

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

An Affiliate of the International Commission on Mathematics
Instruction

No. 46 March 2001

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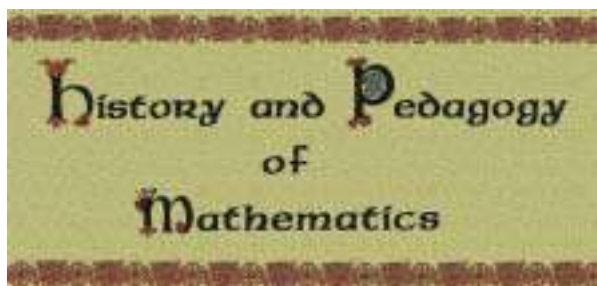
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Peter Ransom, The Mountbatten School

Editorial

Many thanks to all of you for your messages after the distribution of the last HPM Newsletter. I apologise for not getting the numbering correct, having mistakenly numbered it 44 instead of 45, hence this copy is now the 46th newsletter. My thanks to all the distributors who sent out copies to people on their mailing lists. It gives me great pleasure to announce that the HPM Newsletter is now on line, thanks to the work of Karen Dee Michalowicz. You can find it at

<http://www.sju.edu/~ambruso/hpm/Welcome.html>



The home page of the HPM website

Since this edition of the HPM Newsletter is sent to all distributors at the same time, the current issue may not yet be on line, but an Americas home page is being developed.

Those of you living in the Americas are encouraged to send information about meetings, workshops, lectures, etc. to Karen Dee Michalowicz who will see that they are added to the HPM Americas web site, "Upcoming activities".

Karen can be reached at karendm@aol.com.

Establishment of a History of Mathematics committee in Hungary

On the initiative of Katalin Munkácsy and László Filep, the János Bolyai Mathematical Society of Hungary has decided to form a standing committee for dealing with all matters concerning history of mathematics including its relation to pedagogy, i.e. to the teaching of mathematics. The committee wants to put special emphasis on the history of mathematics in Hungary, and to build up fruitful relations with sister committees in other countries, as well as with ICHM. Moreover, it intends to study the connections between history and pedagogy of mathematics.

The board of the society asked 12 of its members to participate in the work of this History of Mathematics Committee. Professor Ákos Császár, member of the Hungarian Academy of Sciences, was nominated to be chairman, and Katalin Munkácsy, associate professor of the Teacher Training Faculty of Eötvös University of Budapest became its secretary.

The committee held its inaugural meeting on October 4, 2000 in Budapest. Seven members were present, the chairman and secretary, as well as: László Filep, College of Nyíregyháza (myself), István Gazda, Hungarian Science History Institute, Elemér Kiss, University of Tîrgu Mures, Romania, Mihály Szalay, Eötvös University, Tibor Weszely, University of Tîrgu Mures, Romania.

At the first meeting the committee discussed the following topics:

1. Preparation of the celebration of coming anniversaries of noted Hungarian or Hungarian-born mathematicians, such as

- the bicentenary of the birth of János Bolyai;
- the 25th anniversary of the death of László Kalmár and Pál Turán;
- the 50th anniversary of the death of Ottó Szász and Pál Dienes;
- the centenary of the birth of Ábrahám Wald.

2. Activities concerning the celebration of the Bolyai bicentenary. E. Kiss and T. Weszely took the responsibility for coordinating the events to be held in Romania and Hungary.

3. L. Filep informed the committee about the preparation of an English language book on the occasion of Hungary's millennium. The book gives an overview on the achievements of outstanding Hungarians both in science and humanities. L. Filep is writing the mathematical part.

László Filep, College of Nyíregyháza

The Dangerous Hole of Zero

History makes a man wise is a common saying. By studying history we can know the errors and mistakes committed in the past and save ourselves from repeating them. According to P. S. Jones "One use of the history of mathematics is to reveal to students some of the conceptual difficulties and errors which have impeded progress". G. A. Miller even says "The teachers of mathematics may frequently gain more from a clear exposition of failures than from such an exposition of successes on the part of the eminent mathematicians of the past".

In this brief note we mention the mistakes, gathered from a few earlier works, in connection with some arithmetical operations involving the number zero (now denoted by the hole "0").

1. The great Indian mathematician Brahmagupta (7th century AD) was the first to give explicitly in his *Brahmasphuta-Siddhanta* (chapter XVIII), the various rules involving zero (in arithmetical operations) but they also include his statement that "zero divided by zero is zero". That is, $0 \div 0 = 0$ which is not true in general.
2. The *Ganitasara-sangraha* (I, 49) of the Jaina mathematician Mahavira (9th century) contains $a \div 0 = a$
3. On the other hand Sripati (11th century) in his *Ganita-tilaka* (rule 45) gives $a \div 0 = 0$

4. Bhaskara II in his famous *Lilavati* (12th century) gives the wrong rule $(a \times 0) = a$. His commentator Ganesa (1545) remarks that the rule comes by cancelling zero from the numerator and denominator!

5. Leonhard Euler (1707-1783) wrongly got $(\dots + 1/x^3 + 1/x^2 + 1/x + 1) + (x + x^2 + x^3 + \dots) = 0$ by summing the two G.P.s which cannot be simultaneously convergent. Euler's tomb, St. Petersburg, Russia



6. It is said that William Emerson (c.1780) and George Baron (1804) asserted that $0^0 = 1$



The Emerson Arms in Emerson's town of Hurworth, Great Britain

7. Martin Ohm (1828) gave the verbal equivalent of $(a \div 0) \times 0 = 0$, if $a \neq 0$
8. A few years later is found the statement (by A. L. G. Demonville?) that "nothing multiplied by nothing is one" i.e. $0 \times 0 = 1$

9. S. G. Abel (father of the famous N. H. Abel, 1802-1829) wrote a textbook which contains $1 + 0 = 0$
10. Surprisingly, even the great Shinivasa Ramanujan (1887-1920) got the wrong result $1^2 + 2^2 + 3^2 + \dots = 0$

The above examples show that there was a lack of understanding of the real nature and behaviour of zero.

References

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 R. C. Gupta: *Ganita-Bharati* **4**, 121 note 3
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 Datta & Singh: *History of Hindu Mathematics, vol 1*. p246 note 7
 A. De Morgan: *The Encyclopaedia of Eccentrics*. La Salle, 1974, pp292-293 note 8
 A. Stubhaug: *N. H. Abel and his Times*. Springer, Berlin, 2000, pp89 and 135 note9

The scientific heritage of Abu Sa'id Ahmad ibn Mohammad ibn 'Abd al-Jalil al-Sijzi

On 25 January 2001, I gave a lecture in the city of Zabol in the southeastern Sistan province of Iran on the *Scientific heritage of Abu Sa'id Ahmad ibn Mohammad ibn 'Abd al-Jalil al-Sijzi*. He was an eminent Iranian mathematician and astronomer of the tenth century AD, born in Sistan province (al-Sijzi means native of Sistan). He was especially powerful in geometry. He wrote in Arabic, and we know about 60 works by him among which about 40 have remained and only a few of them have been published.

An interesting treatise by him on *Geometrical Problem Solving* which has striking similarities with George Polya's *How to Solve It?* was translated into English by Dr. Jan P. Hogendijk (Utrecht University, Holland) with an introduction and commentary. It was published in Iran together with an edition of the Arabic text by Dr. Hogendijk and a Persian translation by Mohammad Bagheri (Tehran, 1996). This publication was mentioned in *Have You Read?* column of the *HPM Newsletter No. 42* (November 1997). Abu Rayhan al-Biruni, the famous Iranian mathematician, astronomer and Indilog of the 10th century AD has admired al-Sijzi for the invention of a boat-shaped astrolabe which is based on the notion of the rotation of the earth in a stationary universe.

The lecture was given in Zabol University and was warmly received by the audience consisting of professors, students, and teachers, mostly inhabitants of Sistan.

Mohammad Bagheri

A report of ICGK 2000, Kashan, Iran

An International Conference on Ghiyath al-Din Jamshid Kashani (al-Kashi) was held in Kashan University (Iran) on 9-11 November 2000.

This was one of the many activities that took place in Iran for the Mathematics World Year 2000. Ghiyath al-Din Jamshid Kashani (d. 1429) was born in Kashan where he was engaged in mathematical and astronomical studies before his departure for Samarkand in 1421. This eminent Iranian scientist joined Ulugh Beg's scientific circle in Samarkand and was supported by him. In Samarkand Kashani designed and supervised the observatory made for Ulugh Beg. Kashani is very famous for his accurate calculation of π .

Some of the invited speakers who presented papers on the scientific heritage of Kashan were

- Dr. Yvonne Dold-Samplonius (Heidelberg), *Al-Kashi's method to calculate arches*
- Dr. Jan P. Hogendijk (Utrecht) *Al-Kashi's determination of 2π in 16 decimals and its role in the history of mathematics*
- Dr. Sergei S. Demidov and Dr. Miryam M. Rozhanskaya (Moscow) *On the study of the scientific heritage of Jamshid al-Kashi in Russia and Central Asia*

A paper entitled *Al-Kashi's treatise on determining sine of one degree and analogous treatises of other astronomers of observatory of Ulugh Beg and of their students* by Professor Boris Rosenfeld (Pennsylvania) was read in the congress.

A piece of theatre based on the life of Kashani was performed in Kashan on the occasion of the congress. A video film entitled *A Qubba for Al-Kashi* made by Dr. Yvonne Dold-Samplonius was shown and warmly appreciated in the congress. For her precious work on Kashani's scientific heritage, Dr. Yvonne Dold-Samplonius was recognised as *Honorary Citizen of Kashan* during a special ceremony arranged by the municipality of Kashan. A workshop on the astrolabe organised by Dr. Jan P. Hogendijk and Mr. Reinoud Koornstra was also an attractive part of the congress. In the first day of the congress, the participants attended the special ceremonies of inauguration at two statues of

Kashani, and the constructional site of the observatory of Kashan University that will be named after Ghiyath al-Din Jamshid Kashani. During the congress days, the participants also enjoyed marvellous sightseeing including the historical buildings of Kashan. The congress was sponsored mainly by the Iranian Mathematical Society and The Iranian National Committee for WMY2000.



Mr. Parviz Shahridri, an eminent Iranian scholar in the history and pedagogy of mathematics, introduces himself to the statue of al-Kashi in the campus of Kashan University, Iran

Alongside the ICGK 2000, a conference on computational mathematics and astronomy was also held in Kashan University.

Mohammad Bagheri

Reviews

In you would like to be involved in reviewing books or magazines for this section, please send your contact details and area(s) of interest to the editor who will forward books or magazines for review as and when they become available.

If you wish for a book to be reviewed, please send it to the editor who will arrange for it to be reviewed.

Focus Issue, *Mathematics History*, “*Mathematics Teacher*”

Vol 93, No. 8, November 2000,

National Council of Teachers of Mathematics,
Reston, VA USA

In November 2000, the National Council of Teachers of Mathematics (NCTM) published a focus issue of their journal, *Mathematics Teacher*, dedicated to mathematics history. The journal, written for secondary teachers, featured articles and activities by some very credible mathematics historians. Some of the authors are Shai Simonson writing on the mathematics of Levi ben Gershon; S.I.B. Gray writing about the mathematics in the Age of Jane Austin; Patricia Wilson on strategies for using mathematics history; Dane Camp on Mandelbrot; and Lawrence Shirley writing about using costumes in the classroom. Other articles are on Kepler and Wiles, Felix Klein, and John Napier.

The beauty about this publication is that it is very usable by the secondary teacher. Unlike many scholarly publications that give us a picture of the mathematics of a certain era or of a certain mathematician, this journal helps the teacher see how the information can be used in the classroom.

As a collector of old and rare books I was particularly interested in the Gray’s discussion of the content in British texts in the early 1800’s. She details problems in early 19th century British texts that not only give the reader a cultural, historical and sociological view of the times, but also give students the opportunity to see different algorithms. The problems are fun!

In the journal one can also find some web sites where resources and activities in the history of mathematics can be located. In addition there is detailed the Historical Modules Project co-directed by Victor Katz and Karen Michalowicz where modules for the secondary mathematics classroom using the history of mathematics are being developed.

The only caveat I give is about the resources recommended in the article, *Sharing Teaching Ideas*. If I remember correctly the original set of Walch posters of *Great Mathematicians* referenced by the authors included one woman, Hypatia. To use the set, I had to make my own additional posters of women. Even though the authors provide a list of mathematicians including

more women, three of the better known women mathematicians, Maria Gatena Agnesi, Mary Somerville and Ada Lovelace are noticeably absent. Conspicuously, the list of pre 20th century mathematicians lists one twentieth century mathematician, a woman, Mary Lucy Cartwright. It fails to list another woman, one of the greatest mathematicians of the 20th century Emmy Noether.

This journal is valuable across cultures and countries. A look at the journal's contents and a reading of Lawrence Shirley's article can be found at <http://www.nctm.org/mt/2000/11/index.html>.

Photocopies of individual articles are available at \$4.00 per title from NCTM, Publications Department, 1906 Association Drive, Reston, VA 20191-9988. Please add \$3.00 for shipping if the order is less than \$50.00 and \$7.00 if the order totals more than \$50.00.

Karen Dee Michalowicz, The Langley School

ICMI Study on History in Mathematics Education

Edited by John Fauvel & Jan van Maanen
Kluwer Academic Publishers \$185, £115, Eur 159, Dfl 350 ISBN 0-7923-6399-X xviii plus 437 pages

This book was launched at ICME-9 in Tokyo in August 2000 with great enthusiasm and vigour by the co-editor Jan van Maanen. It is the culmination of many years' work by over 80 worldwide enthusiastic historians of mathematics. The Executive Committee of ICMI ordered the study at ICME-8 in Seville. Firstly there was a discussion document of 12 questions for research in the spring of 1997. This was followed by a one-week study conference in France in April 1998, attended by over 70 people. The writing, editing and revising was completed during 1999 and the book was released towards the end of 2000. The intended audience was for "teachers, mathematics educators, decision-makers and concerned parents across the world".

The 11 chapters cover a diverse set of aspects, from current usage of the history of mathematics in national school curricula, through teacher-training to resources on the worldwide web. They contain fascinating accounts of people's experiences in other countries, affording valuable additions to the reader's armoury of current historical teaching ideas. There are good discussion points from the international contributors, such as, should we talk about Pythagoras' theorem, or should it be Gou Gu's theorem? Pascal's Triangle or Yang Hui's

triangle? Cavalieri's Principle or the Zu Geng Principle?

There are recurrent themes. These are that the History of Mathematics

- should be introduced to all students in order for them to have a better understanding of the mathematics taught to them;
- increases students' motivation to learn;
- crosses all ability ranges, backgrounds;
- gives an incentive to read and to use the library and, above all,
- humanises what can be seen by students as a formidable subject, and makes it totally accessible.

While an ICMI Study can appear daunting to the average individual, I found this book to be a very pleasant surprise, in that it was fascinating and I was unable to put it down. It certainly appears to be of value to all of its intended audience and I warmly recommend it to everyone, certainly as being worthy of its place on the library bookshelf of every institution worldwide where mathematics is taught.

(Further details and an order form can be found on the last two pages of this newsletter.)

Jenny Ramsden, Wycombe Abbey School

Have you read these?

This section contains references to books or articles that may be of interest to all those concerned with the history of mathematics. Please send details with complete bibliographic information to the editor for inclusion in future issues.

SYMmetryplus

If you are looking for some History of Mathematics input for young people to read and research for themselves, there is surprisingly little on the library bookshelf that looks inviting to a young audience. Why not direct them to the *SYMmetryplus* magazine? Published by The Mathematical Association (UK) three times a year, its pages include puzzles, articles on mathematical themes such as knots, logic problems, codes and board games from around the world. Each issue also contains a biography of a famous mathematician and a complementary article about an aspect of his/her work. The magazine is aimed at young mathematicians from age 10 to 18 years and there is plenty of material contained within its 16 brightly coloured pages to stretch and tantalise everyone (teachers and parents included). Further details can be obtained from The Mathematical Association, 259 London Road, Leicester LE2

3BE, UK or via their website at www.m-a.org.uk

Jenny Ramsden, Wycombe Abbey School

Have you been here?

The British Society for the History of Mathematics web site at www.dcs.warwick.ac.uk/bshm/ has many links to related sites.

The HPM Americas web site at <http://www.sju.edu/~ambruso/hpm/Welcome.html>

Information about other sites would be welcomed by the editor.

Society news

INDIAN SOCIETY FOR HISTORY OF MATHEMATICS

Founded by the late Professor Udit Narayana Singh

The ISHM aims to promote study, teaching and education in history of mathematics. It provides a forum for exchange of ideas and experiences regarding various aspects of history of mathematics. In addition to the annual conferences, ISHM aims at organising seminars/symposia on the works of ancient, medieval and modern mathematicians and has been regularly bringing out its bulletin *Ganita Bharati*. Scholars, teachers, students and all lovers of mathematical sciences are welcome to join the Society. The membership dues payable, on the 1st of January every year, with effect from 2000 are:

Ordinary	Rs100.00	US\$ 30.00
Institutional	Rs 400.00	US\$ 60.00

Life	Rs 1000.00	US\$ 300.00
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All members of ISHM are entitled to receive a free copy of the periodicals published by the Society. All cheques, drafts etc. are to be drawn in favour of "Indian Society for History of Mathematics" payable at Delhi and must be sent to the Treasurer (Dr. Man Mohan, Dept. of Mathematics, Ramjas College, Delhi-110007, India). *

GANITA BHARATI

Ganita Bharati, the Bulletin of the Indian Society for History of Mathematics, is published quarterly every year. It publishes significant

original research papers, articles, review articles, book reviews, news items, reports and dissertation abstracts etc., within the ambit of 'history of mathematics'. The principal languages of publication are English, German, French, Sanskrit and Hindi.

Submission of Manuscript

Manuscripts, books for review and dissertation abstracts for publication in *Ganita Bharati* must be submitted in duplicate to the Editor (Dr. R. C. Gupta, R-20, Ras Bahar Colony, P.O. Lahar Gird, Jhansi-284003, India). Papers and articles intended for publication must comprise sufficiently novel and previously unpublished material. These must be prepared conforming to accepted international standards and the first page should contain (i) the title, (ii) author's name and affiliation, and (iii) abstract of the paper. There are no page-charges. Author(s) will get 20 offprints free. More offprints may be ordered in lots of 50. Each lot will cost Rs. 30.00 (US\$ 15.00 outside India) per printed page.

Subscription Rates

Libraries, institutions and other establishments can subscribe to *Ganita Bharati* directly. Subscriptions can be ordered through agents also, but no agent shall be supplied more than one copy at the Indian rates. The present subscription rates (annual) are:

Rs. 400.00 per volume in India; US\$ 60.00 (or equivalent) per volume outside India.

Back volumes are also available at double the current rates. All cheques/drafts etc. are to be drawn in favour of "Indian Society for History of Mathematics" payable at Delhi and must be sent to the Managing Editor (Dr. Man Mohan, Dept. of Mathematics, Ramjas College, Delhi-110007, India). *

*Money Orders are not acceptable. For outstation cheques Rs. 25.00 (US\$ 5.00) must be added as bank collection charges.

Historical Modules project

The Historical Modules project, a project funded by the U.S. National Science Foundation and administered by the Mathematical Association of America, will be having its final summer session in June. The project has produced twelve self-contained modules using the history of mathematics to teach various subjects in the secondary mathematics curriculum. Six of the modules were field-tested in AY 1999-2000 and are currently being edited for publication. (These are on Linear Equations, Negative Numbers, Proof in Geometry, Combinatorics, Exponentials and Logarithms, and Trigonometry.) The

remaining six are being field tested during the current academic year. (The subjects are Polynomials, Areas and Volumes, Statistics, Functions, Trigonometry II, and a special module on the work of Archimedes.) The writing team members and some of the field testers will return to Washington in late June to revise these modules in accordance with the suggestions of the field testers. They will then be edited for publication.

Although only past participants will be returning to Washington in June, inquiries are welcome regarding the modules themselves. Contact Victor Katz or Karen Michalowicz, the co-directors of the project. Their email addresses are vkatz@udc.edu and karendm@aol.com.

Announcements of events

The Americas Section of HPM

The Americas Section of HPM will meet during the National Council of Teachers of Mathematics annual meeting in Orlanda, Florida, Friday, April 6, 5:30-9:00 p.m. in Rosen Centre Hotel, Salon 16. The program for this meeting, as well as, other meetings will be listed on the HPM Americas web site listed in the editorial.

IV Seminário Nacional de História da Matemática

April 8 to April 11 2001

Universidade Federal do Rio Grande do Norte - Natal, RN, BRAZIL.

Organized by SBHMat - Sociedade Brasileira de História da Matemática.

For more information see <http://www.ccet.ufrn.br/4snhm/index.html>, or contact:

Prof. Dr. John A. Fossa

Caixa Postal 1631

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59 078 - 970 Natal, RN

BRAZIL

The Mathematical Association Annual Conference

April 8 to April 11 2001

St. Martin's College, Lancaster, UK

For more information see <http://www.m-a.org.uk/cc/ac01.html>, or contact:

The Mathematical Association, 259 London Road, Leicester LE2 3BE, UK

International Conference on Mathematical Education

The Northeast Normal University of China is to host an international conference on mathematical education from

16 August to 22 August 2001.

The conference will focus on the following areas:

1. Reform of mathematics curriculum in elementary and secondary schools
2. Teaching mathematics in elementary and secondary schools - pedagogy
3. The use of technology in teaching mathematics
4. Pre- and in-service teacher training
5. Normal education - theory and practice

Registration (covers conference materials and meals) \$200 before 15 June 2001, \$220 later

Contact Professor Lianju Sun, Mathematics Department, Northeast Normal University, 138 Ren Min Avenue, Changchun, China 130024

E-mail CCICME@nenu.edu.cn

From Sumer to Spreadsheets: the History of Mathematical Table-making

22-23 September 2001,

Kellogg College, Oxford, UK

The regular autumn residential meeting of the British Society for the History of Mathematics takes place in Oxford again for 2001, by popular demand, and is on the unusual but deeply rewarding subject of mathematical table making. It will give a technical, institutional, intellectual and social history of tables from earliest times until the late twentieth century, with talks given by leading scholars from Europe and north America.

Tables of one sort or another have been an important feature of mathematical activity for some 4500 years. Not long ago logarithm tables were the main calculation aid, and the concept of a table has more recently taken on new dynamic life in the form of a computer spreadsheet. Issues of design, utility, information processing, and capitalist production methods are all invoked in the insights of historians in a range of disciplines over recent years.

Speakers include Benno van Dalen (Frankfurt), David Grier (Washington DC), Eddy Higgs (Oxford), Graham Jagger (Open University), Chris Lewin (Hampshire), Arthur Norberg (Charles Babbage, Institute, Minneapolis), Eleanor Robson (Oxford), Stephen Johnston (Museum of the History of Science, Oxford), Doron Swade (Science Museum, London), Mike Williams (Calgary), George Wilkins (formerly Nautical Almanac Office), Martin Campbell-Kelly (Warwick), Mary Croarken (National Maritime Museum, Greenwich).

Enquiries: Mary Croarken, 12 Dovedales, Sprowston, Nonvich NR6 7QE: mgc@dcs.warwick.ac.uk Booking inquiries to Hazel Richards, Administrator, Day & Weekend Schools, OUDCE, 1 Wellington Square, Oxford OX1 2JA. Tel 01865-270380 email ppsdayweek@conted.ox.ac.uk

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Archimedes, Gauss and Galileo feature in this mosaic panel seen above the doors of the Mathematics and Science Faculty at St. Petersburg University, Russia

History in Mathematics Education: The ICMI Study

*Edited by John Fauvel (The Open University, UK)
and Jan van Maanen (University of Groningen, The
Netherlands)*

*Kluwer Academic Publishers, xviii + 437 pages, ISBN 0-7923-
6399-x*

This book investigates how the learning and teaching of mathematics can be improved through integrating the history of mathematics into all aspects of mathematics education: lessons, homework, texts, lectures, projects, assessment, and curricula. Most of the leading specialists in the field have contributed to this ground-breaking book, whose topics include the integration of history in the classroom, its value in the training of teachers, historical support for particular subjects and for students with diverse educational requirements, the use of original texts written by great mathematicians of the past, the epistemological backgrounds to choose for history, and non-standard media and other resources, from drama to the internet.

Resulting from an international study on behalf of ICMI (the International Commission of Mathematics Instruction), the book draws upon evidence from the experience of teachers as well as national curricula, textbooks, teacher education practices, and research perspectives across the world. Together with its 300-item annotated bibliography of recent work in the field in eight languages, the book provides firm foundations for future developments.

Focusing on such issues as the many different ways in which the history of mathematics might be useful, on scientific studies of its effectiveness as a classroom resource, and on the political process of spreading awareness of these benefits through curriculum design, the book will be of particular interest to teachers, mathematics educators, decision-makers, and concerned parents across the world.

