will take place the week following the II CIBEM (Segunda Conferencia Iberoamericana de Educação Matematica), which occurs July 18-22, also in Blumenau.

Blumenau, with 270,000 inhabitants, is a prosperous industrial city in the South of Brazil, founded in 1850 by German immigrants, and also a renowned touristic center. Its Oktoberfest attracts tourists from all over the world. Blumenau is located about 700 km south of São Paulo. It is served by the airport of Navegantes, about 50 km east of Blumenau. There are several daily flights between São Paulo and Navegantes and a good and frequent interstate bus service between São Paulo and Blumenau. Comfortable night buses offer sleeping chairs. Weather in July is winter, but mild, sometimes showing beautiful sunshine during the day and going down to about 40°F in the evenings.

Although the program has not been finalized as of this writing, among the speakers will be George Booker (Australia), John Fauvel (U.K.), Florence Fasanelli (U.S.A.), Israel Kleiner (Canada), and Ubiratan D'Ambrosio (Brazil). The program of the International HPM Blumenau Conference will include invited plenary talks, concurrent hour and half-hour talks, poster presentations (with rooms for further discussions), and books and project exhibits. The Proceedings will be published. At registration, a book of abstracts will be provided. A fee of US \$20 will be collected at the registration desk, open from 4:00 pm on July 24 at FURB, Rua Antonio da Veiga 140, 89010-971 Blumenau, SC, BRAZIL; tel: (55) 473 26 8288; fax: (55) 473 22 8818.

Conference on History of Mathematics in Honor of Boris Rosenfeld

A conference on the history of mathematics in honor of Boris Rosenfeld's 77th birthday will be held on August 27-28, 1994 at Pennsylvania State University, University Park, PA. The focus of the conference are Professor Rosenfeld's specializations in research in the history of mathematics, including in particular the history of geometry and the history of mathematics in the medieval Islamic world. Boris Rosenfeld himself will be the featured speaker. Invited hour speakers are Sergei S. Demidov and Jan Pieter Hogendijk. Other speakers include Francine F. Abeles, Mohammed K. Azarian, Thomas Drucker, Charles Duffy, Charles E.

Ford, Bernard Goldstein, Edward S. Kennedy, Ronald Sklar, and E. R. Suryanarayan. A collection of conference papers will be published in Modern Logic Publishing's new MLP Books series. For more information, contact the program chair, Dr. Irving H. Anellis, Modern Logic Publishing, Box 1036, Welch Ave. Station, Ames, IA 50014-1036, U.S.A.; email: fl.mlp@isumvs.iastate.edu. For general information on local arrangements, contact Prof. Svetlana Katok, Department of Mathematics, Pennsylvania State University, University Park, PA 16802-6401, U.S.A.; email: katok_s @ math.psu.edu.

Third International History, Philosophy and Science Teaching Conference

The Third International History, Philosophy and Science Teaching Conference will be held at the University of Minnesota, Minneapolis, from October 27 to November 1, 1995. It follows the very successful First conference held at Tallahassee in 1989 and Second conference held at Kingston in 1992.

The local organizing group comprises Fred Finley and Pat Heller from the Science Education Unit, University of Minnesota, Roger Stuewer and Alan Shapiro from the Minnesota Centre for the History and Philosophy of Science, and David Rhees and Nahum Kipnis from the Bakken Museum of Electricity and Medicine, Minneapolis. External advisors include Jere Confrey (Cornell University), Skip Hills (Queen's University), Ken Tobin (Florida State University), Fabio Bevilacqua (Università de Pavia), and Michael Matthews (University of New South Wales). The conference will be held in association with the U.S. History of Science Society's annual conference, occurring October 26-29, 1995.

The conference organizers are particularly keen to encourage the production of units of work and lessons in the sciences and mathematics that incorporate historical and philosophical themes. These can be for elementary, secondary, or college level classes. It is anticipated that one stream of the conference will be concerned with pedagogical and resource matters.

The organizers also encourage the various international and U.S. groups that have interests in the role of HPS in science, mathematics and history teaching to use the conference as an occasion to present their work and to consolidate networks.

Paper proposals should be sent to, and information about the conference can be obtained from, Professor Fred Finley, Department of Curriculum and Instruction, University of Minnesota, Minneapolis, MN 55455-0208, U.S.A.; fax: 612-624-8277; email: finleyfn@vx.cis.umn.edu. To be put on the conference mailing list, send full name and address to Fred Finley.

Report from Cuba

Robert Rosenfeld

This past March I visited the University of Havana, where I met Gilberto Diaz Santos, a profesor who teaches English to students majoring in mathematics. His course makes use of specially prepared readings which are intended to be typical, both in words and use of symbols, of what math majors might encounter. In particular, he likes to use readings from the history of mathematics. Professor Diaz Santos is currently revising the selection of readings as well as adding new exercises appropriate for language students. If any readers have material they think might be helpful to him, I know he would be happy to hear from them. His address is Prof. Gilberto Diaz Santos, Faculty of Mathematics, University of Havana, San Lazaro y L, C. Havana 10400, CUBA. One consequence of the economic situation in Cuba is that email is not currently reliable at the university; phones are often dead and there is no money to pay for some of the required links. This situation changes frequently and unpredictably. If it is more convenient to use me as an intermediary, I can be reached at RR1, Box 3063, Plainfield, VT 05667.

Proyecto de Trabajo

Tomando en cuenta la reciente revolución que ha sufrido la historiografía de las ciencias matemáticas griegas, a través de los trabajos de Wilbur Knorr y Sabetai Unguru, entre otros, los editores de la revista *Mathesis* se propusieron editar un fascículo de *Mathesis* dedicado a la historia de esta disciplina. Una primera lista de fuentes secundarias que debían estar incluidas en dicho fascículo comprendía más de 30 referencias. Dado el carácter interdisciplinario de *Mathesis* dentro de las propias ciencias matemáticas, era

obvio que sus editores no podían dedicarle un espacio exageradamente amplio a un tema únicamente y olvidar el resto de las ramas de las matemáticas.

Como consecuencia, el proyecto original se transformó en una empresa muchísimo más ambiciosa, pero no por ello impostergable: la publicación en español de una *Enciclopedia para la Historia y Filosofía de las Ciencias Matemáticas*. Bajo este marco conceptual, se tiene contemplado publicar una enciclopedia de quince volúmenes dedicados al desarrollo histórico y filosófico de las ciencias matemáticas. La *Enciclopedia* estará dividida en períodos cronológicos generales: Matemáticas en la Antigüedad, Matemáticas Medievales, Matemáticas Renacentistas, Matemáticas Modernas y Matemáticas Contemporáneas. Cada uno de estos períodos cronológicos estará cubierto en tres volúmenes. El primero estará dedicado a una compilación de las obras originales producidas por los matemáticos más representativos del período en cuestión. El segundo de los tomos estará compuesto por los trabajos de reconstrucción y análisis llevados a cabo por profesionales contemporáneos. Estos trabajos -- de treinta cuartillas aproximadamente cada uno de ellos -- estarán dirigidos al público en general y no al especialista. Y finalmente, el tercer volumen consistirá de una amplia y detallada bibliografía sobre el tema.

Cabe mencionar que este proyecto no sería posible sin el financiamiento de la Dirección General de Asuntos del Personal Académico (DGAPA) de la Universidad Nacional Autónoma de México. El proyecto es dirigido por el Dr. Alejandro Garcíadiego Dantan, en colaboración con los Drs. Thomas Archibald (Acadia University, Canada) y Francisco Rodríguez-Consuegra (Universidad de Barcelona, España). Se buscará integrar un consejo editorial formado por especialistas en el tema para cada uno de los períodos cronológicos en cuestión. La primera fase, que comprende los volúmenes de matemáticas en la antigüedad, se dará a conocer públicamente en agosto de 1995.

Informes: Dr. Alejandro Garcíadiego Dantan, Cubículo 016, Departamento de Matemáticas, Facultad de Ciencias, UNAM, 04510 México, D.F., MÉXICO. Teléfonos: 616 25 85; 622 48 58 ó 622 48 60; Fax: 622 48 59 ó 616 04 51; Correo-E: Gardan@redvax1.dgsca.unam.mx ó Mathesis @ unamvm1.dgsca.unam.mx.

The HPM Movement in Portugal

Eduardo Veloso

In the *Newsletter* of July 1993, John Fauvel raised the questions: "Where are we going? ... Are we a small band of isolated enthusiasts or the tip of an ever-expanding tree?" I would like to point out some Portuguese facts that perhaps could answer partially these important questions.

- Since the beginning of 1990, the *HPM Newsletter* has circulated in Portugal, and the number of teachers receiving it has been growing steadily.
- Last year, in April, a working group on History and the Teaching of Mathematics (GTHEM) was launched in the Portuguese Association of Teachers (APM). The major aims of this group are the exchange of experiences on using history in the mathematics classroom and to help teachers in their efforts to integrate the history of mathematics in their teaching. For instance, teachers can write and ask for documentation or advice concerning a specific topic in the History of Mathematics.
- Two groups of mathematics teachers, one in Lisbon and another in the north of Portugal, organized a 2-year program of studies in History of Mathematics and their integration in the classroom. As a main support of the program, they are using the 17 units published by the British Open University and the source book, *The History of Mathematics, A Reader*, by John Fauvel and Jeremy Gray. Activities for the classroom will be prepared and discussed collectively by the teachers and will be tested and used in their classes.
- Around 25 Portuguese teachers attended the First European Summer University on the History of Mathematics in Montpellier last July. It was the largest foreign delegation.
- The *Primeiro Encontro Luso-Brasileiro de História da Matemática* was organized in Coimbra, Portugal (from 29 August to 2 September 1993) by the *Seminário Nacional de História da Matemática*, founded in 1988 by the *Sociedade Portuguesa de Matemática*. Since its foundation, the Seminário has organized several meetings with the participation of foreign researchers, like Ubiratan d'Ambrosio, Christian Houzel, Jean

Dhombres, Ivor Grattan-Guinness, and Eduardo Ortiz. This *Primeiro Encontro Luso-Brasileiro* was attended by more than one hundred researchers and teachers from Brazil and Portugal and, through presentations of papers, panels, and even short-duration courses, allowed a good exchange of ideas about the research that is being carried out in both countries and the perspectives of cooperation between researchers from both sides of the Atlantic, including the African countries where Portuguese is the official language.

· In July 1996, the ICME-8 Satellite Meeting of HPM and the Second European Summer University on History and Epistemology in Mathematics Education will take place in Braga, Portugal. We are expecting that hundreds of researchers and teachers will meet during one week in this nice town in the north of Portugal. We are beginning the preparation of this event, and surely, in 1996, we will be able to answer more concretely the questions of John Fauvel.

Why Study History of Mathematics

The following is a synopsis of remarks made by Professor R. C. Gupta on the occasion of his election as President of the Association of Mathematics Teachers of India.

A study of any type of history in general may satisfy one of the human curiosities. Through it one gets a glimpse of what happened when and where, and possibly why it happened that way. Who discovered the so-called "Pythagorean Theorem"? Certainly the Greek mathematician Pythagoras (6th century B.C.) was not the first discoverer as the theorem was known in Babylonia, China, and India earlier than his time. For the advancement of our civilization in this age, it is important to know and understand how science progresses. A study of the history of science is the best way to find this knowledge and understanding and also the best way to make science comprehensible as a human enterprise to science students and the public at large. Mathematics has always played a significant key role in the development of science and technology. Thus the history of mathematics is an important component of the history of civilization. Through it one is able to trace the line of intellectual development in the world.

The present stock of scientific and mathematical knowledge has not dropped as a bolt from the blue. It is the result of centuries of efforts, often painful, by hundreds of our scientists and mathematicians through the ages. It is our moral duty to remember and respect them all. Through the study of the history of mathematics, one can also correct a lot of miscredits, since the study often shows that many results and formulas are not named after the true discoverers. For instance, the series (now called the Madhava-Gregory Series) was known in India about 250 years earlier than in Europe.

Mathematics is an art as well as a science. The study of the history of mathematics in itself is a fascinating pursuit. Stories and anecdotes related to the discoveries or inventions in mathematics are quite exciting several times. Have you heard of the third diagonal of a cyclic quadrilateral? And of how Indians discovered it; and then used it successfully?

A sound knowledge of the history of mathematics will enable one to have an idea of the relations which existed between various branches of mathematics, and between mathematics and other subjects as well as between mathematics and social forces. By reading historical surveys in various areas of mathematics, one can have an idea of the enormous developments taking place in the subject. Other methods to fight this ignorance will not be so easy.

A knowledge of the history of mathematics will save us from repeating errors made in the past, and from wasting time on solving the problems which have been proved to be unsolvable long ago. At the same time it will show that mathematical development is the result of human endeavor and not of instant divine magic. Mathematicians have struggled hard for about 350 years to prove Fermat's Last Theorem before the ripening of the fruit.

The most important benefit from the sound knowledge of the history of mathematics is that it increases the understanding of mathematics itself. Through it one can know more clearly as to how and why mathematics is created, grows, develops, changes, is generalized, and abstracted. It will complete the mathematics teacher's mastery of the subject and will provide him with new opportunities for a deeper and more intuitive grasp of his topic. Teachers of mathematics will have better insight into the subject and will realize that the historical sequence is an excellent guide to pedagogy. Their many unanswered questions are answered by the

history of mathematics.

Consequently classroom teaching will be more interesting, lively, and useful. Students will feel motivated for learning. They will not find the subject dull and frightening. They will find that study of the history of mathematics is fascinating, and it will stimulate them to investigate further. Weak students will feel less badly discouraged over their ordinary mistakes when they note that even great mathematicians had slips. Aryabhata I gave the volume of a pyramid as half the product of the area of the base and height, and Euler stated the incorrect result by summing the two geometric progressions. For its own sake also the study of the history of mathematics is necessary for mathematics. The study will create an understanding of the nature of and role played by mathematics, which is needed to assure the subject due attention and proper position in the curriculum. It is therefore said that "no subject loses more than mathematics by any attempt to dissociate it from its history."

There is heuristic value of the history of mathematics in helping to make new findings. Historical knowledge gives a perspective and is an essential background for research. History of mathematics can be considered as a method of research and a process which may sometimes lead to modern mathematics. Failures of past mathematics have often led to major discoveries by other mathematicians.

The study and use of the history of mathematics provides many benefits including answers to chronological whys, logical whys, methodological whys, pedagogical whys, and even philosophical whys.

Science Teaching: The Contribution of History and Philosophy of Science

This new book by Michael Matthews of the University of New South Wales, Australia, argues that science teaching, and science teacher education, can be improved if teachers know something of the history and philosophy of science, and if the science curriculum includes the historical and philosophical dimensions of topics. Further, the history and philosophy of science has an important role in many of the theoretical arguments that science educators need to address. Its ten chapters deal with The Rapprochement Between History and Philosophy of Science and Science Education; Debates about the Science Curriculum; Contemporary Curricular Developments; History of Science in the Curriculum; Philosophy in the Curriculum; Pendulum Motion: The Use of History and Philosophy in the Classroom; Constructivism and Science Education; What is Science?: Realism and Empiricism; Multicultural Science Education; and Teacher Education. Among the prepublication comments: "What an incredible piece of work! ... I hope that it receives the attention it deserves from teachers as well as scholars... It stands alone in the field for its grand sweep and rich detail." (Dr. F. James Rutherford, director of AAAS Project 2061) "The most complete and up-to-date introduction to the field ... The bibliography is itself an extraordinary resource and will be appreciated by both newcomers and professionals in the field." (Professor Fabio Bevilacqua, Università de Pavia) "It not only fills a major gap in the current literature of science education, but is also delightful to read. Every reader in science education will come away with new insights... The book is sure to be a wonderful resource for science educators." (Professor Jim Wandersee, Louisiana State University). The book may be ordered from Routledge Publishers, New York (phone: 212 244 3336) at a price of US \$19.95 (paperback) or \$65.00 (hardback).

AMS-MAA Meeting in San Francisco

Among the many sessions at the annual AMS-MAA meeting to be held in San Francisco from January 4 -7, 1995, there are two which may hold particular interest to readers of this *Newsletter*. One is an MAA Contributed Paper Session organized by David Pengelley and Reinhard Laubenbacher of New Mexico State University on "Teaching with Original Sources", to be held on Thursday and Friday afternoons. The second is an AMS Special Session in the History of Mathematics organized by Victor Katz (University of the District of Columbia) and Tom Archibald (Acadia University), to be held all day Saturday.

Because teaching with original sources is becoming increasingly widespread, the MAA session will be a forum for exchanging experiences using original sources from all time periods in teaching at any level. Papers are invited which address the incorporation of specific sources in a particular instructional setting. Most presentations will be limited to ten minutes, but selected participants may extend their contributions up to twenty minutes. To submit a contributed paper send your name and address and a one-page summary of

your presentation to David Pengelley, Mathematical Sciences Department, New Mexico State University, Las Cruces, NM 88003-0001. To enable the organizers to evaluate the appropriateness of your paper, include as much detailed information as possible within the one-page limitation. Your summary must reach Professor Pengelley by September 2, 1994. He will acknowledge receipt of your summary and will advise you promptly if you have been selected to make a presentation.

The schedule for the AMS session is not yet finalized, but among the mathematicians who have accepted invitations are Judith Grabiner (Pitzer College), Barnabas Hughes (California State University Northridge), Joseph Dauben (C.U.N.Y.), V. Frederick Rickey (Bowling Green State University), Ronald Calinger (Catholic University), and J. Lennart Berggren (Simon Fraser University). Although most of the speakers will be by invitation, anyone who is interested in giving a presentation at the session should contact one of the organizers as soon as possible. Their email addresses are vkatz@udcvax.bitnet and tom.archibald@acadiau.ca.

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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