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

AN AFFILIATE OF THE INTERNATIONAL COMMISSION ON MATHEMATICS INSTRUCTION

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.

1994 December 1 - 3 Tunis
The 5th Maghribian Symposium on the History of Arabic Mathematics. (See inside for more details.)

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 February 11 Oxford
A centenary meeting to commemorate the death of Arthur Cayley, January 26, 1895, will be held in the Mathematics Institute, Oxford. Speakers include June Barrow-Green, John Coates, Tony Crilly, Maria Fernanda Estrada, Jeremy Gray, Keith Lloyd, Walter Ledermann, and Peter Neumann. For further information, contact Robin Wilson,

Faculty of Mathematics, Open University, Milton Keynes MK7 6AA, UK (phone: 0908 274066)

1995 April 3 - 5 Gregynog, Wales
Residential meeting of the British Society for the History of Mathematics. (See inside for more details.)

1995 April 6 - 9 Boston
Annual meeting of the National Council of Teachers of Mathematics and of the Americas Section of HPM. (See inside for more details.)

1995 April 19 - 23 Melbourne
This ICMI Regional Conference, entitled a Regional Collaboration in Mathematics Education, will be held at Monash University in Melbourne. The main aim of the confernce is to address the issues, problems and mechanisms concerning regional collaboration. For more information, contact Conference Secretariat, 144 Jolimont Road, East Melbourne, 3002, AUSTRALIA (Phone: 61 3 654 7533; Fax: 61 3 654 8540).

1995 June 3 - 5 Montreal
Annual meeting of the Canadian Society for the History and Philosophy of Mathematics. (See inside for more details.)

1995 June 30 - July 4 Cairns, Australia
International meeting of HPM. The theme of the meeting is ethnomathematics and the Australasian region. (See inside for more details.)

1995 July 24 - 29 Bergen
PDME III, Political Dimensions of Mathematics Education Conference, will take place in Bergen, Norway. The official languages of the conference will be English and Spanish. For further information, contact Stief Mellin-Olsen, Institutt for praktisk pedagogikk, University of Bergen, N-5020 Bergen, NORWAY (Phone: 47 5 544830; Fax: 47 5 544852; email: mellin-olsen@psych.uib.no).

1995 October 29 - November 3 Minneapolis
Third International History, Philosophy and Science Teaching Conference. (See the July issue of the Newsletter for more details.)

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

International Meeting of HPM in Blumenau, Brazil

Erica Dakin Voolich

The HPM conference, which met July 25-27, 1994 in Blumenau, opened with Ubiratan D'Ambrosio introducing the various international dignitaries who each brought greetings from their organizations. This was the opening to three days of sharing of ideas from people from all over the world.

There were many wonderful talks and fruitful discussions following each of them; some emphasized the history and some the pedagogy. I will write about attending the English-speaking sessions and Elena Ausejo will write about attending the Spanish and Portuguese sessions. Hopefully between us we will cover most, if not all, of the sessions. Two of the major addresses had a different perspective, Charles Jones's call for an HPM agenda and Ubiratan D'Ambrosio's expressed concern about the history of the future. Both asked for our taking action.

Sohindar Sachdev (Elizabeth City State University, USA) spoke of African-American mathematicians' contributions and the difficulties that have existed both for students and for professors. He called for American textbooks to include more contributions by African-American, Hispanic, and Native American mathematicians as role models for the children.

Marilyn Frankenstein (University of Massachusetts, USA) spoke on using history in teaching critical mathematics literacy. She gave examples of hidden history that is not usually found in textbooks. For example, the Incas used *quipus*; how might these have developed had the culture not been destroyed? Or what was the role of women's unpaid labor in capitalism? She talked of challenging her students to think, to question the data that they read in the papers.

Luis Saraiva (Universidad de Lisboa, Portugal) spoke on the historiography of mathematics in Rudolfo Guimaräes (1866-1918). Guimaräes was a Portuguese mathematician who extensively researched the work of Pedro Nuñes, wrote about Portuguese mathematics for the Paris Exhibition (1900), and outlined a university mathematics history course that went beyond a compilation of dates (which was in contrast to his compilation of contributions of Portuguese mathematicians). Because he was isolated, he was not very influential.

Jaime Carvalho e Silva (Universidade de Coimbra, Portugal) spoke on the history of mathematics in the classroom: hopes, uncertainties and dangers. One of the difficulties in Portugal in teaching the history of mathematics is the lack of resources in Portuguese - only Struik is available; Boyer is available in Brazil, but not in Portugal. José Sebastião e Silva wrote two of the official high sc hool textbooks in the 1950s. These were used for twenty years and included introducing concepts within a historical context when appropriate and interesting historical notes. However, once he died in 1972, there was no history in the high school books. Now it is again fashionable to include history, but it is not of the same quality because of the lack of resources. The speaker's own recently published calculus book includes historical problems, acknowledgement of theorems, and references to when the problems that drove the development of calculus arose in history. He recommended that including biographies can be boring to students. However, learning history is valuable to the teacher in gaining a fuller understanding of mathematics, and an appreciation of the errors of mathematicians will make one more tolerant of student errors. Students will gain a broader view of mathematics by learning of the contributions of mathematicians of their own country as well as of other civilizations and cultures.

Israel Kleiner (York University, Canada) spoke on the paradoxes in mathematics: history and pedagogy. A paradox is a truth standing on its head; it is an inconsistency, a misconception, a counterexample to widely held notions, a false statement that seems true, or a true statement that seems false. Paradoxes are a source of conflict and predicament that are useful in the classroom. Possible examples to use involve the development of irrational numbers, negative numbers, logarithms of negative and complex numbers, functions, power series, and the decomposition of geometric objects. Historically, definitions come at the end of the development of the concepts, not at the beginning; e.g., real numbers were used for a thousand years without any formal definition. Paradoxes can generate curiosity and hence increase student motivation. They can create an effective environment for debate. They can encourage examination of underlying assumptions. And finally, they demonstrate that faulty arguments are not absent in the community.

Abducarimo Ismael and Daniel Soares (Universidade de Maputo, Mozambique) talked about their experiences teaching mathematics history to future teachers. The issue is

not why to teach mathematics history, but how. "One can invent mathematics without knowing much of its history. One can use mathematics without knowing much of any of its history. But one cannot have a mature appreciation of mathematics without a substantial knowledge of its history." (Abe Shenitzer) "Having understood how the human race has acquired the knowledge of certain concepts, we are in a better position to judge how the human child should acquire such knowledge." (George Pólya) We need ethnomathematics and history of mathematics bound together. In Mozambique there are many local languages, but one language of instruction in school, Portuguese. There is confusion for some children because the structure of their own tongue says "14" as "10 plus 4", and they think the teacher is asking a foolish question when they are asked, "What is 10 plus 4?" The teacher who understands history will understand different ways to introduce various topics and can choose the most rational. Many of the parents have not gone to school, and yet they have a knowledge of mathematics. For example, they use samples of different woven baskets in their classes to demonstrate different geometric designs and show which is the stronger construction. We ought to be setting up studies to see if it makes a difference to use cultural materials in the classroom.

George Booker (Griffith University, Australia) spoke on constructing fraction ideas: integrating views from the past with contemporary teaching and learning. Historically, how one sees fractions affects one's ability to compute. For example, the Chinese had a decimal system which gave each place value a name based on measurement; this actually delayed their use of decimals with the whole number system. There is a cognitive leap from a system based on counting to one of fractions. You need fraction words in the language in order to deal with fractions. Historically, one approach is to use smaller and smaller units and avoid fractions altogether. For example, when Australia switched to the metric system, most lengths became measured in millimeters. Our view of Egyptian fractions is that of "unit" fractions. However, if you look at the problems that the Egyptians solved, you find that they thought of 1/5 as a "fifth part" in a sharing of something. Traditionally there are problems with understanding that decimals are extensions of the whole numbers and in dealing with the part/whole concept. People try to avoid common fractions because they really do not understand them. The history of mathematics reminds us that our models, language, and notation are just one of the ones our students could construct. We need to provide the situation where mathematics conventions can be constructed and personally adopted.

Florence Fasanelli (SUMMA/MAA, USA) spoke on the history of polyhedra and its enhancement of teaching. Our ideas of proofs, axioms, and definitions are evolving. It is important for children to draw and build models; we need to move beyong lecturing in the teaching of mathematics. Our earliest visual model was a truncated pyramid in the Moscow Papyrus, which includes a verbal algorithm for computing the volume. Building this and following the process yields the formula. About 500 B.C., Hippasus first studied the dodecahedron mathematically; unfortunately the construction involves incommensurables, and his making this public led to his death at sea. Plato gave the first account of all five regular polyhedra and their inscription in a sphere, and this is preserved completely in Euclid's *Elements*. In fact, some believe that the reason for the *Elements* was to develop the Platonic solids formally. Euclid did not believe in visualization. However, the 1570 English edition of the *Elements* included pop-up models. The artists/ mathematicians of the Italian Renaissance, such as Piero della Francesca, Fra Luca Pacioli, and Albrecht Dürer, included mathematical models in their work. Descartes came very close to discovering Euler's formula. Euler himself had told Goldbach that it was too difficult to prove - we should remember this when we ask our students to do proofs - while Lagrange finally figured out a proof. Kirkman drew a graph of the points of a polyhedron and explored whether one could trace through the vertices; his friend Hamilton took the idea and sold it as a game so that

now we talk about Hamiltonian circuits. Klein looked at forming a group of rotations of a polyhedron. Over the centuries, the polyhedron definition has evolved from a solid, to equilateral and equiangular, to a system of edges, to a surface with space outside, to spaces with a structure. Not only has the definition changed, but so have the ways of teaching. Constructing models are a good way for students to gain an understanding. And, recall, the ancient Greek meaning for the work "to prove" was to make visible.

Erica Voolich (Wheelock College, Solomon Schechter Day School, U.S.A.) spoke on using biographies in mathematics classes. The issue is not whether to use math history in math classes, but how. There are a variety of ways to introduce students to biographies. With younger students, you can read stories after raising "what if ... " questions for them to talk about. Older students can celebrate mathematicians' birthdays, research and write biographies following a given format, role play mathematicians in a "tv talk show" format, or role play a mathematician paying the class a visit. Using biographies is a way to help students realize that there is a human aspect to mathematics, that mathematics is not just a series of rules to apply to a set of numbers.

Charles Jones (Ball State University, U.S.A.) spoke on finding order in history and learning. We can not turn back history to check a thesis, but we can repeat physical experiments. Thus models of physical systems are simpler in comparison to behavioral systems. The analytic tools of mathematics are not as successful in psychology and social systems as they have been in the sciences. However, complexity theory seems to be able to explain living systems. Complexity theory finds global order from chaos, and order arises from the system as a result of local interactions; in fact, small changes may result in large changes in the final system. Complexity theory helps to explain how historical order emerges. An attractor brings order to a period, and there seems to be a cycle of order, breakdown, attractor, order, etc. We need to identify a role for H.P.M. There are possible areas of research. For example, history is an attractor for emergent order in the chaos of math learning. Can this help learners learn mathematics? Can this put new ideas into the context of what one already knows? An attractor brings order to a system of ideas. For another example, what are the similarities between the processes of history and pedagogy? Does historical structure suggest a pedagogy of the subject? Creativity in learning and history is complicated and nonlinear, while common pedagogy is linear. We should be testing to see if learning is enhanced by looking at history, if learlning is more closely related to history than to logic, if teachers should step back and let students find their own understanding. It is extremely important that HPM adopts a point of view describing its activities. [A condensed version of Charles Jones's talk calling for HPM's adoption of an agenda can be found in the July, 1994 HPM *Newsletter*, in his "From the President of the Americas Section."]

Ubiratan D'Ambrosio (Former international chair of HPM and organizer of this conference) closed the conference by talking about the future of history and some of his methodological concerns. We are all a part of creation. Once life starts, the creator loses control because of free will. We are not like a stone, since a stone does not give birth to a new stone. Instead, we are creators ourselves thourgh our own actions and are immersed in this universe that goes back through history. Creation brings everything from your past into your future. Every instance of creation is the beginning of a process. How have we come to understand history? Our sources of understanding history traditionally have been oral history, monuments/artifacts, manuscripts (modified by copies), printing, and recording. But what about history in the future? Historians of the future will not have to piece ideas together as they do today to figure out how the pyramids were built because we save the "building plans." But there is a much larger issue. We need to be conscious of history as an evolution of

thought. Is this generation of technology recording the stages of this thought as the copyist of the manuscripts did historically? For example, when we use the word processor, editing and revising, are we losing the thought processes that were preserved in the past? What will history be in the future?

The Proceedings of the meeting will be published.

More on the HPM Meeting in Blumenau

Elena Ausejo (University of Saragossa - Spain)

The Americas section of the ISGHPM has been meeting regularly during the last two decades. In this tradition, the meeting in Brazil not only showed the increasing development of the incipient Spanish and Portuguese-speaking community within the continental framework, but it also enabled us to distinguish several fronts in the historical-pedagogical reflection: the use of history as a didactic tool; the historical conceptual introspection applied to mathematical pedagogy; the historical analysis of the socioeconomic and political roots of various models of mathematical education, and the research on sociocultural links of mathematical education.

Although this multiplicity of approaches hinders any clear classification of contributions, it can be said that *ethnomathematics* shone in its advancements [Abdulcarimo Ismael and Daniel Soares (University of Maputo, Mozambique), "Why teach history of mathematics to future teachers: a case study;" Paulus Gerdes (Mozambique), "Examples of incorporation into mathematics of themes belonging to the history of geometry in Africa; Clara Lucia Higuera (University of Amazonia, Colombia), "The Inca `yupana': historical element as pedagogic tool; Leonel Morales (University of San Carlos, Guatemala), "Mayan Arithmetics"] and found some kind of reply in *criticalmathematics* [Marilyn Frankenstein (University of Massachusetts, U.S.A.), "Using history in teaching critical mathematics literacy"] as well as in the dignifying approach to Afroamerican culture [Sohindar Sachdev (Elizabeth City State University, U.S.A.), "African American mathematicians and their contributions"] or in the various autochthonous historical and cultural references to be found in the didactic applications of history of mathematics [Erica D. Voolich (Wheelock College, U.S.A.), "Using biographies to humanize the mathematics class"].

Within the field of the historical analysis of national developments of mathematical education was the opening lecture [Mariano Hormigon (University of Zaragoza, Spain), "Development and Pedagogical Renovation of Mathematics in the Spanish Liberal Model"], as well as the works by Sergio Nobre (UNESP, Brazil), "Diffusion of Mathematics in early 18th-century Germany," Elena Ausejo (University of Zaragoza, Spain), "La enseñanza de las matemáticas en España a comienzos del siglo XX: un debate para su reforma," Clovis Pereira da Silva (Federal University of Paraná, Brazil), "Development of Mathematics in Paraná: the UFPR case study," and Luis Saraiva (University of Lisbon, Portugal), "The historiography of mathematics in Rodolpho Guimaräes."

Specific pedagogic applications to mathematical education of historical arguments were the critical reflections by Charles V. Jones (Ball State University, U.S.A.), "Linking history to Pedagogy in Mathematics: A Critical View," Carlos Sanchez (University of Havana, Cuba), "Uses and Values of History of Mathematics in Mathematical Learning," and Jaime Carvalho e Silva (University of Coimbra, Portugal), "History of mathematics in the classroom: hopes, uncertainties and dangers," as well as the works by Israel Kleiner (York University, Canada), "Paradoxes in mathematics: history and pedagogy," Florence Fasanelli (Summa/MAA, U.S.A.), "The history of polyhedra and its enhancement of teaching," and George Booker (Griffith University, Australia), "Constructing fraction ideas: integrating views from the past with contemporary

teaching and learning." This section was completed by a set of didactical experiences: Ignacia Hernaiz / Carla Ottolenghi / Mariel Marmorato (Colegio siglo XXI, Buenos Aires, Argentina), "History of mathematics in science teaching: a space/time travel," Catarina Maria Vitti (Piracicaba, SP, Brazil), "History of mathematics: a way to recover the pleasure of learning," Eduardo Sebastiani Ferreira (UNICAMP, SP, Brazil), "Teaching of proportions through history of mathematics," and Fabius Bonet (Itatiba, SP, Brazil), "Epistemological obstacles and the history of π."

A third set of contributions included the historical and epistemological study of the process of mathematical development and learning: Eduardo S. Ferreira (UNICAMP, Brazil), "The biggest half of the sandwich is mine," Denise Silva Vilela (Campinas, SP, Brazil), "The resort to abstraction in the definition of number by Cantor," and those talks giving special regard to oriental and classical mathematics: Germano B. Afonso (UFPR, Curituba, PR, Brazil), "The relationship between the Binary Code and `I ching'," Emmanuel Lizcano (UNED, Spain), "Cultural roots of formal languages: an anthropology of zero," and Sandra Vosokolkis (University of Córdoba, Argentina), "Geometrical institutions in the Greek conception of mathematics: to be or not to be."

Finally, the Closing Lecture by Ubiratan D'Ambrosio (UNICAMP/FURB, Brazil), "The future of history: some methodological concerns," gave a glance at the various factors that constitute the historical concern and pointed out future problems, related to new technologies, for historians' work.

V Coloquio Internacional de Filosofía e Historia de las Matemáticas

La Universidad Nacional Autónoma de México fue sede del V Coloquio Internacional de Filosofía e Historia de las Matemáticas. Del 6 al 9 de junio se realizaron los cursos propedéuticos de historia, filosofía y pedagogía de las matemáticas en los que fue muy grato recibir a estidiantes, profesores e investigadores de los diversos niveles de educación en México. En especial, cabe destacar el interés de amplio grupo de estudiantes y profesores de la Escuela Normal Superior de México. La semana del 13 al 17 de junio se trasladó el Coloquio as auditorio del Instituto de Física para dar lugar a la jornada de investigación. En la inauguración (celebrada el lunes 13) se contó con las asistencia de autoridades de la Coordinación de Humanidades, de el Departamento de Matemáticas, de la Secretaría General de la Facultad de Ciencias y del editor de la revista *Mathesis*.

Algunos de los temas a discutir durante la jornada de investigación fueron los siguientes:

- Desarrolos alemanes de la lógica matemática y teoría de conjuntos;
- Astronomía en los siglos XIV y XV;
- Historia de la matemática uruguaya;
- Historia de la matemática colombiana;
- Matemática y lenguaje;
- Publicaciones de Kurt Gödel;
- Historia de la ciencia en México. La matemática de Bartolache;
- La infinitud de Dios;
- Matemáticas griegas;
- Matemáticas indús;
- Ecuaciones diferenciales en el siglo XIX, e
- Historia de la matemática Inglesa en el siglo XX.

First French-German Meeting on Questions of the History and the Teaching of Mathematics

This first meeting was held at Heidelberg on March 12, 1994 with the participation of IREM de Strasbourg, Universität Koblenz-Landau, and the Pädagogische Hochschule Heidelberg. The theme chosen was "History and Teaching of Geometry." The following topics were treated in talks: "The Use of Vectors in French Mathematical Teaching" (Michel Sarrouy, Strasbourg); "Conics in French Teaching of Geometry" (Jean Pierre Friedelmeyer, Strasbourg); and "Remarks on the History of the Idea of Geometrical Transformation" (Horst Struve, Landau). There was also a discussion about French and German programs for the teaching of geometry and a presentation of slides under the title "Mathematics -- What a History!" by André Stoll (Strasbourg). A second meeting is scheduled for next year at Landau. For further information, write to Klaus Volkert, Pädagogische Hochschule Heidelberg, FB III Mathematik, Im Neuenheimer Feld 561, D-69120 Heidelberg, GERMANY.

Fifth Maghribian Symposium on the History of Arabic Mathematics

The 5th Maghribian Symposium on the History of Arabic Mathematics will be held in Tunis, Tunisia from 1 to 3 December, 1994. The Symposium themes are:

1. Mathematics: Algebra, Geometry, Arithmetic, Number theory, Combinatorics, Trigonometry;
2. Astronomy: Planetary models, Astronomic tables;
3. Applied mathematics: Science of inheritance, Architecture, Optics, Mechanics, Astrology, Music;
4. Mathematics and society: Mathematical manuals, Educational infrastructures, Mathematics and cultural and ideological environment, Mathematics and philosophy, Pre-Islamic mathematical heritage, Transmission of Arabic mathematics to Europe, Mathematics and the classification of sciences.

The Symposium languages are Arabic, English, and French. For more information, write or fax to Mahdi Abdeljaouad, Institut Supérieur de l'Education et de la Formation Continue (ISEFC), 43 rue de la Liberté, 2019 le Bardo, Tunisia (Fax: 568954).

Residential Conference of the British Society for the History of Mathematics

This BSHM meeting in Wales, April 3-5, 1995, provides an opportunity for all those interested in history of mathematics research to spend some time together talking about current research interests, about the practice of the history of mathematics, and learning about the historical tradition of studying the history of mathematics in Britain over the past three centuries - from Wallis (John: 1616-1703) to Wallis (Peter: 1918-1992). Some of the speakers include Ivor Grattan-Guinness (Middlesex University), "The study of history of mathematics in Britain;" David H. Fowler (University of Warwick), "British historians of Greek mathematics;" John Fauvel (Open University), "Historians of mathematics in the early 19th century;" Adrian Rice (Middlesex University), "Augustus De Morgan, historian of mathematics;" and Tom Whiteside (University of Cambridge), "Historians of Newton."

The residential cost is expected not to exceed £100 for the three days and two nights. For further details, contact John Fauvel (address on the first page) or Colin Fletcher (Department of Mathematics, University College of Wales, Aberystwyth, Dyfed SY23 3BZ, UK; phone: 0970 622757).

International HPM Conference in Cairns

The HPM Conference in Cairns, Australia will meet from June 30 to July 4, 1995. The

theme for the plenary addresses will be Ethnomathematics and the Australasian region, but individual papers may address any issue pertinent to the interests of HPM.

The conference will begin in the early evening of Friday, June 30 with a plenary address, followed by a reception. Saturday, Sunday, and Tuesday are full days with plenaries and the presentation of individual papers, while Monday is scheduled for a full day excursion to the Great Barrier Reef. There will also be a conference dinner on Sunday night with free time in the other evenings to explore the many and varied restaurants in Cairns. The conference will be held at the Cairns Colonial Club Resort Conference Centre, in the style of an historic Australian homestead, set in tropical gardens and totally self-contained. The conference facilities will accommodate up to 400 persons in large and small meeting rooms and are withn a few metres of the accommodation. Registration is anticipated to be Aus $320 (approximately US $240) for the five days. This will include the cost of lunch Saturday - Tuesday, all morning and afternoon teas Friday - Tuesday, the opening Reception and the closing function, and an excursion to the Great Barrier Reef on Monday, which includes breakfast and lunch. A set of abstracts of all plenaries and papers will be provided at the conference.

The full day excursion to the Great Barrier Reef will be on a luxuriously appointed, large Catamaran which takes up to 350 people. We are hoping that there will be enough participants and accompanying persons at the conference to have exclusive use of a boat. The excursion would then begin with breakfast on board, include a presentation by marine biologists, all refreshments, and the use of snorkel gear, underwater observatory and semi-submersible for coral viewing at the outer reef some 150 km from Cairns. The return will be by Coach along a very scenic coastal road with beaches on one side, tropical rainforest on the other. Accompanying persons can be included on this excursion at a cost of Aus $125 per adult, $80 per child.

The conference has been timed to allow local teachers and other interested parties to attend the Friday night opening and the plenaries and papers during the weekend. The cost for this is $130, which includes the conference abstracts, the Reception, lunch, morning and afternoon teas. For a single day's attendance (Saturday, Sunday or Tuesday), the cost is $60 which includes lunch and morning and afternoon tea, but no other social activity. Participation on the excusion is available for the accompanying person's rate of $125.

The conference dinner will be a seafood, barbeque buffet at the Radisson Plaza Hotel on the Cairns Pier, overlooking the ocean. Cost, including wine, dessert and coffee, is $35 per person.

Cairns airport is served by many domestic and international flights daily. Qantas and other international carriers fly directly to Cairns from North America, Asia, and the Pacific, linking with flights from Europe. Domestic flights provide access from all major cities linking with other International flights. The airport is approximately 10 km from the city, with the conference venue halfway between the city and the airport. The Cairns Colonial Club meets all incoming flights with courtesty coaches.

The Cairns Colonial Club resort contains 3 restaurants, 2 bars, 3 large swimming pools, and various other recreational facilities, including children's play areas. It offers a range of accommodations, ranging from $89 per night for a standard double room to $136 per night for a 1 bedroom suite. Bookings for accommodation will be made through Ozacom, PO Box 301, Fortitude Valley, Queensland 4006, AUSTRALIA (Fax: 61 7 252 4674).

Please register your interest and request a second announcement of the conference by sending a note with your name, address, phone, fax, and email to George Booker,

Institute for Learning in Mathematics and Language, Griffith University, Nathan, Queensland 4111, AUSTRALIA. You may also send the information by fax to 61 7 875 5686 or by email to G.Booker@edn.gu.edu.au.

Americas Section of HPM Meeting in Boston

The Americas Section of HPM will meet as usual in connection with annual meeting of the National Council of Teachers of Mathematics. HPM will meet on Friday, April 7, 1995 from 5:30-7:30 pm. As always, the discussions at the meeting will be continued over dinner. The meeting room will be announced in the next Newsletter. Send in all proposals for presentations at the meeting to Erica Voolich, 244 Summer St, Somerville, MA 02143.

As was noted in the last Newsletter, the Americas section of HPM is now becoming formally affiliated with the NCTM. As part of this process, we have agreed to begin collecting dues to support the organization, rather than continuing to rely on the generosity of various people and institutions. The dues are a very reasonable $10 per year. We need your support through this dues payment if this Newsletter is to continue to be distributed. Please send your check, made out to HPM, to the treasurer, Sherry Cox, 532 C Fleetwood Ct., Kingsport, TN 37660. She can also be reached by email at slcox@aol.com.

CSHPM in Montreal

The annual meeting of the Canadian Society for the History and Philosophy of Mathematics will take place June 3-5, 1995 in Montreal in connection with the Learned Societies Conference. The meeting will be held at the Université du Quebec á Montreal. There will be a special session on the history of mathematics around 1900 chaired by Thomas Archibald. Proposals for papers in this session should be sent to him at Acadia University, Wolfville, Nova Scotia, B0P 1X0, CANADA or by email to tom.archibald@acadiau.ca. The program chairs for the regular session are Jim Tattersall and Jerry Lenz. Papers at this session can be in any aspect of the history or philosophy of mathematics, including their use in the teaching of mathematics. Proposals can be sent to Jim Tattersall (after January 1) at Mathematics Department, United States Military Academy, West Point, NY 10996, USA or to Jerry Lenz at Mathematics Deaprtment, St. John's University, Collegeville, MN 56321, USA.

Dirk Struik Centenary Lecture

In honor of the one hundredth birthday of Dirk Struik, well-known mathematician and historian of mathematics and author of the widely read *A Concise History of Mathematics*, among many other books, Brown University and the American Mathematical Society sponsored his centenary lecture at Brown University, Providence, RI on September 30, 1994. This was probably the first celebration of a mathematician's hundredth birthday in which the principal speaker was the honoree himself. In fact, a few days afterwards, Professor Struik flew off to Europe for another hundredth birthday celebration in his native Netherlands, where he was scheduled to give another lecture.

Professor Struik's own lecture, on "Mathematicians I have Known," was preceded by several other brief talks and followed by a reception and exhibit on the history of mathematics in the Brown University Library. We present here some of the remarks made by Jim Tattersall of Providence College:

I have known Dirk for a number of years now as a historian of mathematics and as a fellow Sherlockian, but first and foremost I have known him as a mathematician. I was introduced to his work as a graduate student when I came upon his quintessential

book, *Lectures on Classical Differential Geometry*. It proved to be just the antidote for, as Dirk would say, the dry-as-dust text we were using in class. But his book was much more than just another textbook. I had never seen anything like it. Besides a substantial amount of rigorous mathematics, there were interesting historical asides throughout the book (something graduate students do not get enough of) and numerous references to primary and secondary sources. On the one hand, it was a geometry textbook, and on the other, it was a valuable sourcebook containing insightful comments on the people who developed the subject. I looked over my copy recently and noticed that several passages were marked with exclamation points, and several times I had written "nice result" or "clever" besides a particular proof. The book was impressive not only for its clarity but as an example of how a mathematician can view his subject humanistically, culturally, and historically and still get the basics across. It changed my life and gave me a whole different outlook towards mathematics.

Dirk's mathematical roots go way back. His father earned a teacher's diploma in mathematics and taught at a grammar school in Rotterdam. Dirk's father had a love for mathematics and history and instilled that love in his son. He subscribed to a monthly mathematical teacher's magazine and enjoyed solving the many triangle and circle geometry problems it contained. It was not long before Dirk was trying his own hand at the nine-point circle and pedal triangle problems.

In high school in Rotterdam, Dirk was first introduced to the wonders of the calculus by his teacher and friend G. W. Ten Dam. It was Ten Dam who later supported and encouraged Dirk to attend the University of Leiden, where from 1912 to 1917 Dirk studied algebra and analysis with Kluyver, geometry with Zeeman, history of mathematics with Vollgraf (one of the editors of the complete works of Huygens), astronomy with de Sitter (the cosmologist), and physics under Ehrenfest and Lorentz. Ehrenfest knew many of the major Euorpean physicists of the period, Hertz, Frank, Rutherford, Einstein, and would introduce them to his students when they came to Leiden. This was an exciting period to be a graduate student in the sciences. Plack was making discoveries that would revolutionize physics. Einstein's papers on Brownian motion, the photoelectric effect, and the special theory of relativity had appeared in 1905. Relativisitic thinking was the rage, and in 1916 Einstein published his general theory of relativity treating gravity not as a force but as a warping of space.

After a short stint teaching high school at Alkmaar, Dirk worked for seven years as a research assistant to Jan Schouten, who had an electrical engineering background and was professor of mathematics at the Technical High School in Delft. Working with Schouten, Dirk developed several methods of classifying vectors in accordance with Felix Klein's Erlangen Programme studying properties left invariant under various mappings. Dirk applied his methods, enriched by the use of tensor analysis, first to relativity and then to differential geometry, and published a number of papers relating to his work on tensor calculus with Schouten which led to his receiving a doctorate from the University of Leiden in 1922. Several years later, they published a book on their new methods in differential geometry in two volumes: Volume 1 was written by Schouten and Volume 2 by Dirk. Dirk's thesis as well as the book he and Schouten published were written in German. Dirk's linguistic ability is phenomenal. Besides studying Latin and Greek in school, he is fluent in Dutch, German, and English, reads scientific Italian, French, Russian, and in a pinch Romanian and Portuguese. There was even a time as a student when he read Swedish newspapers.

In 1923 Dirk and Ruth Ramler were married. Ruth had received a Ph.D. from the University of Prague in 1919. She was a student of Philip Frank and had George Pick and Gerhard Kowalewski for thesis advisors. Her dissertation was on the axiomatics of

affine geometry in two and three dimensions.

From 1924 to 1926, Dirk was the recipient of a Rockefeller Fellowship. The Struiks spent nine months in Italy, mainly in Rome, where Dirk worked with Levi-Civita on a problem in hydrostatics. Levi-Civita had investigated properties of waves in canals with infinite depth and suggested that Dirk try his hand on the case of canals of finite depth. It was an intriguing problem, and Dirk succeeded in getting series solutions to integro-differential equations. It was on a visit to Bologna that Dirk became interested in the history of mathematics, when he was shown a number of 16th century algebraic manuscripts. After their nine-month stay in Italy, the Struiks went to Germany, where in Göttingen Dirk attended the lectures of Hilbert and Courant. He became good friends with fellow visiting scholar Norbert Weiner, who suggested that Dirk come to the United States and work at MIT. Soon afterwards, Dirk received a formal invitation from Samuel Stratton, then president of MIT, offering him a lectureship. Dirk accepted the offer and the next academic year he was promoted to assistant professor.

Struik and Weiner worked applying some of Struik's ideas and methods to the Schrödinger equation of quantum theory and derived a number of interesting results. Since Dirk was on a ten-month salary in 1927 at MIT, he sought summer employment and worked at the Bell Telephone labs in New York with Thornton C. Fry. Dirk applied his knowledge of continued fractions to develop a new type of wave filter for which he and Fry were able to obtain a patent.

One of Dirk's greatest contributions to the mathematical community has been his diligent reviews of articles and books in differential geometry and in the history of mathematics, starting in the 1920s when he was an assistant to Schouten with the *Review Semestrelle* and the *Zentralblat für Mathematik*. In 1940, when Neugebauer came to Providence, Dirk began contributing to the *Mathematical Reviews*. Anyone familiar with his reviews knows how clear, informative, and interesting they are. They are a valuable resource and are always a pleasure to read.

Throughout his career Dirk has made contributions to both pure and applied mathematics and over half of his hundred or so publications are in those two fields.

Dirk was once asked what mathematician he would most like to meet. Who did Dirk choose? Who would you have chosen? Euler, Maria Agnesi, Gauss, Euclid, Hypatia, Pythagoras? Dirk chose Gaspard Monge (1746-1818). Now Monge was an exceptional mathematician and teacher who developed descriptive geometry, a field essential to both mechanical and architectural drawing. Along with Vandermonde, Lagrange, and Laplace, he taught in Paris at the short-lived Ecole Normal, a school established by Napoleon to train teachers. Later, Monge was instrumental in founding the Ecole Polytechnique, the prototype of all of our technical schools, including MIT, Cal Tech, and West Point. In addition, during the French revolution, Monge was an active Jacobite and was temporary head of the government the day that Louis XVI was executed. It was Monge and Fourier who accompanied Napoleon on his ill-fated scientific expedition to Egypt where Napoleon's fleet was destroyed by Nelson in Aboukir Bay. Yes, Dirk, Monge, besides being a good mathematician was quite a revolutionary character.

When Dirk was asked if he had any advice to offer graduate students just beginning their careers in mathematics or the history of mathematics, he replied that they should be aware of the three keys to success: perseverance, perseverance, and perseverance. Thank you, Dirk, for being such an inspiration to mathematicians and nonmathematicians alike.

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 three 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 Wednesday morning and afternoon and Thurday afternoon. 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. The third is an MAA minicourse entitled "Recovering Motivation in Mathematics: Teaching with Original Sources," to be held on Friday morning and afternoon, again led by Reinhard Laubenbacher and David Pengelley.

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. Among the eighteen speakers are Daniel Otero (Xavier University, Cincinnati), "Calculus for Fun and Profit in the Humanities Curriculum;" Etienne Archinard (College de Saussure, Switzerland), "A Very Rich Source by L. Euler;" Luis Moreno-Armella (Mexico), "Proof in History and Proof in the Classroom;" and Christine Stevens (St. Louis University), "Primary Sources and Primary Goals in Teaching the History of Mathematics."

The AMS Special Session in the History of Mathematics has sixteen speakers, dealing with a wide variety of historical topics. Among them are J. Lennart Berggren (Simon Fraser University, Canada), "Al-Kuhi's Solution to a Problem Inspired by Archimedes;" Wilbur Knorr (Stanford University), "We have been reading the wrong text of Euclid;" Judith Grabiner (Pitzer College, Claremont), "Maclaurin among the Molasses Barrels: Mathematics and Society in Eighteenth-Century Britain;" Marcia Ascher (Ithaca College), "Marshall Islands Stick Charts: A Case in Ethnomathematics;" and Barnabas Hughes (California State University Northridge), "$\int(1/x)dx = \ln x + c$: Why is it defined. How it was discovered, Who were responsible."

The description of the minicourse is as follows: Mathematics education is faced with two important problems: lack of motivation in the presentation of theories, and overemphasis of utility at the expense of creativity. Participants will explore how the study of a problem at a subject's core and the long road toward its solution, through reading original historical sources, can be an effective remedy for both these problems. This method can be successful either in specially designed courses or in the existing curriculum. Original source materials will be provided, with special focus on a lower division course illustrating the development of five branches of mathematics.

To register for the meeting (and the minicourse), see the October issue of the MAA *Focus* or the AMS *Notices*. Come to San Francisco and enjoy the first week of January by studying the history of mathematics and its use in teaching.

Histoire d'Algorithmes "du Caillou a la Puce"

This new book, by J.-L. Chabert, E. Barbin, M. Guillemot, A. Michel-Pajus, A. Djebbar, J. Borowczyk, and J.-C. Martzloff aims to place algorithms in their historical and cultural context and, by so doing, to throw light on comtemporary algoirthmic practice. The fact that computers are now so widely used has brought about a revival of interest in algorithmic techniques which in fact originated centuries ago. Their importance is often ignored by both historians and present-day scientists who tend to be more concerned with developing concepts; neverthelss, algorithms play an integral part in the development of scientific theory.

Each chapter of the book uses authentic material reflecting different aspects of a particular theme. The passages have been selected not only for their originality and historical interest but also for their "readibility" by high school students in their final year (in the case of the first few chapters) and by university students (for the following chapters). Each passage is placed in its context and is accompanied by mathematical explanations.

The initial chapters deal with algorithmic questions and techniques that go far back in history, particularly concerning calculus, arithmetical operations, magic squares, calculating π, Newton's methods, successive approximations, and arithmetic problems. The following chapters deal with the algorithms of more complex objects than numbers: solving linear systems, interpolation, approximate integration, solving differential equations, and the approximation of functions.

The book may be orderd from Belin, 8, rue Férou, 75278 Paris Cedex 06, FRANCE for 210 F.

Fear of Math: How to Get Over It and Get On with Your Life

In this new book, Claudia Zaslavsky shows you how those who fear math can learn to understand the reasons for their fear and to overcome that fear. She gives a host of reassuring methods, drawn from many cultures, for tackling real-world math problems. She explodes the myth that women and minorities are not good at math. The book can be ordered from Rutgers University Press, 109 Church St., New Brunswick, NJ 08901, USA (Phone: 800-446-9323) for $13.45 (paper) or $33.30 (hardcover).

In Eves' Circles

This new book, edited by Joby Milo Anthony and published by the Mathematical Association of America, contains many of the papers presented at a conference at the University of Central Florida in May, 1991 celebrating Howard Eves' eightieth birthday. Because Eves is famous for his work in the history and pedagogy of mathematics, many of the papers deal with those topics. In "The Meanings of Mathematical Proof: On Relations Between History and Mathenatical Education," Evelyne Barbin carefully examines the historical notion of "proof" in mathematics, and draws some conclusions about the role of proof for mathematics teachers. In particular, she addresses the question "Is proving a means to convince or to enlighten?" Claudia Zaslavsky, in "From Howard Eves to *Africa Counts* to Multicultural Mathematics Education," discusses the influence of Howard Eves on her famous work on mathematics in Africa. Joe Albree presents "An Alternative to the Conventional Wisdom of a Term Paper in History of Mathematics Survey Courses" and shows how he has helped students in his courses gain confidence with library research skills and organizational and writing skills as they complete a progression of literature reports. Other articles in the book deal with topics in history, geometry, problem solving, and pedagogy.

To order this valuable book for your personal library and for its use in the classroom, write to the MAA at 1529 18th St., N.W., Washington, DC 20036, USA or call them at 800 331 1622. The list price is $24.00.

From Five Fingers to Infinity: A Journey through the History of Mathematics

Have you ever wanted to share with your students an article that you read years ago on the history of mathematics but can no longer find? Well, the odds are that you will find it in this new book, edited by Frank Swetz and published by Open Court Publishers, Chicago. Professor Swetz has managed to bring together a wonderful variety of

articles dealing with the history of virtually all aspects of mathematics considered in the secondary and college curriculum. Many of these articles were written years ago and are hard to find now. Swetz's book will therefore introduce a new generation of students to some excellent historical writing by such historians as Vera Sanford, Philip Jones, and Dirk Struik. Professor Swetz has also included some of the best current research in topics ranging from the invention of numbers by Babylonian accountants some 5000 years ago to the modern study of dynamical systems. In fact, several of the authors whose works are included have recently won national awards for expository writing, including Israel Kleiner, V. Frederick Rickey, William Dunham, and Judith V. Grabiner. A wise teacher will encourage students to read the articles in this collection which are relevant to the topic at hand and will also make use of the historical material in teaching the mathematical concepts themselves. This book is one which should find a prominent place on any high school or college mathematics teacher's desk and one which will be continually gleaned for material to use in the classroom.

Explorations in Ethnomathematics and Ethnoscience in Mozambique

This new book, edited by Paulus Gerdes and published by the Instituto Superior Pedagógico of Maputo, Mozambique, is a collection of articles designed to respond to the challenges for mathematics and science education in Africa for the twenty-first century. In "Educate or Perish: Africa's Impass and Prospects," by Joseph Ki-Zerbo (UNESCO-UNICEF, Dakar/Abidjan, 1990), the author stresses that "Africa is in serious trouble, not because its people have no foundations to stand on, but because ever since the colonial period, they have had their foundations removed from under them." It is therefore necessary for researchers in education to restore those foundations. Thus, ethnomathematical and scientific studies in Mozambique analyze

- scientific traditions that have survived colonization, and activities in people's daily life with scientific components, and look for ways to incorporate them into the curriculum;
- cultural elements that may serve as a starting point for doing and elaborating mathematics and science, both in and outside school.

A type of mathematics and science education is intended that succeeds in valuing the scientific knowledge inherent in the culture by using this knowledge to lay the foundations of providing quicker and better access to the scientific heritage of the whole of humanity.

Thus, the book contains articles designed to help teachers in the classroom accomplish the above aims. For example, there are articles on the origin of the concepts of even and odd in Makhuwa culture (by Abdulcarimo Ismael), on the mathematical-educational exploration of traditional basket weaving techniques in a children's "Circle of Interest" (by Marcos Cherinda), on popular counting methods in Mozambique (by Daniel Soares and Abdulcarimo Ismael), and on how to handle the theorem 8+5=13 in (teacher) education (by Jan Draisma).

To experience the results of ethnomathematical research in Mozambique and to see how these results may be used in the classroom, even in other countries, you should order this book as well as other publications of the Ethnomathematics Research Project, including *Sipatsi: Technology, Art and Geometry in Inhambane*, *SONA Geometry: Reflections on the tradition of sand drawings in Africa south of the Equator*, and *African Pythagoras: A study in Culture and Mathematics*. For more information, write to Paulus Gerdes at Instituto Superior Pedagógico, P.O. Box 3276, Maputo, Mozambique or contact him by fax at 258-1-422113.

Nordisk Matematik Didaktik (Nordic Studies in Mathematics Education) - NOMAD

This new journal, published quarterly in the Scandinavian languages and once a year in English, is edited by Bengt Johansson. It aims to stimulate, support, and foster Nordic researchers and postgraduate students in mathematics education and to develop mathematics teaching and teacher education in theory and practice at all levels of the education system. Naturally, articles dealing with the use of history will find their place in the journal. One of the articles in the March, 1994 issue may be of particular interest to readers of this Newsletter: "Standardized mathematics testing in Sweden: The legacy of Frits Wigforss," by Jeremy Kilpatrick and Bengt Johansson. The article deals with the fifty-year history of standardized testing in Sweden, a history of particular interest because this well-established, functioning system of norm-referenced tests is now being replaced by a new system of criterion-referenced measurement. The Swedish example, both historically and current, may have echoes elsewhere as new methods of assessment come into use in other countries as well.

For information on subscriptions to NOMAD, contact the editor at NOMAD, Box 1010, S-431 26 Mölndal, SWEDEN or by fax at 46 31 773 2080.

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.

Activites Integrating Math & Science (AIMS), *Historical Connections: Resources for Using History of Mathematics in the Classroom*, Vols. 1 and 2 (1993). (For grades 4-12. Available from AIMS, P. O. Box 8120, Fresno, CA 93747)

Artmann, Benno, "A Proof for Theodorus' Theorem by Drawing Diagrams," *Journal of Geometry* 49 (1994), 3-35.

Ayoub, Raymond, "What is a Napierian Logarithm?" *American Mathematical Monthly* 100 (1993), 351-364.

Barrow, John D., *Pi in the Sky: Counting, Thinking, and Being* (New York: Oxford University Press, 1992).

Bidwell, James K., "Humanize Your Classroom with the History of Mathematics," *The Mathematics Teacher* 86 (1993), 461-464.

Bottazzini, Umberto, "The Influence of Weierstrass's Analytical Methods in Italy," in S. Demidov, ed., *Amphora* (see below).

Brabenec, Robert L., "Historical Development of the Foundations of Mathematics: Course Description," *Science & Education* 3 (1994), 295-309.

Calinger, Ronald, Review of *Leonhardi Euleri, Sol et Luna II*, ed. by Charles Blanc (*Opera omnia*, Series 2, 24) in *Isis* 85 (1994), 521-522.

Demidov, Sergei, *et al*., eds., *Amphora: Festschrift for Hans Wussing on the Occasion of his*

65th Birthday (Basel: Birkhäuser, 1992).

Feingold, Mordechai, ed., *Before Newton: The LIfe and Times of Isaac Barrow* (Cambridge: Cambridge University Press, 1990).

Fischer, Hans, "Dirichlet's Contributions to Mathematical Probability Theory," *Historia Mathematica* 21 (1994), 39-63.

Garrison, James W., "Newton and the Relation of Mathematics to Natural Philosophy," *Journal of the History of Ideas* 48 (1987), 609-629.

Kolmogorov, A. N. and Yushkevich, A. P., eds., *Mathematics of the 19th Century: Mathematical Logic, Algebra, Number Theory, Probability Theory* (Boston: Birkhäuser, 1992).

Mackinnon, Nick, "The Portrait of Fra Luca Pacioli," *The Mathematical Gazette* 77 (1993), 130-219.

Perl, Teri, *Women and Numbers: Lives of Women Mathematicians Plus Discovery Activities* (San Carlos, Ca.: Wide World Publishing, 1993).

Sageng, Erik, Review of Douglas M. Jesseph's *Berkeley's Philosophy of Mathematics* (1993) in *Isis* 85 (1994), 520-521.

Schuppener, Georg, *Geschichte der Zeta-Funktion von Oresme bis Poisson* (Egelsbach: Hohenhausen, 1994).

Shenitzer, A. and Steprans, J., "The Evolution of Integration," *The American Mathematical Monthly* 101 (1994), 66-72.

Soifer, Alexander, *Mathematics as Problem Solving* (Center for Excellence in Math Education, 885 Red Mesa Drive, Colorado Springs, CO 80906, USA).

Steele, Brett, "Muskets and Pendulums: Benjamin Robbins, Leonard Euler, and the Ballistics Revolution," *Technology and Culture* 35 (1994), 348-382.

Swetz, Frank, "Fifteenth and Sixteenth Century Arithmetic Texts: What Can We Learn From Them?" *Science & Education* 1 (1992), 365-378.

Toussaint, Godfried, "A New Look at Euclid's Second Proposition," *The Mathematical Intelligencer* 15 (1993), 12-23.

White, Alvin, *Humanistic Mathematics Network Journal* 9 (February, 1994) (Harvey Mudd College: email to awhite@sif.claremont.edu).

Zaslavsky, Claudia, "`Africa Counts' and Ethnomathematics," *For the Learning of Mathematics* 14 (1994), 3-8.

The *Newsletter* is the communication of the International Study Group on the Relations Between History and Pedagogy of Mathematics, an affiliate of the International Commission on Mathematical Instruction. It is edited in the Department of Mathematics, University of the District of Columbia, Washington, DC 20008, U.S.A. and printed and mailed with funds supplied by U.D.C. and other educational establishments around the world. The *Newsletter* is free of charge upon request, and may be reproduced with acknowledgement.

Distributors:

U.S.: Editorial Office

Canada: M. A. Malik (Concordia University, Montreal, Qué H4B 1R6)

Mexico: Alejandro Garciadiego (UNAM - contact at José M. Velasco 71, Del. Benito Juárez, 03900 Mexico, D.F.)

South America: Geraldo Pompeu, Jr. (Departamento de Matemática, PUCCAMP/Campus I, s/n 112 km, Rodovia SP 340, 13100 Campinas SP, Brazil)

Australia: George Booker (Faculty of Education, Griffith University, Brisbane, Queensland 4111)

New Zealand: Andy Begg (SMER Centre, University of Waikato, Private Bag 3105, Hamilton)
United Kingdom: John Fauvel (Mathematics Faculty, Open University, Milton Keynes MK7 6AA)

France: Evelyne Barbin (IREM Paris Nord, Université Paris XIII, Avenue Jean-Baptiste Clément, 93430 Villetaneuse Cedex)

Austria: Manfred Kronfellner (Institut für Algebra und Diskrete Mathematik, Technische Universität Wien, Wiedner Hauptstraße 8-10/118, A-1040 Wien)

Germany and Eastern Europe: Roland Stowasser (Technische Universität Berlin, Straße des 17. Juni 136, 1000 Berlin 12, Germany)

Belgium and the Netherlands: Jan van Maanen (Rijksuniversiteit Groningen, Department of

Mathematics, P.O. Box 800, 9700 AV Groningen, The Netherlands)

Scandinavia: Bengt Johansson (Institutionen för ämnesdidaktik, Göteborgs universiteit, Box 1010, S-431 26 Mölndal, Sweden)

Spain and Portugal: Eduardo Veloso (Associaçáo de Professores de Matemática, Rua Major Neutelde Abreu 11, 1500 Lisboa, Portugal)

Italy: Luciana Bazzini (Departimento di Matematica, Università de Pavia, Via Abbiategrasso 209, 27100 Pavia)

Greece, Turkey and the Balkans: Nikos Kastanis (Department of Mathematics, Faculty of Sciences, Aristotle University of Thessaloniki, 54006 Thessaloniki, Greece)

Israel: Anna Sfard (The Science Teaching Centre, The Hebrew University of Jerusalem, Givat Ram, 91904 Jerusalem)

Iran: Mohammad Bagheri (P.O. Box 13145-1785, Teheran)

South Asia: R. C. Gupta (Department of Mathematics, Birla Institute of Technology, P. O. Mesra, Ranchi-835 215, India)

Japan: Osamu Kota (3-8-3 Kajiwara, Kamakura-shi, Kanagawa-ken 247)

Malaysia: Mohini Mohamed (Dept. of Science and Technological Education, Universiti Teknologi Malaysia, Karung Berkunci 791, 80990 Johor Bahru, Johor)

Other East Asia: Gloria Benigno (Department of Education, Culture & Sports, Region X, Division of Misamis Occidental, Oroquieta City, Philippines)

Morocco: Abdellah El Idrissi (ENS, BP S-41, Marrakech)

Southern Africa: Paulus Gerdes (C. P. 915, Maputo, Mozambique)

Other Africa: J. O. C. Ezeilo (National Mathematical Centre, Private Mail Bag 118, Abuja, Nigeria)

Elsewhere: U.S. Editorial Office.