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

NEWSLETTER

AN AFFILIATE OF THE INTERNATIONAL COMMISSION ON MATHEMATICAL INSTRUCTION

No. 15 October 1987

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. Edited and produced in the Dept of Mathematical Sciences, Ball State Univ, Muncie, Ind. 47306 U.S.A. The *Newsletter* is available free of charge upon request. Distributors: U.S., Editorial Office; Canada, David Wheeler (Concordia Univ, Montréal, Qué H4B 1R6); Mexico, Alejandro Garciadiego (UNAM-contact at: José M. Velasco 71, Del. Benito Juárez 03900, Mexico, D.F.); South America, Ubiratan D'Ambrosio (address above); Australia, George Booker (Brisbane Coll Adv Educ, 130 Victoria Park Rd, Kelvin Grove, Queensland 4059); New Zealand, Andy Begg (Math Curr OFF, Dept Educ, Private Bag, Wellington); elsewhere, Edv. Jacobsen (Div Sci Tech & Envrmtl Educ, UNESCO, B.P. 3.07 Paris). Send requests and address changes to the Editor.

Calendar

Meetings with HPM components are highlighted.

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

1988 June 30-July 4. . . . . São Paulo
HPM Americas Section in conjunction with 2.o Congresso Latinoamericano de História da Ciência e Tecnologia. Contact: Comissão Organizadora, 2.o CLA/HCT, Caixa Postal 6043, 13.081 Campinas SP Brasil [See inside.]

1988 July 20-22 . . . . . Firenze
HPM Quadrennial Session Prior to the International Congress on Mathematical Education (ICME). Contact Dr Florence Fasanelli, National Science Foundation, 1800 G Street NW, Washington DC 20556 [See inside for details]

1988 July 27-Aug 3 . . . . . Budapest
International Congress on Mathematics Education (ICME 6). Contact: ICMI-6, János Bolyai Mathematical Society, H-1041 Budapest, Anker köz 1-3, Hungary. [See No 13, 14 and inside]

1988 Nov 14-19 . . . . . Hannover
Fifth Internationaler Leibniz-Kongress: "Leibniz-Tradition und Aktualität". Contact: Kongressbüro, Niedersächsische Landesbibliothek, Waterloostr. 8, D-3000, Hannover, 1, FRG.

Editorial...

Ethnomathematics: A Research Program in History

Ubiratan D'Ambrosio[1]

It has been said that 'ethnomathematics' might be an unfortunate term, since it suggests the study of mathematics of primitive cultures. But it is a most appropriate term for emphasizing the cultural essence of mathematical knowledge. First of all, "primitive cultures" reveals a bias which has been surmounted in cultural anthropology, especially by the dissociation of the prefix ethno from the notion of race. Reading the current NSF formulaires makes this clear. Ethno now encompasses all that is associated with cultural behavior: values, myths, codes, symbols, and so on. By comparison, 'cultural' mathematics is inadequate as absolutely redundant; 'mathematics and society', because it suggests a pure relationship; 'oral' mathematics, because of its evident limitations to orality; and so on. It seems to me that ethnomathematics, understood in its broader sense, is the most appropriate. Scholars in other disciplines dealing with different codes of behavior use this terminology (e.g., ethnoscience, ethnoastronomy, ethnomethodology, ethnopsychiatry, and so on) and we mathematicians should be joining them.

The history of science and mathematics tends to minimize or even ignore the cultural motivation behind scientific advances. Although societal and cultural factors are recognized for having influenced the directions in which science grew, they have not received enough attention in understanding and explaining the process of productivity and creativity in science and mathematics. This creativity may share it motivation with the same natural and cultural environments which create the framework in which popular sageness finds its roots and grows to a body of knowledge. This possibility calls for a somewhat different way of looking into the epistemological foundations of scientific knowledge. It calls for an ethnological interpretation of mental processes by recognizing the different modes of thought, as well as different logics of explanation, which depend upon experiential background of the cultural group. Thus we are led to disclaim the assertion that there is only one underlying logic governing all thought.[2]

Let us try to remove an etymological barrier, which tends to see in the term ethnomathematics a relation between mathematical behavior and racial component. In 1975, when I first used the term in discussing the role of time in the origins of Newton's ideas in the calculus, it was clear that a racial component might be a factor in shaping the concept and process of measuring time. I was relying on Scandinavian folklore in my argument. Although it is clear since then that we are using the prefix ethno in a much broader sense, it remains important to repeat and emphasize that it encompasses all the ingredients that make up a group's cultural identity language, codes, values, jargons, beliefs, myths, food and dressing habits, physical traits, and so on. To understand and decipher the cosmic order, as well as to create and to gain knowledge, are universal drives, proper to the human species. These complementary roles of doing and knowing, that are essentially the techne (τεχνη) and the episteme (επιστημη) which gave rise to what we call nowadays Western science, are common to all civilizations and have been the main force behind every human action. The recorded history of every civilization shows us that counting, measuring and modes of inference and decision making have always been present. In Greece, though, mathematics has played a dominant role and, as a consequence, the Western mode of thought reserves for mathematics a prominent role in educational systems. This survived the Romans' declared practicality in dealing with mathematics —a typical ethnomathematics— and then the Middle Ages, giving us now the same domineering role of mathematics over the other school subjects. To be sure, enormous progress has been made in science and technology and these advances, with both positive and negative effects, have reinforced this special role by clarifying the importance of mathematical tools.

Notwithstanding this overarching role of mathematics in Western culture, recently it has been recognized by some that mathematics has roots in other cultural systems and that it is itself a cultural system. Cultural groups

which in our broad conceptualization include, for example, children of a certain age range in a neighborhood, farmers cultivating wheat, engineers in car factories, and so on, have their own patterns of behavior, codes, symbols, modes of reasoning, ways of measuring, of classifying, of mathematizing. These different forms of mathematics, which are proper to the cultural groups, we call *ethno*mathematics. So, there is an ethnomathematics of a certain age group of children in a certain neighborhood, as well as an ethnomathematics of nuclear physicists, and so on. One's own mathematical creativity manifests itself within the realm of one's own ethnomathematics, because authentic creativity will emerge from the ground that has been laid by these practices. We appeal to D.H. Lawrence: "Instead of life being drawn from the sun, it is the emanation of life itself, that is, from all the living plants and creatures which nourish the sun." With this metaphor we want to place the source for authentic mathematical and scientific creativity not in formalized mathematics and science, but in the process of mathematics and science, fed by the creative process itself. Indeed, in looking for the paradigms which generate mathematics, we start with an "undefined, unformalized and uncodified" approach to the "really real" problems posed by nature and society, and go on to formalized and codified knowledge. Ethnomathematics has now come to be about all this.

Ethnomathematical practices have been incorporated into the various cultural groups through the very dynamic process of building up knowledge. To identify the steps in this process is quite difficult and might well be considered a chapter in the "history of the evolution of ideas". We have to rely on sources which we recognize as determinant in the generation of ethnomathematical ideas, all rooted in the complex cultural mesh of the group, such as myths, religious, divinatory and magical practices, the arts and artifacts in general, tales and styles of argument, explanations and everyday life skills. Normally these are recognized and can be identified in the design and making of objects, in the urban dressing and food habits, in icons and artistic conception, and are usually kept and transmitted by oral traditions and through popular, marginal literature. To study the history of mathematics from the cultural viewpoint, or the cultural history of mathematics, which indeed represents the comprehensive histories of the ethnomathematics (in the plural!), requires a new historiographical posture. The sources, as well as the methodology are distinct from those usually dealt with in the history of mathematics. But we are convinced that the historiographical advances resulting from the history of ethnomathematics will contribute to the difficult understanding of the evolution of mathematical ideas.

1. This editorial has been condensed by the Editor.

2. See the "mathematical empiricism" and the challenge to current epsitemologies proposed by Philip Kitcher in The Nature of Mathematical Knowledge (NY: Oxford University Press, 1984), as well as the cognitive approach to the history of science proposed by Richard H. Schlagel in From Myth to the Modern Mind (NY: Peter Lang Publishing, 1985).

Professor D'Ambrosio is currently the Chair of HPM. □

From the Editor

There was no *Newsletter* in May 1987, the present # 15 following # 14 dated February 1987. This hiatus is partly due to the lack of material available last May. Since then enough material has surfaced. This unevenness in the quantity of news illustrates how dependent this type of publication is on the willingness of readers to send news, announcements, information, opinions and the like. You are encouraged to think of this *Newsletter* when you receive such information, and send it to the Editor.

The failure to publish last May also points out another problem: we (meaning HPM) are at an awkward stage of development. The resources required to produce and distribute a four page issue of the *Newsletter* is almost the same as for an eight or twelve page issue. Since the costs of these resources is high, producing only a four page issue is not economical.

You will note that there is news in this issue, though. I call your attention to the preliminary plans for a 'pre-session' in Florence, Italy,

during the week immediately preceding ICME-6. There has been some discussion of arranging a tour from Florence to Budapest, but no specific details are available. In addition, the HPM program during ICME-6 has been put in a final form, thanks to the efforts of our HPM Chair, Professor Ubiratan D'Ambrosio. Descriptions of the meeting plans have appeared in previous issues of the *Newsletter*. By putting all of them together you should have a good preview of the meetings. **N.B.** Be sure to respond to the Call For Papers for the Florence meeting; details are elsewhere in this issue.

One last bit of information: I may be reached by computer mail over the 'CSNET' network. My address is CVJONES%BSU.CSNET with additional syntax appropriate to your system. □

How HPM Relates to ICME-6

Our widening readership may find the structure of HPM somewhat baffling, and the frequent use of acronyms surely does not help clarify matters. A brief explanation may therefore be in order.

HPM (the International Study Group On the Relations Between History and Pedagogy of Mathematics) exists as one of three study groups of the International Commission On Mathematical Instruction (ICMI), the other two being The International Group For the Psychology of Mathematics Education and The International Organisation of Women and Mathematics Education.* ICMI itself derives support from UNESCO. Every four years, ICMI and a host country organize an international meeting, known as the International Congress on Mathematics Education (ICME). There have been five of these so far; the sixth (ICME-6) will be in Budapest next August. HPM will meet in conjuction with ICME in two ways: first, ICME-6 has assigned a portion of its program and facilities in Budapest to HPM to organize and use; second, HPM will organize a 'pre-session' in Florence during the week immediately prior to ICME-6. In Florence, papers will be presented and the business of HPM will be conducted (e.g., choosing the co-chairs for the next four years, discussing long range plans, etc.).

HPM has two co-chairs and an Advisory Board with geographic representation, all chosen at the quadrennial meeting. One of the co-chairs has usually taken a more active role in keeping in touch with the Board and various organizations, by initiating action, planning meetings—especially the quadrennial ICME meeting—and keeping the Study Group informed through this *Newsletter*.

HPM as an organization of people is represented at the international level by the quadrennial meetings and by this *Newsletter*. The *Newsletter* is a forum for news and information about the use of history in teaching, with some opinion expressed in editorials. It is the structure through which people make known their activities in using history in teaching mathematics, and find out about others' activities. Between quadrennial meetings, the *Newsletter* is the visible form of HPM and anyone may contribute to it by sending material to the editor. At the regional level, HPM has 'sections' which meet and may have newsletters. Sections are intended to serve the needs and concerns of a region, especially by holding meetings that are more accessible. An HPM section may not exist in a given region; there may be another organization to serve much the same purpose.

*These organizations may be contacted as follows: Dr Joop van Dormolen (PME Secretary), Institute for Teacher Education, University of Utrecht, P.B. 80 120, 3508 TC Utrecht, The Netherlands; Erika Kuendiger (IOWME Correspondent), Faculty of Education, University of Windsor, 401 Sunset Avenue, Windsor, Ontario N9B 3P4, Canada. □

ICME-6 Program Is In Final Form

ICME-6 is organized on behalf of the International Commission on Mathematical Instruction through the János Bolyai Mathematical Society with the cooperation of the Hungarian Academy of Sciences and the Ministry of Education and Culture. All main issues are decided by the International Program Committee and executed by the Hungarian Organizing Committee (HOC).

A comprehensive second announcement will be sent to all those who have shown interest in ICME-6. Please inform the HOC if this booklet has not reached you (by the end of September

1987). This second (and final) announcement will give details of the conference being held July 27-August 3, 1988, in Budapest, Hungary, including the major scientific and social activities and the plans and addresses of the chief organizers of working groups and their Hungarian coordinators. It will also provide information on accommodations, optional programs, visas, registration, transportation, and the like, and will contain registration and abstract forms.

The major activities of the Congress will be organized in the following manner: (1) plenary sessions, which include lectures by invited speakers A. Ersnov, J.P. Kahane, L. Lovász, B. Nebres, and G. Vergaud, (2) seven action and seven theme groups, each of which will occupy four 90 minute sessions —each group will be divided into smaller subgroups for a portion of the session, these action and theme groups will consider two aspects of professional work, (i) according to the age of the students and (ii) from a thematic point of view; (3) topic areas and international study groups, the main role of which is to exchange information and keep track of recent progess —each group will focus mostly on some specific theme or subject; (4) survey lectures (according to the classification of action and theme groups, but independent of these) will give a broad overview of some major trends and issues in the field since the last Congress; (5) national presentations on some key aspects of mathematical education in Argentina, Bulgaria, Malawi and Spain; (6) 'Mathematics, Education and Society', a program mainly motivated by increasing concern about the relations between mathematics learning and teaching and the social context in which it takes place; (7) short oral communications and poster presentations; and (8) projects.

If you wish to contribute to the work of any of the working groups, or need more information about them, then please contact the chief organizer of the particular group (see following item). If you need more information on the Congress in general, contact: János Bolyai Mathematical Society, ICME-6; Budapest, POB 240, H-1368, Hungary; Phone: (36)-1-427741. All matters concerning accommodation, optional programs and organizational questions are managed by: Malév Air Tours-Congress Department (Ms Elisabeth Szentirmai), Roosevelt tér 2, Budapest, H-1051, Hungary; Phone: (36)-1-187836; Telex: 224954 malev h or 2253 0 mairt h. There is no electronic mail address for the Congress.

Deadline for the return of abstract forms and abstracts (for short communications) is February 29, 1988. Deadline for the return of registration form, transfer of accommodation deposit and fees of most optional programs is March 10, 1988. If you plan to contribute to the activities of the working groups, contact their chief organizers as soon as possible.

Based on Bulletin of the International Commission on Mathematical Instruction, No. 22, June 1987. □

ICME-6 Topic Areas

A list of topic areas and chief organisers of ICME-6 is given as follows, (CO=Chief Organizer). Video and Film- CO: M. Emmer, University La Spazienza, Dip. Mat., Pizzale A. Moro, I-00185, Roma, Italy; Visualization- CO: C. Gaulin, Laval University, Department of Mathematics, Quebec City, Quebec, G1K 7P4, Canada; Competitions- CO: G. Berzsenyi, Lamar University, Department of Mathematics, PO Box 10047, Beaumont, TX 77710, USA; Problems of Handicapped Students- CO: O. Magne, School of Education, PO Box 23501, S-20045, Malmo, Sweden; Comparative Education- CO: D.A. Quadling, 12 Archway Court, Barton Road, Cambridge, CB3 9LW; Probability Theory and Statistics- CO: K. Travers, 505 E Armory St, Champaign, IL 61820, USA; Proofs, Justification and Conjectures- CO: D. Pimm, Centre for Mathematics Education, The Open University, Walton Hall, Milton Keynes, MK7 6AA, England; Language and Mathematics- CO: C. Laborde, IMAG University of Grenoble, 12 Rue Bleriot, F-38100, Grenoble, France; Students of High Ability- CO: S. Kenderov, Institute of the Bulgarian Academy of Sciences, PO Box 373, BG-1090, Sofia, Bulgaria; Mathematical Games and Recreations- CO: D. Singmaster, 87 Rodenhurst Road, London, SW4 8AF; Women and Mathematics- CO: L. Burton, Thames Polytechnic, Faculty of Education and Community Studies, Bexley Road, Eltham, London SE9 2PQ; Theory of Mathematics Education- CO: H-G. Steiner, Universität Bielefeld, IDM, PB 8640, D-

4800, Bielefeld, West Germany; Spaces and Geometries- CO: W.R. Bloom, Murdoch University, School of Mathematical and Physical Sciences, Murdoch, WA 6150, Australia; Information and Documentation- CO: G. König, Lauenburger Str. 45, D-7500, Karlsruhe 1, West Germany; Systematic Cooperation Between the Theory and Practice of Mathematical Education- COs: B. Christiansen, Department of Mathematics, Royal Danish School of Educational Studies, Emdrupvej 115 B, DK-2400 Copenhagen NV; and P.F.L. Verstappen, Stichting voor de Leerplanontwikkeling, Postbus 2041, 7500 CA Enschede, The Netherlands.

Based on Bulletin of the International Commission on Mathematical Instruction, No. 22, June 1987. □

HPM Will Have Session In Firenze Prior To ICME-6

During the week immediately prior to ICME-6 (in Budapest), the International Study Group on History and Pedagogy of Mathematics (HPM) will meet in an 'ICME-6 Presession' for scientific and business sessions in Florence, Italy. The location will be the Palazzo Medici-Riccardi (1 Via Cavour, Florence, Italy) on July 20, 21, and 22, 1988. A call for papers is now being issued. Send abstracts to Florence Fasanelli (address below).

In addition to sessions for presenting papers, the meeting will include a tour of the Palazzo Castellani con Museo di Storia della Scienza —Museum of the History of Science (Piazza dei Giudici 1) and a trip to Vinci. Participants will be responsible for arranging their own local housing. The meeting location is very close to the railroad station.

Those who attended the the pre-session at Sturt Campus in Adelaide remember well the pleasure of sharing many ideas, selling books to each other, exchanging printed material and listening to a variety of papers related to the teaching of mathematics and the history of mathematics and the relation between them. Next year we will have these same experiences, but in the halls of the residence of the Medici's (until 1540), Charles VIII and the Emporer Charles V.

More information will appear in the next *Newsletter* including information about housing possibilities. All inquiries should be directed to Dr Florence Fasanelli, National Science Foundation, 1800 G Street NW, Washington, DC 20550, USA.

Information provided by Dr Fasanelli, a former Chair of the Americas Section of HPM and currently a program officer of the National Science Foundation. □

Call for Papers
HPM ICME-6 Pre-Session
Firenze, Italy
1988 July 20, 21, 22
SEND ABSTRACTS TO
Florence Fasanelli
National Science Foundation
1800 G Street NW
Washington, DC 20550

HPM Sessions During ICME-6

HPM sessions on the ICME-6 program are now final, although specific days for the HPM sessions during the Congress have not been decided. Four sessions are arranged in two symposia, one panel discussion and a session of contributed papers.

Symposium 'Non-euclidean geometries and their adoption in the school system'. Speakers Niko Kastanis (Greece), Massouma Kazim (Qatar), and Tibor Wessely (Romania).

Symposium: 'The evolution of algorithms for use in schools'. Speakers: H. Graham Flegg (England), Alejandro Garciadiego (Mexico), and Lawrence Shirley (Nigeria).

Panel: 'History of mathematics in the teaching of mathematics'. Panelists: Evelyne Barbin (France), Hans Wüssing (German DR), Helena Pycior (U.S.A.), and Árpád Szabó (Hungary). Moderator: Luis Carlos Arboleda (Colombia).

Communications: To be organized.

The symposia are divided into 20 minutes for each speaker, including the introduction and questions. Each panelist will have 10 minutes for presentation, leaving 20 minutes for an overall discussion. History as relevant to mathematics education is stressed, rather than

history of mathematics per se.

From information provided by Ubiratan D'Ambrosio, HPM Co-chair and Chief Organizer, ICME-6. □

Second Cumulative Bibliography Now Available

Each issue of the *Newsletter* since issue #5 of October 1983 contains "Have You Read?", a feature that lists books and articles which may be of use in using history to teach mathematics. The "Have Your Read?" lists for issues #5 through #9 were accumulated into one alphabetized list, called the "First Cumulative Bibliography", and made available in September, 1985.

Now, the "Second Cumulative Bibliography" from the *HPM Newsletter* is available. It contains the entries from "Have You Read?" that appeared in issues #10 through #15 —over 140 citations— about the same size as the First.

If you would like to receive a copy of this "Second Cumulative Bibliography", send $1.00 (US) to the Editor (Charles V. Jones, Department of Mathematical Sciences, Ball State University, Muncie, IN 47306, USA). The "First Cumulative Bibliography" is also available for $1.00 (US). □

A Recent Source for Using History in the Teaching of Mathematics

The Eduction of Mathematics Teachers is a collection of talks presented at the International Congress of Mathematicians in Helsinki in 1978. A variety of nations are represented, which gives the whole work a breadth of view possible only in such international symposia. The central theme, though, ties together these various nationalities in a common problem of striving to provide the best training for teachers of mathematics.

It is a rich source of ideas and issues on how teachers of mathematics should be trained. Problem solving and modelling are emphasized, but of special interest to readers of this *Newsletter* are the several discussions of the role of history in teaching mathematics and in training teachers of mathematics. The book has been available for several years, but it bears being highlighted again. Its discussions are timely.

It was edited by Hans-Georg Steiner and published by the Institut für Didaktik der Mathematik der Universität Bielefeld. Inquire: IDM, Universität Bielefeld, D-4800 Bielefled 1, Federal Republic of Germany (Bundesrepublik Deutschland). □

New Open University Course on the History of Mathematics

[John Fauvel—] The Open University, Milton Keynes (England), has completely rewritten its course on the history of mathematics, so as to provide a complementary focus and teaching style. The new course concentrates on training students in the study and understanding of past mathematical texts in their historical context. It consists of the usual Open University spread of written units, TV programmes and radio programmes (which are sent to students on audio-cassette). The set book around which the course is written is a freshly-prepared source-book, *The History of Mathematics: A Reader* (editors John Fauvel and Jeremy Gray, published by Macmillan).

The course material falls into four blocks, of two months' study time each. Block I, "Mathematics in the ancient world", moves from the earliest evidence for human mathematical activity, before the time of the Egyptians and Babylonians, through the achievements of classical Greece culminating in Euclid's *Elements* and the great geometers Archimedes and Apollonius. Block II, "From the middle ages to the seventeenth century", follows the development of the algebraic approach through Moslem culture to sixteenth century Italy. Then by the end of that century the rediscovery of classical Greek texts helped lead to an unprecedented flowering of mathematics, in the work of Napier, Descartes, Desargues, Kepler, Fermat, Galileo, etc. Block III, on "The seventeenth and eighteenth centuries", largely concerns the invention of the calculus by Newton and by Leibniz, building on the work of many previous mathematicians, and its consequences. The block discusses also how algebraic style reached its almost modern form in the hands of the great Swiss

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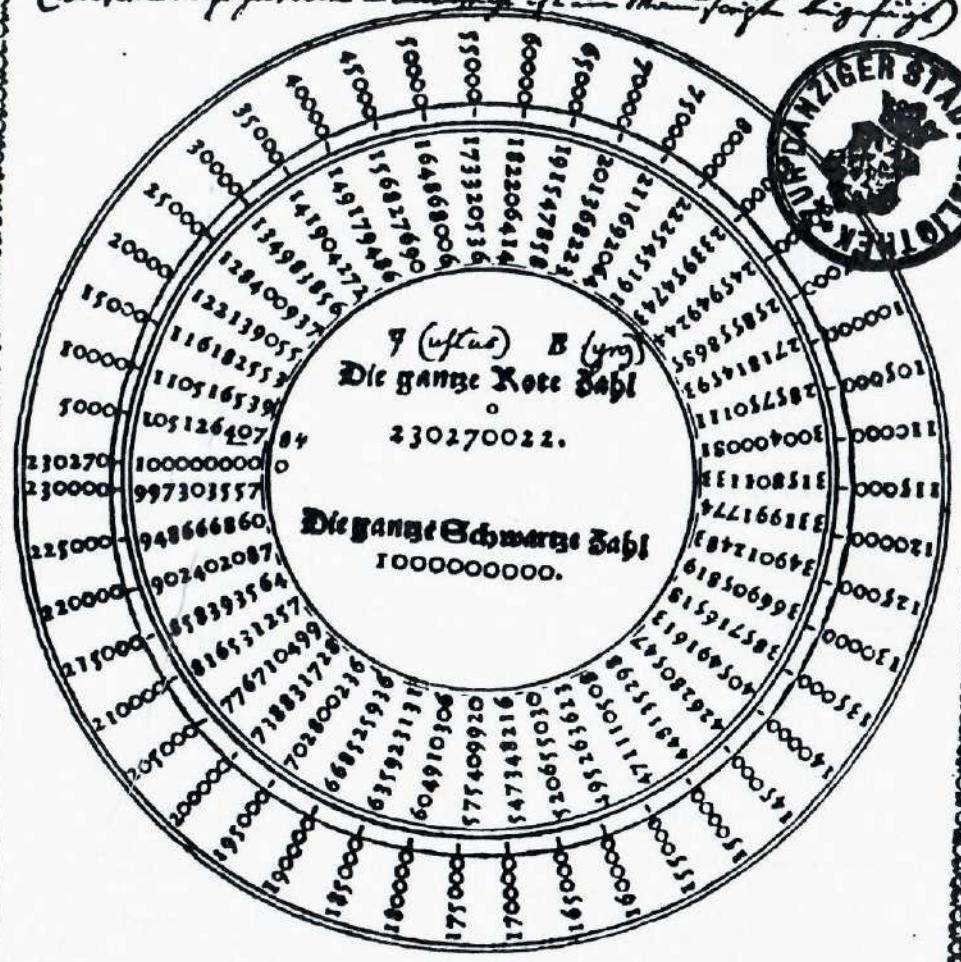

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120	····20066	····21895	····26238	····33111	····42523	····54489	····69021	····86132
130	····30078	····31957	····36351	····43274	····52738	····64755	····79338	····96501
140	····40091	····42020	····46465	····53439	····62953	····75021	····89656	103706871
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170	····70136	····72216	····76812	····83938	····93605	102705827	····20616	····37986
180	····80153	····82283	····86930	····94106	102203824	····16097	····30939	····48360
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260	····60325	····62856	····67907	····75490	····85616	····98299	····13551	····31387
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310	····10465	····13248	····18552	····26387	····36769	····49709	····65219	····83316
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330	····30528	····33412	····38817	····46754	····57237	····70279	····85893	103904091
340	····40561	····43496	····48950	····56939	····67473	····80566	····96232	····14481
350	····50596	····53580	····59085	····67124	····77710	····90855	103406571	····24871
360	····60631	····63665	····69221	····77311	····87947	102901144	····16911	····35265
370	····70667	····73751	····79358	····87499	····98186	····11434	····27254	····45659
380	····80704	····83839	····89496	····97687	102408426	····21725	····37596	····56061
390	····90742	····93927	····99635	101907877	····18667	····32017	····47940	····66444
400	100400781	100904017	101409775	····18068	····28909	····42310	····58265	····76846
410	····10821	····14107	····19916	····28260	····39152	····52604	····68611	····87241
420	····20862	····24199	····30058	····38453	····49396	····62900	····78971	····97643
430	····30904	····34291	····40201	····48646	····59641	····73196	····89326	104008045
440	····40948	····44384	····50345	····58841	····69887	····83493	····99674	····18445
450	····50991	····54479	····60489	····69037	····80133	····93792	103510024	····28848
460	····61037	····64574	····70636	····79234	····90381	103004091	····20375	····39254
470	····71083	····74671	····80783	····89432	102500630	····14391	····30727	····49661
480	····81130	····84768	····90931	····99631	····10880	····24692	····41080	····60075
490	····91178	····94867	101501080	102009831	····21131	····34994	····51435	····70466
500	100501227	101004966	····11230	····20032	····31384	····45299	····61790	····80814

mathematician Leonard Euler. Block IV deals with several "Topics in nineteenth-century mathematics". Is Euclid's parallel postulate necessarily true, or can other logically consistent geometries be devised? Can a formula be found for solving equations of the fifth degree, and if not why not? Was the French Revolution a good thing (for the development of geometry)? Were the foundations of calculus secure? (And if not, what to do about it? Does it matter anyway?) Can calculation be mechanised? Can you 'prove' a theorem by using a computer? These are some of the questions discussed by the end of the course.

The Open University is aiming this course both at mathematics undergraduates and at those interested in cultural history and history of science. It is expected that many mathematics teachers will be interested-mathematics in the educational tradition is a theme running through the course, from scribal training in the Babylonian era to the Pestalozzi school of nearly four millennia later..

The course was edited by HPM advisory board member David Pimm. Further details of availability of the course units and television programmes may be obtained from Open University Education Enterprises Ltd, 12 Cofferidge Close, Stony Stratford, Milton Keynes MK11 1BY, UK.

John Fauvel is on the mathematics faculty of the Open University in England. □

History of Science Meeting in Germany in August 1989

[Christoph J. Scriba—] The 18th International Congress of the History of Science is scheduled for 1 to 9 August 1989. It will take place in two cities of the Federal Republic of Germany, in Hamburg and Munich. From Tuesday, 1 August, until Saturday, 5 August, the location will be the 'Congress Center' in Hamburg (CCH). On Sunday, 6 August, the Congress will transfer to Munich and will be continued in the 'Deutsches Museum von Meisterwerken der Naturvissenschaft und Technik' until Wednesday, 9 August 1989.

The general theme of this Congress will be Science and Political Order (Wissenschaft und Staat). This theme is to comprise all facets of the relations between science —here always understood to include technology and medicine— and the numerous forms of political order. Political order, in this context, is to be interpreted in a broad sense: From the various philosophies about society and state to the actual realizations they have found in past and present in all parts of the world.

Thus the term 'state' is meant to include not only the organization of governmental power (and the processes of political decision making) at various times in history, but also all forms of governmental and semi-governmental institutions that have influenced the growth of science in one way or another. The relations between science, technology and political systems are, however, not only to be studied in one direction. The congress theme should also direct attention to the response of science to the political order: response in the form of organisation and management of science, in the choice of research topics, in the ways in which science, medicine and technology have been applied to meet the needs of the state in peacetime and in war, and the actions these disciplines have taken at various times to bring their interests to bear on state and government. Last but not least the responsibility of science and the scientists towards the state and its various forms of political activities under which science is undertaken in daily research, teaching, planning, etc. should be topics of reflection and discussion at this Congress.

As usual, the Congress will consist of Symposia which will address themes of special interest, and Scientific Sections devoted to the various branches and periods of the history of science and technology. As a new departure, we propose to introduce Poster Sections. Colleagues availing themselves of this facility will be allocated space on a poster board, and one morning or afternoon session will be reserved for discussion. During this period (or at any additional time they may wish to announce on the board) they may be contacted by other congress participants, explain their research projects and discuss in an informal way problems and results of their work.

Chairman of the National Program Committee is Professor Fritz Krafft (Fachbereich Mathematik, Staudinger Weg 9, D-6500 Mainz, F.R. Germany); chairman of the Organizing Committee is Professor Christoph J. Scriba (Institut für Geschichte der Naturwissenschaften, Bundesstr. 55, D-2000 Hamburg 13, F.R. Germany). Chairpersons of the various Commissions and Committees of the Division of History of Science of the International Union for the History and Philosophy of Science (IUHPS/DHS) who are interested in organizing special symposia are invited to contact Professor Krafft in the near future.

The first detailed circular will be distributed by the National Committees of the IUHPS/DHS, or may be requested from Professor Scriba (Bundesstr. 55, IGN, D-2000 Hamburg 13, F.R. of Germany). The second circular will be mailed to all colleagues who by returning the entry-form express interest in further information.

Dr Scriba is director of the Institut für Geschichte der Naturwissenschaften, Hamburg. □

New ICMI Executive Committee

The Executive Committee for the International Commission of Mathematical Instruction now consists of the following: President: J.-P. KAHANE (Université de Paris-Sud, Centre d'Orsay, Mathématique - Bâtiment 425, 91405 Orsay Cédex, France); Vice-Presidents: LEE Peng Yee (National University of Singapore, Kent Ridge, Singapore 0511, Singapore); Emilio LLUIS (Cincinnati 23, Ciudad de los Deportes, 03710, D.F. México); Secretary: A.G. HOWSON (University of Southampton, Centre for Mathematics Education, Southampton, SO9 5NH, United Kingdom); Members: Hiroshi FUJITA (Department of Mathematics, University of Tokyo, Bunkyo-ku, Tokyo 113, Japan); Jeremy KILPATRICK (Department of Mathematics Education, 105 Aderhold, The University of Georgia, Athens, GA 30602, USA); Mogens NISS (IMFUFA, Roskilde University, P.O. Box 260, DK-400 Roskilde, Denmark); Past-President: H. WHITNEY (Institute for Advanced Study, Princeton, NJ 08540, USA); Ex-officio Members: L.D. FADDEEV (L.O.M.I. Fontanka 27, Leningrad 191011, USSR); O. LEHTO (Secretary of IMU, University of Helsinki, Department of Mathematics, Hallituskatu 15, 00100 Helsinki 10, Finland); J.H. van LINT (Technische Hogeschool Eindhoven, Department of Mathematics and Computing Science, P.O. Box 513, 5600 MB Eindhoven, The Netherlands). This committee will serve from 1987 to 1990. The new members are Messrs. Fujita, Kilpatrick, Lee, Lluis, Niss, and van Lint. □

Reprints of Classic History Books

Many of the standard sources in the history of mathematics have gone out-of-print, so when one reappears it is worth noting. Recently Dover Publications (U.S.) reissued Margaret E. Baron's *The Origins of the Infinitesimal Calculus* in the U.S. and Canada as a Dover paperback. This is good news since Professor Baron's book is a first rate history and an excellent resource for all of us interested in using history in the classroom. The same advertisement also lists C.B. Boyer's *The History of the Calculus and Its Conceptual Development* and David Eugene Smith's two major contributions, *History of Mathematics* in two volumes and *A Source Book in Mathematics*. Dover is also the publisher of *The Thirteen Books of Euclid's Elements* as edited by T.L. Heath. Unfortunately, I believe Dover no longer publishes Heath's editions of Diophantos, Archimedes, and Apollonius, all of which are rich sources of historical material. □

Canadian History Group Seeks Members

If you are interested in the history of mathematics, you may want to take advantage of a free offer from the Canadian Society for History and Philosophy of Mathematics/ Société canadienne d'histoire et de philosophie des mathématiques. Free copies of the Society's current *Bulletin* are available on request. The Society has always had an international membership and is currently seeking to broaden its outlook and appeal. One of the benefits of membership is a subscription to *Historia Mathematica*.

Send your request to Roger Herz-Fischler, Mathematics Dept, Carleton University, Ottawa, Ontario K1S 2J2, Canada (electron mail address: ROGERH-F CARLETON.NETNORTH). □

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.

Abeles, Francine 1986 "Determinants and linear systems: Charles L. Dodgson's view" *British Journal of the History of Science* 19, 331-35.

Dodgson is better known as Lewis Carroll, author of *Alice's Adventures In Wonderland.*

Arcavi, Abraham 1987 "Using historical materials in the mathematics classroom" *Arithmetic Teacher* 35:4 (Dec) 13-16.

Examples of how to use historical sources to develop worksheets and problems. Excellent example of activities promoted by HPM.

Ascher, Marcia 1983 "The logical-numerical system of Inca quipus" *Annals of the History of Computing* 5:3, 268-78.

Discussion of Inca quipus as a topic in the history of data representation, data storage and computation.

——— 1984 "Mathematical ideas in Western cultures" *Historia Mathematica* 11, 76-80.

A detailed outline of an undergraduate course emphasizing ideas about number, spatial configuration and logic as they appear in cultures other than our own.

Ascher, Marcia, and Robert Ascher 1981 *Code of the Quipu. A Study in Media, Mathematics and Culture* Ann Arbor, Mich: Univ Michigan Press.

Discussion of the logical-numerical system of Inca quipus and their cultural context.

——— 1986 "Ethnomathematics" *History of Science* 24, 125-144.

Includes a critique of the treatment of nonliterate peoples and their ideas in histories of mathematics. Explores, with examples, the serious study of such ideas.

Aspray, William; Philip Kitcher (Eds) 1987 *History and Philosophy of Modern Mathematics* Minneapolis, Minn: University of Minnesota Press [ISBN: 0-8166-1566-7 (cloth); 0-8166-1567-5 (ppr)]

Proceedings of 1985 conference on interdisciplinary approach to mathematical thought.

Berggren, J.L. 1985 "History of mathematics in the Islamic world the present state of the art" *Bulletin* Middle East Studies Association 19, 9-33.

Boyer, Carl B. 1987 *The Rainbow: From Myth to Mathematics* Princeton Univ Press [ISBN 0-691-08457-2]

A reprint of the 1959 edition with color plates replacing earlier black and white illustrations (also in paperback: ISBN 0-691-02405-7).

Briand, Jean-Pierre, et al 1986 *L'histoire de l'enseignement, XIX-XX siècles Guide du chercheur* Paris Institut national de recherche pédagogique/Pulications de la Sorbonne.

Closs, Michael P. 1983 "A truncated initial series from Xcalumkin" *American Antiquity* 48, 115-22

——— 1983 "Were the ancient Maya aware of the precession of the equinoxes" *Archaeoastronomy* 6, 164-71.

——— (Editor) 1986 *Native American Mathematics* Austin: University of Texas Press.

Dauben, J.W. 1986 "Infinity. . .the Achilles' heel of mathematics?" *Consortium* # 20 (Nov) 9-10.

Describes two of Zeno's paradoxes, one of Galileo's, and credits Cantor with sorting out the infinite.

——— 1987 "Infinity. . .and the transfinite" *Consortium* 22 (May) 8-9.

Describes Cantor's first proof of the non-denumerability of the real numbers, which appeared in his 1874 paper on the countability of the algebraic numbers.

Dieudonné, Jean 1986 *Abrégé d'histoire des mathématiques 1700-1900* Hermann [ISBN 2-7056-6024-0]
One volume, newly revised edition of 1978 work.

Dieudonné, Jean, and Jacques Tits 1987 "Claude Chevalley (1909-1984)" *Bulletin* of the American Mathematical Society n.s. 17:1 (July) 1-7.
Biographical essay describing Chevalley's contributions to math-ematics, with bibliography of Chevalley's work.

Edwards, A.W.F. 1987 *Pascal's Arithmetical Triangle* Oxford Univ Pr [ISBN: 0-19-520546-4]
Traces Pascal's triangle to Pythagorean, Hindu and Arabic sources.

Fauvel, John; Jeremy Gray, Eds. 1987 *The History of Mathematics: A Reader* London: Macmillan.
Readings at all levels, primary and secondary, formal and informal, about mathematics and its social-intellectual context from Babylon to the Four-Colour Theorem.

Fischer, Gerd, Ed. 1986 *Mathematical Models from the Collections of Universities and Museums* Friedr Vieweg & Sohn; and *Commentary* [ISBN 3-528-08991-1]
Photographs of models of surfaces created in European institutions during nineteenth century.

Feuer, Lewis S. 1987 "Sylvester in Virginia" *Mathematical Intelligencer* 9:2, 13-19.
J.J. Sylvester's 1841 stay at the University of Virginia was cut short after six months because of the slavery issue with overtones of anti-Semitism.

Fowler, D.H. 1987 *The Mathematics of Plato's Academy. A New Reconstruction* Oxford: Clarendon Press [ISBN 0-19-853912-6]
A reconstruction of early ratio theory, based on methods we now call continued fractions. Discusses sources of Euclid's *Elements*.

Goldberg, Dorothy 1987 "In celebration: Newton's *Principia*, 1687-1987" *Mathematics Teacher* 80:9 (Dec) 711-14.
Some details of how Newton came to write his *Principia*. Color portrait of Newton.

Grinstein, Louise S.; Paul J. Campbell (Eds.) 1987 *Women of Mathematics: A Bibliographic Sourcebook* Westport, Conn: Greenwood Press, 288 pp [ISBN: 0-313-24849-4].
Biographies and bibliographies of over forty women mathematicians, many written by women mathematicians.

Hay, Cynthia (Editor) 1987 *Mathematics from Manuscript to Print* Oxford: Oxford University Press [ISBN 0-19-853909-6]
Overview of late Medieval and Renaissance mathematics. Proceedings of the September 1984 conference of the British Society for the History of Mathematics, held at Keble College, Oxford.

Howson, Geoffrey 1982 *A History of Mathematics Education in England* Cambridge Univ Press.
History written through biographies (Recorde, Pepys, Doddridge, C. Hutton, DeMorgan, others).

———— 1984 "On writing a history of mathematics education" *Recherches en Didactique des Mathématiques* 5:2, 238-52.
Thoughtful remarks on writing a history that goes beyond mere chronicling of events.

Jones, Charles V. 1987 "Historical Notes: The calendar and arithmetic" *Indiana Mathematics Teacher* 2:1, 19-21.
Basic calendar information useful in developing arithmetic classroom material.

Jaouiche, K. 1986 *La théorie des parallèles en pays d'Islam: Contribution à la préhistoire des géométries non-euclidiennes* (L'histoire des Sciences Textes et Etudes) Paris: Vrin.

Keen, Linda (Ed) 1986 *The Legacy of Sonya Kovalevskaya* Contemporary Mathematics Vol 64. Providence, Rhode Island (USA): American Mathematical Society.

Three essays on Kovalevskaya's life and work, along with several more on contemporary differential equations. [ISBN 0-8218-5067-9]

Kenschaft, Patricia C. 1987 "Charlotte Angas Scott, 1858-1931" *College Mathematics Journal* 18:2 (March) 98-110.
Biography of first British female doctorate, who was also first mathematician at Bryn Mawr College (U.S.). Includes bibliography.

Kruger, Lorenz; Lorraine Daston; Michael Heidelberger (Eds) 1987 *The Probabilistic Revolution* Vol. 1 *Ideas in History* Cambridge, Mass/London: The MIT Press

Kruger, Lorenz; Gerd Gigerenzer; Mary S. Morgan (Eds) 1987 *The Probabilistic Revolution* Vol. 2 *Ideas in Science* Cambridge, Mass/London: The MIT Press

Li Yan; Dù Shìrán 1987 *Chinese Mathematics. A Concise History* Translated by John N. Crossley & Anthony W.-C. Lun. Oxford: Clarendon Press [ISBN 0-19-858181-5]
"The mathematical developments in China over a period of more than 2000 years are presented in more detail than has previously been available in English." [Publisher's announcement] Annotated to sources in Western languages; extensive bibliography.

Maor, Eli 1986 *To Infinity and Beyond: A Cultural History of the Infinite* Boston: Birkhauser Boston [ISBN 0-8176-3325-1]
Mathematics, cosmology, art and music discussed (much on Escher), demanding little technical mathematics.

Purkert, Walter; Hans Joachim Ilgauds 1987 *Georg Cantor, 1845-1918* (Vita Mathematica, 1) Basil/Boston/Stuttgart: Birkhäuser.

Sachs, J.M. 1987 "A curious mixture of maps, dates, and names" *Mathematics Magazine* 60:3 (June) 151-58.
How Mercator's projection was developed and improved before the advent of logarithms.

Sigler, L.E. 1987 *Leonardo Pisano Fibonacci: The Book of Squares* NY: Academic Press [ISBN: 0-12-643130-2]
First translation into English of Fibonacci's *Liber quadratorum* (1225), with commentary. Fibonacci explores many properties of square numbers as sums of odd numbers.

Steiner, Hans-Georg (Editor) 1979 *The Education of Mathematics Teachers* (Materialien und Studien Band 15) Bielefeld: Institut für Didaktik der Mathematik der Universität Bielefeld.
Proceedings of a symposium held during the International Congress of Mathematicians, Helsinki, in 1978. Discusses many issues in using history in teaching mathematics, from a variety of points of view.

Stigler, Stephen M. 1986 *The History of Statistics: The Measurement of Uncertainty Before 1900* Cambridge, Mass: Harvard University Press [ISBN: 0-674-40340-1].

Truesdell, C 1987 Review of U. Bottazzini's *The Higher Calculus: A history of real and complex analysis from Euler to Weierstrass*, in *Bulletin* of the American Mathematical Society n.s. 17:1 (July) 186-89.
A review expressing unequivocal opinions about other historians of mathematics, as well as about the book being reviewed.

Zaslavsky, C 1987 *Math Comes Alive: Activities From Many Cultures* Portland, Maine: J. Weston Walch, Publisher (P.O. Box 658)
A reproducible book containing 64 open-ended activities and games that are multicultural, appropriate for grades 5-9 for gifted students, and adaptable for higher grades.

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.

Gauss (Braunschweig statue) MI 9:2, cover and p 44.

LEGENDRE Burton p 538.

LEIBNIZ Boyer p 437.

LEIBNIZ Burton p 385.

LEIBNIZ (first paper on differential calculus) Burton p 397.

LOBACHEVSKY Burton p 558.

'Mathematical Leather Scroll' Burton p 61.

'Mathematical Leather Scroll' Bunt, Jones, Bedient p 29.

MERSENNE Burton p 480.

'Moscow Papyrus' Bunt, Jones, Bedient p 38.

NEWTON *Mathematics Teacher* 80:9 (Dec) 712.

NEWTON Burton p 361.

NEWTON Boyer p 430.

NEWTON (title page Principia) Burton p 380.

NICOMACHUS (photo ms illustration) Boyer p 199.

NOETHER, E. Burton p 630.

PACIOLI Burton p 305.

PACIOLI (page from Summa) Burton p 296.

PASCAL Burton p 420.

PASCAL (calculating machine) Boyer p 397.

PASCAL (calculating machine) Burton p 424.

PASCAL (triangle, from 1527 arithmetic of Apianus) Boyer p 328.

PASCAL (triangle, from 1527 arithmetic of Apianus) Burton p 434.

PASCAL (triangle, from 1781 Japanese book) Boyer p 399.

PEIRCE, C.S. Boyer p 637.

PLATO (photo of bust) Burton p 131.

PLATO (photo, Raphael's "School of Athens", detail) Boyer p 92.

PLATO (photo ms illustration) Boyer p 199.

PLATO (Academy, photo of mosaic) Burton p 146.

PLATO 'Platonic solids' Bunt, Jones, Bedient p 127.

POINCARÉ Burton p 613.

PTOLEMY Burton p 207.

PYTHAGORAS Burton p 98.

PYTHAGORAS (photo ms illustration) Boyer p 199.

RECORDE (page from Whetstone of Witte) Boyer p 319.

RECORDE (page from Whetstone of Witte) Burton p 303.

REGIOMONTANUS (page from De Triangulis) Burton p 294.

'Rhind Papyrus' Burton p 53.

RIEMANN Burton p 564.

RIEMANN MI 9:2 p 47.

RITTENHOUSE, D. (photo of portrait) *Mathematics Magazine* 60:1 (Feb) cover.

'Rosetta Stone' Burton p 37.

SACCHERI (title page) Burton p 532.

STEVIN (decimal notation) Boyer p 349.

SYLVESTER Boyer p 631.

SYLVESTER MI 9:2 p 15.

TARTAGLIA Burton p 306.

ULUGH BEG (photo of bust) J.L. Berggren, *Episodes in the Mathematics of Medieval Islam* (Springer, 1986) p. 17.

WALLIS Burton p 400.

WEIERSTRASS Burton p 571.

Boyer=C.B. Boyer, *A History of Mathematics* (Wiley, 1968); Burton=D.M. Burton, *The History of Mathematics. An Introduction* (Allyn & Bacon, 1985); Bunt, Jones, Bedient=L.N.H. Bunt, P.S. Jones & J.D. Bedient, *The Historical Roots of Elementary Mathematics* (Prentice-Hall, 1976); MI=*Mathematical Intelligencer* (Springer-Verlag, Heiderlberger Platz 3, D-1000 Berlin 33, Germany; for NA only: Springer-Verlag,

Journal Fulfillment Serv, Dept J, P.O. Box 2485, Secaucus, NJ 07094)..

The Logarithms of Jobst Burgi

[David Kullman—] Jobst Burgi (1552–1632) was a native of Liechtenstein and became the court watchmaker to Duke Wilhelm IV in Kassel, Germany, and later to Emperor Rudolf II and his successors in Prague. He was known for his fine astronomical instruments and his careful, precise computations. His manuscripts include a use of the decimal point (sometimes substituting a small arc for the dot), an elaboration of the rule of false position, and tables of sines. While in Prague, he worked for Kepler computing tables. From about 1584 Bürgi was engaged in the improvement of prosthaphaeresis. There is also evidence that he knew of Michael Stifel's work on exponents.

The idea for logarithms could have occurred to Bürgi by the end of the 1580's, and it is possible that he had computed his tables before going to Prague in 1603. However, Bürgi's only published work, *Arithmetische und Geometrische Progress Tabulen*, did not appear until 1620–six years after Napier's publication. After 1620 the scientific and cultural community in Prague disintegrated, with the result that Bürgi's tables went almost unnoticed and had no apparent influence on the development of mathematics. It is generally believed that Napier and Bürgi may each be credited with the independent invention of logarithms.

Bürgi's logarithms involve a geometric progression that begins with 100,000,000 and has a ratio of 1.0001. The corresponding arithmetic progression contains the terms 0, 10, 20, 30, 40, etc. The logarithm of 1,000,000,000 is 230270.022, which is comparable to $\ln 10 = 2.3026$. Bürgi's table is actually arranged as an antilogarithm table, with the arithmetic progression of logarithms printed in red, and their corresponding antilogarithms in black.

Professor Kullman has an avid interest in the history of mathematics and teaches at Miami (Ohio) University. □