International Study Group On the Relations Between
HISTORY and PEDAGOGY of MATHEMATICS

NEWSLETTER

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address changes to the Editor.

Calendar

Meetings with HPM components are highlighted.

1986 Nov 9-15 . . . . Neuhofen an der Ybbs
Austrian Symposium on History of Mathematics.
Contact: Ch. Binder, Inst für Techn. Mathematik,
Technische Universität Wien, Wiedner Hauptstrasse
6-10, A-1040 Wien, Austria.

1988 Nov 18-22 . . . . Marseille
Didactique des mathématiques. Contact: A. Zeller Meier,
CIRM, Luminy Case 916, route Léon-Lachamp 70, F-13288,
Marseille Cedex 9, France.

> 1997 April 8-11 . . . . Anaheim
> HPM Americas Section in conjunction with
> National Council of Teachers of Mathematics.
> [Details in Americas Supplement]

1987 April 23-25 . . . . Washington, D.C.
A tercentenary symposium celebrating the publication
of Newton's Principia. Contact: Stephen G. Brush,
Center Renaissance & Baroque Studies, Univ Maryland,
College Park, MD 20742, USA. [Details inside]

1987 June 9-12 . . . . Toernooiveld, Nthr'ld
"Newton's Philosophical and Scientific Legacy",
celebrating the tercentenary of the Principia. Contact:
Department of Philosophy, Faculty of Science,
University of Nijmegen, Toernooiveld, Nijmegen, The
Netherlands. [Details inside]

1987 July . . . . Dominican Republic
VII Inter-American conference on mathematics
education. First announcement, contact: Eduardo Luna,
Chairman, VII IACME, Universidad Católica Madre y
Maestra, Santiago de los Caballeros, Dominican Republic

1987 August 7-10 . . . . Gunma, Japan
International Symposium for History of Mathematics
and Mathematical Education Using Chinese Characters.
Contact: Prof Y. Michiwaki, Fac Technology, Gunma
Univ, Tenjin-chō, Kiryu 376, Japan. [See 6:2]

1987 September 8-11 . . . . . . Kassel, Germany
3rd International Conference on Teaching Mathematical Modelling and Application. Contact: U. Blum, Universität Kassel (GHS), Fachbereich Mathematik, Heinrich-Plett-Str. 40, D-3500 Kassel, GDR. [Details inside]

1988 April 6-9 . . . . Chicago
HPM Americas Section in conjunction with annual meeting of National Council of Teachers of Mathematics.

1988 July 27-Aug 3 . . . . Budapest
International Commission on Mathematics Education (ICME 6). Contact: ICME-6, János Bolyai Mathematical Soc., H-1061 Budapest, Anker köz 1-3, Hungary. [Details inside]

Editorial

Ethnomathematics For History in the Third World (Lawrence Shirley—) Certainly no reader of this Newsletter would deny the value of the history of mathematics in the teaching and learning of mathematics. However, this history, as usually reported, is largely a history of Europe. Although many histories start with Egyptian and Babylonian mathematics, they usually then move to Greece and, except for a possible side-trip for Arab contributions, they remain in Europe. Since much school mathematics and most mathematical research is based on the cummulative work of European mathematics, this emphasis may be justified. However, the mathematics of school and research may not be the only mathematics worthy of such consideration. Perhaps the problem of a limited scope of the history of mathematics actually reflects a limited scope of the definition of mathematics.

In any case, this European emphasis certainly doesn't add to the motivational value of history in the school mathematics classes of the third world. After hearing so much of European accomplishments and none from Africa, the African student may come away convinced that Africans have not contributed —or cannot contribute— to mathematics.

In political, social, and economic history, this neglect has been answered by more thorough coverage of the history of non-Western areas and the so-called "black history". However, if we restrict ourselves to the usual areas of academic mathematics covered by historians, we may have trouble finding history of mathematics in Africa or other third-world areas. Often the record-keeping simply wasn't there in complex, but pre-literate societies of previous centuries. However, a more important consideration is that the mathematical thinking may have gone in different directions or to different applications than those known from Europe.

This is why we need to take a wider definition of mathematics. Recently D'Ambrosio and others have spoken of "ethnomathematics" to take in this broader viewpoint—mathematics of daily life, practical applications, informal technology, art, culture, and the ordinary "common sense" logic of solving problems. The prefix "ethno-" appeals especially to the issue at hand, as it covers all cultural groups and their own ways of communicating and reasoning.

To help direct attention to these other areas of mathematics, consider crossing the usual division of "applied" and "pure" mathematics with another division into "informal" and "formal" mathematics. The resulting 2 X 2 arrangement (Fig. 1) has four cells:

	applied	pure	Ethnomat
informal	everyday	cultural	
formal	technical	research	academic

FIG 1

•informal-applied, or "everyday" mathematics: primary mathematics, plus innate or culturally learned skills, probably used world-wide more than any other mathematics;
•formal-applied, or "technical" mathematics: mathematical skills and understandings beyond the basic level, for more complex applications; including much of secondary school mathematics and engineering uses, and also skills of both ancient and modern mathematicians.

•informal-pure, or "cultural" mathematics: mathematics of art, music, numerology, puzzles and games;
•formal-pure, or "research" mathematics: university mathematics (except that which is in the "technical" cell), the work of most of the famous mathematicians of history as well as modern mathematicians.

The line curving from the right side to the bottom of the box and enclosing most of the "research" cell is a rough boundary between ethnomathematics, above the line, and academic or learned mathematics, below it.

Once we open up this view of mathematics, many sources from art and architecture, sociology and anthropology, linguistics, comparative psychology, economics, etc., can demonstrate mathematical thinking and mathematical achievement in cultures from all over the world. From such studies, directed toward mathematical aspects of cultures, we can show students in the third-world that mathematics is indigenous to their culture and not an import from Europe. They can even learn more from their grandparents, traders, farmers, and local artisans. They can see and participate in their own local achievements in mathematics. They can understand that their own mathematics has a history and that it remains a key part of their lives.

Mr. Shirley is a member of the Mathematics Education Section of Ahmadu Bello University, Zaria, Nigeria. □

From the Chair

(Ubiratan D'Ambrosio—) We crossed half-term for our current directive of HPM. In the capacity of co-chairman of the group, I take the opportunity to share with our readers some reflections about these two years and the next two.

HPM used two major international venues to hold symposia in 1985 and 1986. In 1985, on the occasion of the XVIIth International Congress of History of Science, in Berkeley, HPM held a Symposium on August 8, 1985 on "The Relation Between History and Pedagogy of Mathematics." It was attended by about 100 individuals. During the International Congress of Mathematicians (ICM 86), also held in Berkeley, HPM organized a Symposium on

August 8, 1986 on "The Timelag Between Innovation in Mathematics and its Incorporation into Collegiate and University Curricula: Historical Consideration and Pedagogical Implications." It was attended by about 200 individuals. The American affiliate was active in organizing symposia during the Mathematical Association of America-American Mathematical Society (MAA-AMS) joint meetings (New Orleans, January 1986) and the National Council of Teachers of Mathematics (NCTM) annual meeting (Washington, D.C., April 1986), which were attended by some international invitees also.

It must be mentioned the important support HPM has been receiving from Ball State University for the editing, printing and distributing of the Newsletter. The Newsletter now has achieved a high standard. The efforts of Prof. Charles V. Jones in editing it and the material support of Ball State University through its Department of Mathematical Sciences can be considered of paramount importance for the existence and future of HPM. To them warmest thanks.

And how about the future? There is some thinking in preparing the ground for the Newsletter to become a journal. We would like to hear from you on this matter.

Plans for our participation in the 6th International Congress of Mathematics Education, Budapest, Hungary, July 27-August 3, 1988 are under way. We will have four one hour slots and there is the possibility of holding a pre- or post-congress in Hungary or in a nearby country. We would like to hear from you on this.

The Americas affiliate is planning activities for the joint MAA-AMS meetings in January (1987: San Antonio; 1988: Atlanta) and the NCTM annual meetings in April (1987: Anaheim; 1988: Chicago). Again, write with suggestions.

Finally, HPM depends on the involvement and participation of all those interested. Please, do keep us informed of your activities, of publications of yourself or of your friends, including data and details on how to acquire them, and of any matter you feel relevant to our group. Let us give help to the devoted editor. □

From the Editor

The question of whether or not to establish a journal for HPM was not generally discussed at the International Congress of Mathematicians at the University of California, Berkeley. (See related item elsewhere, "HPM Sponsored a Session At the International Congress of Mathematicians.") Usually at meetings such these, where HPM asks for time on the program of a larger organization, there are many in attendance who are hearing about HPM for the first time. They of course cannot fully participate in such a discussion. Moreover, when very limited time is available for a scientific program, it is difficult to justify using the time to deal with such administrative issues.

But this is an issue that keeps re-emerging and merits continued discussion. We are now planning for the ICME-6 program [see two related items which follow this] and it might be well to consider setting aside some time to discuss this issue in particular. By making plans for such a discussion ahead of time, and at a conference where we can be confident that a wide international representation of current HPM supporters will be present, I would hope that some progress could be made towards a resolution.

HPM has grown considerably in the past two years. I anticipate that, within the next year, the *Newsletter* will be mailed directly to about 100 individuals world-wide. Readership is even wider than this: individuals share their *Newsletter* and I frequently receive requests to be added to the mailing list from persons who say they had read someone else's copy. This points to a wide interest and growing need that is being served by HPM. As this demand increases, we perhaps should consider altering the international structure to accommodate the larger challenge.

In one of our discussions in Berkeley, Ubiratan D'Ambrosio suggested that an 'executive secretary' office might serve the organization well. HPM does not at present have an office which clearly functions as a clearing house for its activities and a repository of its records. Many tasks, such as arranging for meetings, are dealt with by individuals who take the initiative, which has been the chair in the past. An executive secretary type office would

presumably take over some of these functions and thereby give the organization a focus for its administrative activity. This too is an issue that merits our collective consideration. All in all, it seems to me that a separate 'business' session sometime during the ICME-6 activities would be time well spent for the welfare of HPM. If you would take the time to communicate your sentiments on these issues to Professor D'Ambrosio or to the Editor (see addresses on page 1), you would help considerably in the efforts to plan the ICME-6 activities. □

Planning For ICME-6 In Budapest Moves Forward

The Sixth International Congress on Mathematical Education (ICME-6) will be held in Budapest 27 July to 3 August 1988. The International Program Committee has made preliminary decisions about the shape of the program and its themes, and these are summarized here to help *Newsletter* readers make plans. HPM is one of the study groups of the International Commission on Mathematical Instruction and has been invited to organize activities as part of ICME-6. HPM will have available four (4) sixty minute periods within the eight day cycle of events.

The overall ICME-6 program will be structured as follows. Registration will be on days "0" (Tuesday, 7/26) and 1 (Wednesday, 7/27). Day 1 - opening session, plenary sessions, reception. Days 2, 3, 6 and 7 (Thursday, Friday, Monday, and Tuesday, 7/29 and 29, 8/1 and 2) - 'Action Groups', 'Theme Groups', survey lectures for 'Topic Areas'; short communications; and evening programs. Day 4 (Saturday, 7/30) - a plenary session followed by a full day excursion. Day 5 (Sunday, 7/31) - "5th Day Program", described briefly below. Day 8 (Wednesday, 8/3) - plenary session and closing ceremonies.

The 'Action' and 'Theme' Groups and the 'Topic' Areas have been identified, along with some chief organizers (listed in 'square' brackets; identification codes are underlined). Action Groups are: A 1. Early Childhood (ages 4-8) [L.P. Steffe, College of Education, 105 Aderhold Hall, The Univ of Georgia, Athens, Georgia 30602, U.S.A.]; A 2. Elementary School (ages 7-12) [Jacques Colomb. I.N.R.P., 29 rue

d'Ulm, 75230 Paris CEDEX 05, France); A 3. Junior Secondary School (ages 11-16) [Uchiei Hirabayashi, Nara Univ of Education, Takabatake-chyo, Nara-shi, 630, Japan]; A 4. Senior Secondary School (Ages 15-19; can include school-university interface) [Jan de Lange Jzn. VOWO, Rijksuniversiteit Utrecht, Tiberdreef 4, 3561 GG Utrecht, The Netherlands); A 5. Tertiary/Post-Secondary/ Academic Institutions (ages 18+; can include school-university interface) [John Mack, Dept of Pure Math, The Univ of Sydney, Sydney, NSW 2006, Australia]; A 7. Adult, Technical and Vocational Education (this will include distance education) [R. Strasser, IDM Univ, Bielefeld, Postach 4690, 4800 Bielefeld 1, German Federal Republic].

The Theme Groups are: T 1. The Profession of Teaching (to include the professional development and the status of teachers) [Prof P.A. House, Dept of Curriculum and Instruction, College of Education, 159 Pillsbury Drive SE, Minneapolis, Minnesota 55455, U.S.A.]; T 2. Computers and the Teaching of Mathematics (to include calculators and graphics) [Rosemary Fraser, The Shell Centre for Mathematical Education, The Univ of Nottingham, University Park, Nottingham NG7 2RD, United Kingdom]; T 3. Problem Solving, Modelling and Applications [Mogens Niss, IMFUFA, Roskilde Universitetscenter, Postbox 260, DK4000 Roskilde, Denmark]; T 4. Evaluation and assessment (to include a full range of evaluation of students, teachers and programs) [D.F. Robitaille, Head, Dept Math and Science Education, Faculty of Education, The Univ of British Columbia, 2125 Main Mall, Vancouver, B.C. V6T 1Z5, Canada]; T 5. The Practice of Teaching and Research in Didactics [N. Balacheff, LSD, BP. 68, 38042 St. Martin-d'Heres CEDEX, France]; T 6. Mathematics and Other Subjects (to include particular reference to mathematics as a service subject) [Werner Blum, Gesamthochschule Kassel, Fachbereich 17, Mathematik, Heinrich Plettstraße 40, 3500 Kassel, German Federal Republic]; T 7. Curriculum Towards the Year 2000 [W.C. Higginson, McArthur Hall, Queen's Univ, Kingston, Ontario K7L 3N6, Canada].

The main role of the Topic Areas is to provide for exchanging information and keeping track of trends. Topic Areas To 9, To 12, and To 14 were absorbed in other areas

after the initial list was compiled (hence these numbers are missing). The Topic Areas, with chief organizers indicated for some, are: To 1. Video, Film (Michele Emmer, Speranza 5, (Universita La Sapienza) Roma 00139, Italy); To 2. Visualization (Claude Gaulin, Laval Univ, Quebec City, Québec G1K 7P4, Canada]; To 3. Competitions (George Berzsenyi, Lamar Univ, Dept of Math, P.O. Box 10047, Beaumont, Texas 77710, U.S.A.]; To 4. Problems of Handicapped Students (including problems of physically, mentally, emotionally and socially handicapped students); To 5. Comparative Education [Douglas A. Quadling, Inst of Education, Shaftesbury Road, Cambridge, United Kingdom]; To 6. Probability Theory and Statistics [Kenneth Travers, 505 East Armory Street, Champaign, Illinois 61820, & Lennart Rade, Chalmers Univ of Tech, Gothenburg S41296, Sweden]; To 7. Proofs, Justification and Conviction; To 8. Language and Mathematics [Colette Laborde, IMAG, Univ de Grenoble, 12 rue Blerlot, Grenoble 38100, France]; To 10. Students of High Ability; To 11. Mathematical Games and Recreation; To 13. Women and Mathematics; To 15. Theory of Mathematics Education; To 16. Spaces and Geometries; To 17. Information and Documentation in Educational Work.

The International Program Committee is considering the theme of "Mathematics, Education and Society", for the "5th Day Program". Because of the limitations in the seating capacity of lecture halls, three strands are proposed to run in parallel, entitled: mathematics as a social and cultural product; social and cultural valuations of mathematics; and social groups and mathematics education. Each strand will be broken down into smaller discussion groups for a portion of the day.

Invited plenary lecturers for the Congress with their topics are László Lovász (Budapest) on trends in mathematics with special emphasis on algorithmic ideas and their relevance to the learning and teaching of mathematics; Bienvenido Nebres (Manila) on trends in schools with special emphasis on the work of the ICMI study group on school mathematics in the 1990's and on the situation in the third world countries; Gérard Vergnaud (Paris) on cognitive psychology relevant to the learning

teaching of mathematics and to research didactics. Andrei Ershov (Novosibirsk) will sent a subplenary talk on a new course for Soviet schools.

'our countries have been invited to give minute "national presentations": Argentina, :aria, Malawi and Spain. Everyone attending ivited to submit abstracts of papers; a mittee will decide on acceptance. Poster sentations are scheduled. Satellite meetings ;roups and organizations are encouraged.

he International Program Committee sists of Ákos Császár, Chair (Math Inst vös Univ, Budapest, Múzeum krt. 6-8, H-1088, gary), Desmond Broomes (School of cation, Univ of the West Indies, Cave Hill pus, P.O. Box 64, Bridgeton, Barbados, West es), Claude Comiti (Inst de Formation des tres, Univ de Grenoble 1, BP 68, F-3 8402 Martin d'Heres Cedex, France), Hiroshi Fujita pt of Math, Fac of Sci, Univ of Tokyo, igo, Tokyo 113, Japan), Geoffrey Howson, officio (Centre of Math Educ, The versity, Southampton, SO9 5NH, United gdom), Shirley Hill (309 Education School, v of Missouri-KC, Kansas City, Missouri 110, U.S.A), Mike F. Newman (Mathematics, IAS, stralian National Univ, G.P.O. Box 4, Canberra,)1, Australia), Tibor Nemetz, local observer łnos Bolyai Math Soc, Budapest, Anker köz 3, H-1061, Hungary), Mihail S. Nikolskii teklov Math Inst, U1 Vavilova 42, Moscov, 7966 GSP-1, U.S.S.R.), Michele Pellerey ituto di Didattica, Univ Salesiana, Piazza :emeo Salesiano 1, I-00139, Roma, Italy), János :endrei (Teachers Training College, Szeged, orilis 4. Útja 6., H-6701, Hungary), and David reeler (Dept of Math, Concordia Univ, Loyola mpus, 7171 Sherbrooke Street West, ntréal, Québec H4B 1R6, Canada).

The main language of the conference is nglish, and simultaneous translations into iveral languages will be provided in several ssions. Social activities and activities soecially for visitors accompanying members f the Congress are planned. Accommodations ill be available, from dormitory type to first lass hotel. KLM is the official carrier of the ongress. Information on travel, lodging and ther logistical requirements may be obtained rom the Second Announcement, anticipated in

March 1987, from ICMI-6, János Bolyai Mathematical Society, H-1061 Budapest, Anker köz 1-3, Hungary.

This information was taken from reports of the IFC meetings held in Budapest, July 1986, and from the First Announcement. A form for requesting the Second Announcement appeared in Newsletter No. 11, and is reprinted elsewhere in this issue. —Editor. □

HPM Planning ICME-6 Participation

HPM has been invited to participate in the Sixth International Congress On Mathematical Education (ICME-6), to be held 27 July to 3 August 1988, in Budapest, Hungary. The International Program Committee has allocated four one-hour sessions to HPM and asked Ubiratan D'Ambrosio, HPM chairperson, to initiate organizing a program. HPM has full responsibility for the organization of these four sessions.

A tentative proposal for discussion, put forward by Professor D'Ambrosio, is to have two one-hour sessions consisting of three speakers each with time left for discussion, a single one-hour session devoted to a panel discussion on the general topic "History and Pedagogy of Mathematics", and a single one-hour session for contributed papers which may be selected from proposals sent to the ICME-6 program committee or solicited for the session through an announcement in this *News-letter*. One of the sessions of three speakers might deal with the theme of the life and work of János Bolyai, or with persons involved generally in "Non-euclidean geometry and its adoption in the school systems". A satellite symposium outside the ICME-6 activities may also be organized if sufficient interest is shown.

An additional meeting will be necessary to choose the executive for the four years, 1988-1992, and to conduct other business which may come before the group. This meeting should not interfere with the four one-hour scientific sessions that are part of the ICME-6 program, it has been suggested.

Ideas and suggestions for the program are needed immediately, as are names of speakers; a report of the HPM planned program is due

by 31 December 1986. You may contact any of the Advisory Board or the Editor, but the most direct and best route would be to write to Professor Ubiratan D'Ambrosio, UNICAMP, Caixa Postal 6063, 13081 - Campinas - SP, Brazil. □

HPM Sponsored Session At International Congress of Mathematicians

HPM held a special session during the International Congress of Mathematicians held at the University of California, Berkeley (3-11 August 1986). On Friday evening, 8 August, Ubiratan D'Ambrosio (CAMPINAS, Brazil), co-chair of the International HPM, welcomed the audience to a session entitled "The time lag between advances in mathematics and their incorporation into collegiate and university curricula: a historical perspective and implications", and gave a brief outline of the history of HPM, its goals and activities. Particular reference was made to the Americas Section and to this *Newsletter*.

Four talks were presented followed by a panel and audience discussion, chaired by Charles V. Jones (Ball State Univ, USA). Victor Katz (Univ of District of Columbia, USA), "Differential forms: their development and introduction into the curriculum", described the ambiguity of the concept of differential forms, essentially until Cartan provided a definition (1899). They are still not part of the American undergraduate mathematics curriculum, although included in graduate programs and undergraduate physics courses. Detlef Spalt (Technical Hochschule, Darmstadt, Federal Republic of Germany), "On the history of the Mean Value Theorem", described a variety of proofs that have been given for the intermediate value theorem, although it is an axiom. Diego Parega (Colombia), "Arithmetical algorithms of the Incas", conjectured the details of the algorithms used by the Incas for multiplication and division. The conjectured procedures were based on diagrams, such as the illustration of a quipu with a calculation table in Ascher and Ascher's *Code of the Quipu* (page 66, Plate 4.3 D). Roland Stovasser (Berlin Technical Univ), "A dusty paper of Diderot for teaching mathematics", described some problems posed by Denise Diderot in "Memoires sur differents sujets de mathématiques". By using the evolute

of the circle, in addition to straight edge and compasses, Diderot disected angles into any number of parts and squared the circle by showing the area of a sector was equal to the triangle formed by evolute generator, radius and a line to the center.

Among the points discussed with the panel of speakers were: the term 'mathematics' is misapplied to 'arithmetic', causing some confusion about what should be in the curriculum; different curricula require different responses to advances in mathematics; advances which are primarily for didactics take longer to be incorporated into curricula than those which are responses to specific needs in applications.

The meeting was held in Lewis Hall 100, beginning at 19:00. In spite of the late hour and remote location, well over a hundred participants attended. □

Tercentenary Celebration of Newton's Principia

The University of Maryland and the Smithsonian Institution will hold an international symposium to celebrate the 300th anniversary of the publication of Isaac Newton's *Philosophia Naturalis Principia Mathematica* April 23-25, 1987, in College Park, Maryland and Washington, D.C. The symposium will feature invited lectures by distinguished scholars and scientists, a session of contributed research papers, and a special exhibit of materials relating to Newton. The symposium will focus on Newton's published work, its relation to the science of his time, its influence on eighteenth century civilization, and its relevance to the twentieth century. The invited lectures will explain the significance of Newton's work for an audience of scientists, historians, philosophers, educators and others with a serious interest in this subject.

The registration fee for the symposium is $50, or $40 if paid by 1 April 1987. A special rate of $25 ($20 by 1 April 1987) is available for students, senior citizens and unemployed scholars. Checks should be made payable to the University of Maryland. The fee covers the cost of lunch on the first day of the symposium, a reception, transportation between Washington and College Park, and copies of

A

TREATISE

OF

FLUXIONS.

In Two BOOKS.

BY

COLIN MACLAURIN, A. M.

Professor of Mathematics in the University of Edinburgh, and Fellow of the Royal Society.

VOLUME I.

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ties multiplied by k $+$ l x^n $+$ m x^{2n} &c. raifed to a power of any exponent k. *De quadrat. curvar.* prop. 5. & 6.

751. The following theorem is likewife of great ufe in this doctrine. Suppofe that y is any quantity that can be expreffed by a feries of this form $A + Bz + Cz^2 + Dz^3 +$ &c. where A, B, C, &c. reprefent invariable coefficients as ufual, any of which may be fuppofed to vanifh. When z vanifhes, let E be the value of y, and let $\dot{E}, \ddot{E}, \dddot{E},$ &c. be then the refpective values of $\dot{y}, \ddot{y}, \dddot{y},$ &c. z being fuppofed to flow uniformly.

Then $y = E + \dfrac{\dot{E}z}{\dot{z}} + \dfrac{\ddot{E}z^2}{1\times2\,\dot{z}^2} + \dfrac{\dddot{E}z^3}{1\times2\times3\,\dot{z}^3} + \dfrac{\ddddot{E}z^4}{1\times2\times3\times4\,\dot{z}^4} +$ &c. the law of the continuation of which feries is manifeft. For fince $y = A + Bz + Cz^2 + Dz^3 +$ &c. it follows that when $z = o$, A is equal to y; but (by the fuppofition) E is then equal to y; confequently $A = E$. By taking the fluxions, and dividing by $\dot{z}, \dfrac{\dot{y}}{\dot{z}} = B + 2Cz + 3Dz^2 +$ &c. and when $z = o$, B is equal to $\dfrac{\dot{y}}{\dot{z}}$, that is to $\dfrac{\dot{E}}{\dot{z}}$. By taking the fluxions a-gain, and dividing by $\dot{z}$, (which is fuppofed invariable) $\dfrac{\ddot{y}}{\dot{z}^2} = 2C + 6Dz +$ &c. let $z = o$, and fubftituting $\ddot{E}$ for $\ddot{y}, \dfrac{\ddot{E}}{\dot{z}^2} = 2C$, or $C = \dfrac{\ddot{E}}{2\dot{z}^2}$. By taking the fluxions again, and dividing by $\dot{z}, \dfrac{\dddot{y}}{\dot{z}^3} = 6D +$ &c. and by fuppofing $z = o$, we have $D = \dfrac{\dddot{E}}{6\dot{z}^3}$. Thus it appears that $y = A + Bz + Cz^2 + Dz^3 +$ &c. $=$ $E + \dfrac{\dot{E}z}{\dot{z}} + \dfrac{\ddot{E}z^2}{1\times2\,\dot{z}^2} + \dfrac{\dddot{E}z^3}{1\times2\times3\,\dot{z}^3} + \dfrac{\ddddot{E}z^4}{1\times2\times3\times4\,\dot{z}^4} +$ &c. This pro-pofition may be likewife deduced from the binomial theorem.

· Let

ers presented at the research seminar. ther inquiries about the Newton Symposium uld be directed to the Center for aissance and Barcque Studies, University of yland, College Park, MD 20742, USA, phone 11454-2749 or 7492.   □

Expanded, Updated Calendar Available

"A Calendar of Mathematical Dates", mpiled by V. Frederick Rickey, is now ailable in a much expanded version. It is inted as a small booklet listing events for arly each day of the year. Here is a mpling: November 23, 1823 — János Bolyai pte to his father "I have made such nderful discoveries that I am myself lost astonishment."; November 24, 1858 — tdekind discovers his cuts and thereby ovides the first correct definition of ntinuity.

If you would like a copy of this very useful ference, which contains 110 pages of formation plus eighteen pages of index, send .00 (U.S.) to V. Frederick Rickey, Department f Mathematics and Statistics, Bowling Green tate University, Bowling Green, Ohio 43403, S.A.   □

Conference on Teaching Modelling and Application

H.G. Steiner—) The 3rd International Conference on the Teaching of Mathematical Modelling and Application (ICTMA 3) will be held 1-11 September 1987 in Kassel, Federal Republic of Germany. The conference theme extends from primary to tertiary level. Special emphasis is laid on related research activities, epistemological and historical questions, and the role of computers. The program will include invited lectures, short communications (25 minutes), discussions, workshops, demonstrations and exhibitions. For further information, please contact: Prof. Dr. W. Blum, Universität Kassel (GHS), Facbereich Mathematik, Heinrich-Plett-Str. 40, D-3500 Kassel, Federal Republic of Germany.   □

Newton Celebration In The Netherlands

The Department of Philosophy of the Faculty of Science of the University of Nijmegen has announced an international congress, "Newton's Philosophical and Scientific Legacy", to celebrate the tercentenary of the publication of Newton's *Principia*. The congress will be held 9-12 June 1987. Invited speakers will include: G. Christianson (Indiana State), I. Bernard Cohen (Harvard), B.J.T. Dobbs (Northwestern), and Richard H. Popkin (Washington Univ). Contributed papers are invited. For more information, write to the Department of Philosophy, Faculty of Science, University of Nijmegen, Toernooiveld, Nijmegen, The Netherlands.   □

Have You Read?

Readers are asked to submit contributions. References need not deal exclusively or explicitly with history in the mathematics classroom, but should have the potential for motivating or enriching. N.B. Supply complete bibliographic information: names of author(s); complete titles of books, articles and journals; for journals include both the volume and date; for books, edition, copyright date, publisher and place of publication. Accuracy in spelling and wording is critical. Please provide concise annotations whenever possible.

Bidwell, James K. 1986 "A Babylonian geometrical algebra" *College Mathematics Journal* 17:1 (Jan) 22-31.
  Converts some Babylonian problems into geometry and derives insights into techniques which may have been used by the Babylonians.

Carr, Alistair 1985 "Halley's comet" *Teaching Mathematics and Its Applications* 4:3 (Dec) 102-16.
  Includes some history, some astrophysics, suitable for upper secondary and tertiary students. Contains 16 problems and 15 (more open-ended) "Investigations". [A. Carr]

Clough, John, and Gerald Myerson 1985 "Musical scales and the generalized circle of fifths" *American Mathematical Monthly* 93:9 (Nov) 695-701.

· A highly mathematicized rendering of the relation of diatonic sets to the chromatic scale; not historical but could be part of a lesson on mathematics and music.

Dauben, Joseph W. 1986 "Historical Notes: Counting the days. . .a gift from the gods" *Consortium* # 19 (Sept) 9.
  Discusses the sources of the number and the names of the days of the week.

Deal, Duane E. 1986 "Mathematical oddments" *Indiana Mathematics Teacher* 1:1, 28-29.
  A collection of mathematical tidbits, mostly historical.

DiDomenico, Angelo S. 1986 "A property of right triangles and some classical relations" *Mathematics Teacher* 79:8 (Nov) 640-43.
  An alternate approach to some historical problems, although the article is not historical.

Eisele, Carolyn (Editor) 1985 *Historical Perspectives on Peirce's Logic of Science* Berlin/NY/Amsterdam: Mouton Publishers.
  Papers on aspects of the studies of C.S. Peirce, one of the great original American thinkers. Peirce was a mathematician and logician, best known as founder of pragmatism.

Euler, Leonhard 1984 *Elements of Algebra* Trans. John Hewlett. NY: Springer Verlag
  Reprint of 1840 translation with 1972 biography written by C. Truesdell.

Fernie, J. Donald 1985/86 "Marginalia: candid posterity and the Englishman" *American Scientist* 73:5, 471-73; 74:1, 55-58.
  Two-part biography of Edmund Halley.

Gerdes, Paulus 1986 "On culture, geometrical thinking and mathematics education" Preprint, to appear in *Cultural Dynamics* Vol 2 (1987). Dedicated to Samora Machel, late President of the People's Republic of Mozambique [d. 1986 Oct 19].
  Developing awareness of social and cultural issues in mathematics education in Third World countries, along with specific examples for training teachers.

Hope, Jack A 1985 "Unravelling the mysteries of expert mental calculation" *Educational Studies in Mathematics* 16:4 (Nov) 355-74.

Descriptions of techniques used by mental calculators.

Howson, A.G., J.-P. Kahane, Editors 1986 *The Influence of Computers and Informatics on Mathematics and Its Teaching* ICMI Study Series: Strasbourg 1985. Cambridge Univ Press.
  Publication by HPM parent organization, not historical.

Jones, Charles V. 1986 "Historical Notes: The origins of the metric system: are they mathematical?" *Indiana Mathematics Teacher* 1:1, 25-27.
  Historically, standardized units come from social and political forces, whereas subdivisions by ten are more mathematical in nature.

Kennedy, Jane B. 1986 "Sharing teaching ideas: Discovering patterns for sums of polygonal numbers" *Mathematics Teacher* 79:6 (Sept) 437-38.

Kleiner, Israel 1986 "The evolution of group theory: a brief survey" *Mathematics Magazine* 59:4 (Oct) 195-215.
  "(This article) derives from a firm conviction that the history of mathematics can be a useful and important integrating component in the teaching of mathematics."

Kunoff, Sharon, and Sylvia Pines 1985 "Teaching elementary probability through its history" *College Mathematics Journal* 17:3 (May) 210-19.
  Brief descriptions and analyses of several classic probability problems, with suggestions for use in teaching.

Kupka, Joseph 1986 "Measure theory: the heart of the matter" *Mathematical Intelligencer* 8:4, 47-56.
  Historical survey of measure theory, intended to help motivate the topic.

Long, Robert L. 1986 "Remarks on the history and philosophy of mathematics" *American Mathematical Monthly* 93:8 (Oct) 609-19.
  ". . .the history and philosophy of mathematics. . .can contribute to our effectiveness as teachers." Thoughtful comments on what one should know.

Meyer, Ruth Ann, and James E. Riley 1986 "Rectangular numbers" *Mathematics Teacher* 79:7 (Oct) 528-32.
> Classroom activity with teacher's guide and activity sheets (for copying).

Parker, Donald B. 1986 "Number harmony" *Mathematical Intelligencer* 8:4, 18-21.
> Mathematics of music theory with some history.

Pazwash, Hormoz, and Gus Mavrigian 1986 "The contributions of Karaji — successor to al-Khwarizmi" *Mathematics Teacher* 79:7 (Oct) 538-41.
> Describes tenth century contributions to algebra; also known as al-Karkhi.

Porter, Theodore M. 1986 *The Rise of Statistical Thinking 1820-1900* Princeton Univ Press.
> Nineteenth century sources of statistics in social and natural sciences.

Ridenhour, J.R. 1986 "Ladder approximations of irrational numbers" *Mathematics Magazine* 59:2, 95-105.
> Analyzes the Greek method of using side and diagonal numbers to approximate irrational values.

Sharlau, Winfried, and Hans Opolka 1985 *From Fermat to Minkowski: Lectures on the Theory of Numbers and Its Historical Development* Springer-Verlag.

+ Sizer, Walter S. 1986 "Continued roots" *Mathematics Magazine* 59:1, 23-27.
> Modern treatment of method used by Viète for 2/π calculation.

Tee, Garry J. 1983 "The pioneering women mathematicians" *Mathematical Intelligencer* 5:4, 27-36.
> Discusses Hypatia, Émilie - The Marquise du Châtelet, Maria Agnesi, Sophie Germain, Mary Somerville, and Ada — Countess of Lovelace.

——— 1985 "From monsters to micros", in *Looking Back to Tomorrow*, W.R. Williams, Editor. New Zealand Computer Society. Pp 21-34.
> A survey history of computing including contributions by New Zealanders.

——— 1985 "Mathematical science in New Zealand", preprint of paper presented at 17th International Congress for the History of Science (1985; University of California, Berkeley). Available from author (Univ Auckland, Private Bag, Auckland, N.Z.).
> Discusses mathematicians, manuscripts and resources, and historical work in New Zealand.

Tirman, Alvin 1986 "Pythagorean triples" *Mathematics Teacher* 79:8 (Nov) 652-55.
> Suggestion for how to lead a class to discover the parametric equations for Pythagorean triples.

Washburn, Dorothy K. 1986 "An anthropological perspective on the 'Emperor's edict'" *Mathematical Intelligencer* 8:4, 66-7.
> Symmetery and patterns in cultural artifacts; responds to previous articles in same journal and contains small but good bibliography on geometric patterns in ethnomathematics.

Have You Seen?

Sources of portraits, pictures, diagrams, formulae, and the like from the history of mathematics, reasonably accessible and suitable as enrichment for the mathematics classroom. If no annotation, the illustration is a portrait of the person. Non-portraits historically associated with a person are listed by the person's name, with an annotation. Illustrations not associated with an individual are listed by title or a descriptive term. Color illustrations noted. Repetitions of the same picture in different sources are not avoided in order to maximize the chances of an item being obtainable. As a rule, portraits of living persons are not included. Send items to the Editor, including information on where to find it or how to get more information about it. Contributor's name is in square brackets.

AIREY, J.R. R.C. Archibald *Mathematical Table Makers. Portraits, Paintings, Busts, Monuments, Bio-Bibliographical Notes* (1948. NY: Scripta Mathematica). Contains portraits of 21 individuals, index for 53 mathematicians, information on other sources. [David E. Kullman, Miami (Ohio) Univ]

AL-KHWARIZMI (stamp) MI 7:3 (1985) 78.

ARCHIMEDES (stamp) MI 7:4 (1985) 78.

BANACH, S. (stamp) MI 8:3 (1986) 80.

BESSEL, F.W. MI 2:3 (1980) 111.

BESSEL, F.W. (stamp) MI 7:3 (1985) 78.

BESSEL, F.W. MI 8:3 (1986) 62.

BIEBERBACH, L. MI 3:1 (1980) 7.

BIRKHOFF, G.D. MI 3:1 (1980) 8.

BÓLYAI, F. (stamp) MI 2:3 (1980) 156.

BÓLYAI, J. (stamp) MI 2:3 (1980) 137.

BOLZANO, B. MI 2:4 (1980) 159.

BOREL, E. MI 4:1 (1982) 32.

BRIOSCHI, F. MI 7:3 (1985) 11.

BÜRGI, J. MI 2:3 (1980) 111.

CAYLEY, A. MI 7:3 (1985) 11.

CANTOR, G. with wife *Scientific American* 249.6 (Jun 1983) 123.

CANTOR, G. MI 7:3 (1985) 12.

CASORATI, F. MI 7:3 (1985) 17.

COURANT, R. (poster) from Springer-Verlag NY Inc.

CREMONA, A.L. MI 2:3 (1980) 111.

CREMONA, A.L. MI 2:4 (1980) 208.

D'ALEMBERT, J.L. (stamp) MI 8:2 (1985) 80.

DARBOUX, G. MI 7:3 (1985) 13.

DEDEKIND, R. MI 7:3 (1985) 18.

DICKSON, L.E. See 'Airey'.

DINI, U. MI 7:3 (1985) 14.

DIRICHLET, P.G.L. MI 2:1 (1979) 43.

EDGEWORTH, F.Y. MI 1:3 (1978) 177.

EINSTEIN, A. (poster) from Springer-Verlag NY Inc.

EINSTEIN, A. (stamp) MI 2:3 (1980) 137.

ESCHER, M.C. (print) "Circle Limit IV" MI 4:1 (1982) 9.

EULER, L. *Scientific American* 239:4 (Oct 1978) 112.

EULER, L. MI 1:1 (1978) 3.

FERMAT, P. de (color) *Scientific American* 239:4 (Oct 1978) 104.

FROBENIUS, G. MI 7:3 (1985) 14.

FUCHS, L. MI 7:3 (1985) 18.

GALOIS, E. (line drawing) *Scientific American* 246:4 (Apr 1982) 137.

GALOIS, E. (stamp) MI 8:4 (1986) 86.

GAUSS, C.F. (poster) from Springer-Verlag NY Inc.

GAUSS, C.F. (stamp) MI 2:3 (1980) 137.

GAUSS, C.F. (stamp) diagram MI 2:3 (1980) 155.

GAUSS, C.F. MI 4:1 (1982) 23.

GÖDEL, K. MI 1:3 (1978) 182.

HALPHEN, G. MI 7:3 (1985) 14.

HAMILTON, WM. ROWAN (stamp) quaternions [in Hamilton's hand] MI 8:2 (1986) 80.

HARDY, G.H. MI 3:1 (1980) 8.

HEINE, H.E. MI 4:1 (1982) 32.

HESSE, L.O. MI 2:4 (1980) 207.

HERMITE, C. MI 7:3 (1985) 11.

HERMITE, C. MI 8:3 (1986) 62.

HILBERT, D. (poster) from Springer-Verlag NY Inc.

HILBERT, D. MI 3:1 (1980) 11.

HILBERT, D. with Hermann Weyl. MI 7:4 (1985) 15.

HILBERT, D. MI 7:4 (1985) 75.

KEPLER, J. See 'Airey'.

KLEIN, F. (poster) from Springer-Verlag NY Inc.

KLEIN, F. MI 2:3 (1980) 112.

KLEIN, F. MI 7:3 (1985) 15.

KOVALEVSKAYA, S. (poster) from Springer-Verlag NY Inc.

KOVALEVSKAYA, S. MI 7:3 (1985) 17.

KOVALEVSKAYA, S. MI 7:4 (1985) 71.

KRONECKER, L. MI 2:3 (1980) 112.

KRONECKER, L. MI 7:3 (1985) 11.

KUMMER, E.E. *Scientific American* 239:4 (Oct 1978) 116.

KUMMER, E.E. MI 2:1 (1973) 11.

LAMÉ, G. MI 2:4 (1980) 160.

LAGRANGE, J.L. MI 8:3 (1986) 62.

LANDAU, E. MI 2:4 (1980) 158, 159.

LEGENDRE, A.M. See 'Airey'.

LEGENDRE, A.M. MI 8:3 (1986) 62.

LEIBNIZ, G.W. MI 2:4 (1980) 208.

LIE, S. MI 7:3 (1985) 15.

LOBACHEVSKY, N.I. (stamp) MI 2:3 (1980) 156.

LOVELACE, Lady of, ADA MI 2:4 (1980) 161.

Men of Modern Mathematics. A history chart of mathematicians from 1000 to 1900" (2 X 12 feet/0.61 X 3.66 m wall chart) Contact an IBM sales or public relations office.

MITTAG-LEFFLER, G. MI 3:1 (1980) 4.

MÖBIUS, A.F. MI 2:3 (1980) 112.

MONGE, G. (stamp) MI 2:3 (1980) 137.

MONGE, G. MI 2:4 (1980) 209.

NAPIER, J. (set of posters) Department of Mathematics, University of Edinburgh, Edinburgh, Scotland. [Garry J. Tee, Univ Auckland].

NAPIER, J. See 'Airey'.

NAPIER, J. MI 2:2 (1980) 65.

NAPIER, J. (stamp) formula; sextant MI 8:3 (1986) 80.

NEWTON, I. (color) *Scientific American* 244:3 (Mar 1981) 166.

NEWTON, I. (double stamp) diagrams; portrait. MI 2:3 (1980) 155.

NOETHER, E. (poster) from Springer-Verlag NY Inc.

NOETHER, M. MI 7:3 (1985) 15.

PASCAL, B. (stamp) MI 2:3 (1980) 137.

PEARSON, K. See 'Airey'.

POINCARÉ, H. (poster) From Springer-Verlag NY Inc.

POINCARÉ, H. MI 7:4 (1985) 76.

RAMANUJAN, S. (stamp) MI 2:3 (1980) 137.

RAMANUJAN, S. (photo of a bust) MI 8:2 (1986) 63.

RIEMANN, B. MI 1:1 (1978) 1, 40.

RIESZ, F. MI 3:1 (1980) 7.

RIESZ, M. MI 3:1 (1980) 6.

ROBINSON, J. MI 8:2 (1986) 77.

RUSSELL, B. (stamp) MI 2:3 (1980) 137.

SCHLÄFLI, L. MI 7:3 (1985) 11.

SCHWARZ, H.A. MI 7:3 (1985) 16.

TCHEBYSHEV, P.L. MI 8:3 (1986) 62.

TCHEBYSHEV, P.L. (stamp) MI 8:4 (1986) 86.

TEICHMÜLLER, O. MI 8:3 (1986) 9 ff.

THOMPSON, A.J. See 'Airey'.

VEBLEN, O. MI 3:1 (1980) 10.

WEBER, H. MI 7:3 (1985) 16.

WEIERSTRASS, K. MI 7:3 (1985) 11.

WEYL, H. MI 7:4 (1985) 13.

WEYL, H. with D. Hilbert. MI 7:4 (1985) 15.

MI=*Mathematical Intelligencer* (Springer-Verlag, Heidelberger Platz 3, D-1000 Berlin 33, Germany; for NA only: Springer-Verlag, Journal Fulfillment Serv, Dept J, P.O. Box 2485, Secaucus, NJ 07094). For posters, write to Springer-Verlag NY Inc, 175 Fifth Ave, New York, NY 10010, USA (Attn: Ingrid Cunningham).

There seems to be no obvious criteria for including and excluding items in this feature, so decisions will be liberal but basically ad hoc. I have surveyed my personal collection of the Mathematical Intelligencer, which has gaps in it. Standard text books and other journals will be surveyed in the future. If you would be willing to survey a journal or book and provide data as above, many HPM readers of this feature (and I) would be most grateful to you. —Editor ▢

Colin Maclaurin and the Treatise Of Fluxions

[Manuscript pages that might be of use in the classroom are included from time to time. Requests or contributions of reproducible specimens of some historical significance are solicited. -Editor.]

(*Duane E. Deal—*) Colin Maclaurin (1698-1746) was a disciple of Isaac Newton and perhaps the most outstanding British mathematician in the century following Newton. He was a Scot who entred the University of Glasgow at the age of 11, received a masters degree in mathematics at 17, and was appointed to a professorship in Aberdeen while only 19. In 1719 he visited London and first met Newton and other members of the Royal Society. In fact, Newton sponsored his first work, *Geometrica organica, sive descriptio linearum curvarum universalis*, a work dealing with properties of conics and higher curves.

In 1734 Bishop George Berkeley published an attack on Newtonian calculus, *The Analyst: A Letter Addressed to an Infidel Mathematician*. (The "infidel mathematician" was presumably Edmund Halley who had differed with Berkeley on religious questions.) In response, Maclaurin wrote *A Treatise Of Fluxions* in two volumes (Edinburgh, 1742), which was the first systematic publication of Newton's calculus. Maclaurin attempts to give a geometric basis for Newton's Fluxions (derivatives). The title page shown is of the first edition.

Section 751, pages 610-11, is Maclaurin's series with a somewhat less than rigorous proof. The theorem is of course a special case of Taylor's series, and Maclaurin gives credit to Taylor on page 611.
Professor Deal is on the faculty of Ball State University. ▢

REQUEST FOR INFORMATION

A detailed Second Announcement will be posted to you, if you complete this form and return it by June 1987, to: ICME6, Janos Bolyai Mathematical Society, Budapest, Anker Koz 1 - 3, 1, 111, H-1060, Hungary.

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