European Mathematical Society

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USEFUL ADDRESSES

President	**Professor Jean-Pierre Bourguignon**, IHES, Route de Chartres, F-94400 Bures-sur-Yvette, France.	e-mail: jpb@ihes.fr
Secretary	**Professor Peter W. Michor**, Institut für Mathematik, Universität Wien, Strudlhofgasse 4, A-1090 Wien, Austria.	e-mail: michor@esi.ac.at
Treasurer	**Professor A.Lahtinen,** Department of Mathematics, P.O.Box 4 (Hallitusakatu 15), SF-00014 University of Helsinki, FINLAND	e-mail: lahtinen@csc.fi
EMS Secretariat	**Ms. T. Mäkeläinen,** University of Helsinki (address above)	e-mail makelainen@cc.helsinki.fi tel: +358-0-191 22883 telex: 124690 fax: +358-0-191-23213
Newsletter editors	**D. Singerman,** Southampton (address above) **I. Netuka,** Prague (address above)	e-mail ds@maths.soton.ac.uk e-mail netuka@karlin.mff.cuni.cz
Newsletter advertising officer D.R.J. Chillingworth, Southampton (address above)		e-mail drjc@maths.soton.ac.uk

Please note change of telephone and fax numbers for Ms. Mäkeläinen as above.

NOTICE FOR MATHEMATICAL SOCIETIES

Please note labels are prepared during the second half of the month before the next issue. Would you please send your updated lists before this time.

Many thanks. Ms T Mäkeläinen

APOLOGY AND CORRECTION

In the previous issue of the Newsletter, the e-mail address of our Public Relations Officer, Ms Mireille Chaleyat-Maurel, was incorrectly recorded. The correct address is:

mcm@ccr.jussieu.fr

We apologise to all concerned for this error.

UNIVERSITY OF CAMBRIDGE

Isaac Newton Institute for Mathematical Sciences

Applications are invited from candidates able to take up office by 1st October 1996 as

Director

of this international institute to succeed Sir Michael Atiyah, OM, PRS

The successful candidate will be a senior academic who has administrative experience and who works in some branch of the mathematical sciences.

The appointment will be subject to the statutes and ordinances of the University.

The present pensionable stipend for the Directorship is £38,993.

The post will be for five years with the possibility of reappointment.

Candidates for the Directorship should send ten copies of their application, marked "Confidential", together with the names of two referees, to the Secretary General of the Faculties, from whom further information regarding the Directorship is available at the General Board Office, The Old Schools, Trinity Lane, Cambridge CB2 1TT, so as to reach him no later than Monday 16th October 1995.

The University of Cambridge follows an equal opportunity policy and aims to achieve the highest quality in teaching and research.

UNIVERSITY OF CAMBRIDGE
ENGLAND
DEPARTMENT OF PURE MATHEMATICS AND MATHEMATICAL STATISTICS

University Lecturer or Assistant Lecturer in Pure Mathematics

Applications are invited for this post in any field of Pure Mathematics to take up appointment from 1 October 1996, or earlier if possible.

Further information can be obtained from Professor J.H. Coates, Head of Department, Department of Pure Mathematics and Mathematical Statistics, University of Cambridge, 16 Mill Lane, Cambridge, CB2 1SB, England (telephone 44-1223-337996, fax 44-1223-337920, e-mail Lectureship@pmms.cam.ac.uk). Applications should be sent to the Head of Department and should include a curriculum vitae and list of publications, together with the names of 3 referees. Candidates must ask their referees to send their reports directly to the Head of Department, to reach him by the closing date.

The closing date for applications is **10 November 1995**

The University is an equal opportunities employer
It aims to achieve the highest standard in teaching and research

Meeting of the Council

Budapest, July 20 and July 21, 1996

The Council meets every second year, The next meeting will be held in Budapest, July 20 and July 21 1996, immediately before the European Mathematical Congress.

Delegates to the Council will be elected by the following categories of members.

(a) Corporate Members

Corporate Members are national mathematical societies which elect 1, 2 or 3 delegates according to size and resources. A society is responsible for the elections of its delegates. Each society should notify the Secretariat of the EMS in Helsinki of the names and addresses of its delegate(s) no later than 20th March 1996. As of 1st July 95 there were 44 societies which could designate a maximum of 67 delegates.

(b) Associate Members

There are three associate members, namely the Gesellschaft für Informatik, the Gesellschaft für Mathematische Forschung and the European Mathematical Trust. Arrangements will be made for election of their delegates (one per associate member).

(c) Individual Members

A person becomes an individual member either through a corporate member, by paying an extra fee, or by direct membership. On 30th June 1995 there were some 1600 individual members and, according to our statutes, these members will be represented by 17 delegates. The mandates of 11 of those 17 delegates end on 31st December 1995 and so elections must be held for their positions. Nomination papers for these elections will appear in a later issue of the Newsletter. Six delegates were elected for the term 1994–97, so they will continue unless they inform the Secretariat to the contrary by 31st December 1995.

The Executive Committee is responsible for preparing the matters to be discussed at Council meetings. Items for the agenda of this meeting of the Council should be sent as soon as possible and no later than 27th April 1996 to the Secretariat of EMS in Helsinki.

The Council is responsible for electing the President, Vice-Presidents and other members of the Executive Committee. The present membership of the Executive Committee, together with terms of office, is as follows.

President	1994–98	Professor J.-P. Bourguignon
Vice-Presidents	1994–98	Professor D. Wallace
	1990–96	Professor L. Márki
Secretary	1994–98	Professor P. Michor
Treasurer	1990–98	Professor A. Lahtinen
Other members	1990–96	Professor E. Bayer
	1993–96	Professor I. Labouriau
	1993–96	Professor A. Pelczar
	1993–96	Professor V.A. Solonnikov

Under Article 7 of the Statutes, members of the Executive Committee shall be elected for a period of 4 years. Committee members may be re-elected provided that consecutive service shall not exceed 8 years. Thus Professors L. Márki and E. Bayer cannot be re-elected. Professors I. Labouriau, A. Pelczar and V.A. Solonnikov are eligible for re-election.

It would be convenient if potential nominations for office in the Executive Committee, duly signed and seconded, could reach the Secretariat by 27th April 1996. The Council may, at its meeting, add to the nominations received and set up a Nominations Committee, disjoint from the Executive Committee, to consider all candidates. After hearing the report by the chaiman of the Nominations Committee (if one has been set up), the Council proceeds to the elections to the Executive Committee posts.

Delegates to the Council meeting, who are to attend the EMC_2, are advised that their accommodation arrangements can be made through the EMC_2. Delegates to the Council, who are not attending the EMC_2, are advised that accommodation arrangements may possibly be made through EMC_2. Please contact the organizers of the Congress as soon as your plans are definite.

Peter Michor
Secretary EMS

Secretariat: Mrs. Tuulikki Mäkeläinen
Department of Mathematics
P.O. Box 4
FIN-00014 University of Helsinki
Finland

European Mathematical Soceity

Report on the Meeting of the Executive Committee

Hamburg June 30 - July 2, 1995

Eva Bayer Fluckiger, Jean-Pierre Bourguignon, Alberto Conte, Isabel Labouriau, Aatos Lahtinen, Peter Michor, Andrzej Pelczar, V.A. Solonnikov and David Wallace were present. László Márki was excused.

Rainer Ansorge (for GAMM, the German Applied Mathematical Society, at the opening of the meeting), Mireille Chaleyat-Maurel (Public Relations Officer), John Coates (Chairperson of the Committee for a European Bibliographical Database), Jens Erik Fenstad (for the European Science Fondation), Adrien Jami (Chairperson of the Committee on Applications of Mathematics), Ina Kersten (President of the German Mathematical Society (DMV)), Stewart Robertson (Chairperson of the Publications Committee), Berndt Wegner (for the FachInformationsZentrum Karlsruhe), Tuulikki Mäkelainen (Secretary of the European Mathematical Society) were invited.

SCIENTIFIC ACTIVITIES

European Congress of Mathematics

ECM2 July 22-26, 1996 Budapest (Hungary)

The first announcement has come out in June. It is also available by anonymous ftp both from the Mathematical Institute of the Hungarian Academy of Sciences (circle.math-inst.hu:/pub/ecm2), and on the server EMIS of EMS (http://www.emis.de). It is possible to register by e-mail (ecm2jbms@math-inst.hu)

The theme of the Congress is "The Unity of Mathematics". The scientific programme is progressing well, with the list of main speakers nearly finished.

Diderot Mathematical Forum

This series covers fundamental mathematics, applications of mathematics and their relationship to society. The conferences will take place simultaneously in three European cities connected by telecommunication. An audience of 100-200 participants is planned in each town. The general scheme includes a plenary session, several parallel sessions, round tables and one lecture for a wider public, with multimedia support.

For the year 1996, there are plans for two conferences, each lasting for two days. "Mathematics and Finance" will be organized by P. Embrechts (Zürich) with the following towns and respective local organizers : London (M. Davis), Moscow (A. Shiryaev), Zürich (H. Bühlmann). J.L. Lions (Paris) has initiated contacts for a conference on "Mathematics and Space" in the three towns : Amsterdam, Münich, Toulouse.

Some topics which could be considered for 1997 are : "Mathematics and climate", "Mathematics and Risk", "Mathematics and Health", "Mathematics and Art"...

EMS Lectures

Thanks to the very efficient work of E. Bayer Fluckiger, the first EMS lectures in Besançon (France) on June 12-15, 1995, were a great success, with about 90 participants. Professor H.W. Lenstra Jr gave four lectures which were videotaped. There were seven other speakers, both established mathematicians and young people. A survey paper should be prepared by the lecturer and submitted to JEMS. Bids for the 1997 lectures are requested in this issue of the Newsletter.

Towards a European Bibliographical Database

Important points raised by the EMS Committee for a European database are the following :

Definition of the structure of the database.

Server presentation of abstracts and résumés of articles to be published in major printed journals should be considered.

Collaboration and coordination with other bodies.

The EMS Committee for a European Bibliographical Database could act as an international advisory board for Zentralblatt. It could also act as an advisory board for the operation consisting in bringing the Jahrbuch der Mathematik to a database (in collaboration with AMS).

Revision of the Mathematical Science Classification Index for the year 2000 should be kept in mind.

The goals of EMS in regard to the database will be defined.

RELATIONS WITH MATHEMATICAL INSTITUTIONS

International Mathematical Union (IMU)

The President had discussions with the President of IMU, David Mumford. EMS can have observer status. Joint activities of EMS and IMU are expected, mainly on WMY 2000.

African Mathematical Union (AMU)

J.-P. Bourguignon is invited to give a lecture at the Congress of AMU in Ifrane (Morocco) in September 1995. He will be asked to represent the EMS at the opening ceremony and at other occasions during the Congress. Information gathered at this meeting will be useful for the activities of the EMS Committee for Developing Countries.

European Science Foundation (ESF)

ESF consists of National Research Organizations and Academies. It has a general Assembly, Executive

Committee and Special Committees. There are five standing Committee with scientists as members and three levels of programmes : Euroconferences (financed by Brussels), Networks (Financed by ESF) and Scientific Programmes (financed by members countries).

EMS has three series of Euroconferences running; a new series on number theory and arithmetic geometry was proposed to the ESF.

ESF acts as an advisory board to the EU, particularly in the following areas :

- Scholarly publishing
- Reflection on large facilities (EMIS and *Zentralblatt für Mathematik* Database could be one of these)
- Cooperative programmes with third world countries.

The President had fruitful discussions with the General Secretary of ESF, Dr Fricker. ESF wishes to cooperate with EMS to enhance the role and visibility of mathematics within the European Union (EU), and stressed the need to represent both pure and applied mathematics. The first Summer School of EMS, in Hungary, could be supported by ESF.

An ESF-ESTA (European Science and Technology Assembly)-EMS joint Committee is formed to write a draft on how mathematics can be more present in the Programmes of the Commission. K.H. Hoffmann and J.P. Bourguignon were appointed to represent the EMS in this Committee.

A team composed, to start with, of J. Ball, J.P. Bourguignon, K.H. Hoffmann and L. Lemaire is to develop the EMS own draft. Some persons from the Committee of Applications of Mathematics should join the team.

European Union (EU)

The President has been in regular contact on various issues with Jack Metthey, a member of Ms Cresson's staff (she is the commissionner of DG XII).

The Committee for the European Union is renamed "Committee on Relations with European Institutions".

INFORMATION SERVICES

European Mathematical Information Service (EMIS)

The EMS server (EMIS) is functioning at http://www.emis.de. It provides at present or will do in the near future :

An Electronic Library (ELibEMS)

The EMS Server collects electronically accessible mathematical journals and proceedings. The electronic versions of a printed journal can be problematic and a solution ought to be sought for the future. To improve the coverage of journals, charges could be considered; a sum to be paid with the membership fee was proposed.

The possibility of publishing abstracts or back volumes of printed journals could be considered.

The editorial board for ELibEMS could consist, to begin with, of the Committee for Electronic Publishing.

Information

Information on EMS, mathematical societies in Europe and the main part of the Newsletter.

Mathematical activities

Joint ventures with other societies or the possibility of mirroring information from other agencies should be explored.

Openings and positions

This service also depends on other sources for the data ; nevertheless, this point is considered to be important for EMS.

Links should be established between member societies' servers as well as to IMU server. In order to respect data protection, written consent of individual members is needed to have their data on the server.

Which agencies are to be allowed to mirror EMIS and at what fee is to be decided later.

Newsletter

The material in the Newsletter will be arranged in a format suitable for the server. A new cover design is under consideration. Information about conferences could be deleted from the printed Newsletter and inserted in the server. This should save money. After their hard and good work over almost five years, the Southampton team asks to be replaced. A new team should be constituted very soon in order to take over in the spring of 1996.

APPLICATIONS OF MATHEMATICS

The meeting in Hamburg included a special meeting with the Committee on Applications of Mathematics.

The second Euroconference on Applications of Mathematics is about Mathematical Methods in Turbulence Models (1996). Planning for the third one will start soon.

Cooperation with other societies in applied fields, like ECOMATH and ECMI, has been fostered and will continue. The Bernoulli Society should be contacted for possible future cooperation.

In order to increase the interest of pure mathematicians in applied areas, it is suggested to include short survey papers in the Newsletter and to have a round table in Budapest.

The question of the subject classification was raised. Applied fields should be reclassified according to the mathematics involved rather than by the field of application. Needed is a group of experts in applied areas, working with some editors of Zentralblatt to develop a scheme, but this may be too ambitious.

It was decided to increase the presence of applied fields in EMS activities (summer schools, Diderot Mathematical Forum, EMC, EMS Lectures, database, server, brochure,...)

WORLD MATHEMATICAL YEAR 2000 (WMY 2000)

Issues 1 and 2 of the Newsletter WMY 2000 are now on the server EMIS. The third issue is in preparation.

One of the activities which is already beginning is the preparation of postage stamps with portraits of mathematicians. After France, Italy has started a project for a joint European or possibly world series of stamps. Suggested names for mathematicians to be represented on stamps are : Lagrange, Riemann, Hilbert.

The long history of Science in Europe could be a European topic for WMY 2000. J.P. Pier (Luxembourg) leads a group working on the history of mathematics in the period 1950-2000.

It is suggested to apply to UNESCO for support of a programme, that could be called "Memory of Mathematicians". It would consist of a database of mathematicians, whose contribution has been important, with biographical data and information on where to find relevant documents.

The EMS Committee for Education could develop a draft for mathematical training in Europe by the year 2000.

The EMS Committee appointed for WMY 2000 is composed as follows : Mireille Chaleyat-Maurel (France), Alberto Conte (Italy), Stephen Gelbart (Israel), Vagn Lundsgaard Hansen (Denmark), Michael Hazewinkel (Netherlands), Osmo Pekonen (Finland), Jose Francisco Rodrigues (Portugal). The chairperson will be appointed at the Besançon meeting.

VISIBILITY

Server

The address of the server should be announced in the Newsletter, on Internet, in Newsletters of member societies, on servers of member societies and offered for publication to AMS Notices.

Brochure

The contents of a brochure, describing the activities of EMS is in preparation.

With the brochure, national societies could distribute a separate leaflet giving further information on EMS, maybe a translation of the brochure and instructions on how to join EMS in their respective countries.

The list of member societies should not be in the brochure but on the server.

Recommendations

Member societies should be urged to mention their membership of EMS in their letterheads, their publications, and wherever else appropriate.

A good example

The Executive Committee of the Italian Mathematical Society (UMI), in order to increase the number of Italian members of EMS, has decided to offer a volume of the "Opere dei Grandi Matematici Italiani" to all members of UMI who also join the EMS.

MISCELLANEOUS

Relationship with member societies

EMS Vice-President D. Wallace will be in charge of strengthening the relationship between EMS and member societies. As a first task, he will ask member societies to publicize ECM2.

Relationship with Science Museums

The renovated mathematics section of the French Science Museum "Cité des Sciences et de l'Industrie / La Villette" (Paris) was inaugurated by the President. It received wide publicity in France (radio, press).

Server of the European Mathematical Society

In June 1996 the 'European Mathematical Information Service' went on line under the URL http://www.emis.de or also under the anonymous ftp server ftp.emis.de.

It contains information about the European Mathematical Congress 1996 in Budapest, about the Society, the Electronic Library of the European Mathematical Society, and information about conferences and other mathematical servers throughout the world.

This service is offered by the EMS in collaboration with FIZ-Karlsruhe. Mirror servers in some European countries are under negotiation, so in the future access should be fast from many European countries.

Point your www browser (Mosaic, Netscape, etc) at the given address and have a look.

Peter Michor
Secretary EMS

Editorial Note: *From this issue onwards it is hoped that most of the text of the newsletter will be available on the server. The server has the great advantage of continuous updating and immediate access which renders it ideal for conference announcements and job advertisements.*

Second European Congress of Mathematics

Budapest, Hungary, July 21--27, 1996

The mathematical world meets every fourth year on the occasion of the International Congress of Mathematics. As with sports fans and the Olympic Games, every mathematician is familiar with the data of these meetings as milestones in the course of his or her career : Zürich 1994, Kyoto 1990, Berkeley 1886, Warsaw 1982, etc. This regular pattern has altered recently. In 1992 the First European Congress of Mathematics opened in Paris a new series of "global" mathematical meetings. The European mathematicians' clock is now set on a two-year period, with an event every other year, alternating between European and International Congresses. The next one coming up is the Second European Congress of Mathematics to be held in Budapest, Hungary, in 1996.

It is not merely a coincidence that Hungary has been chosen to host such a major mathematical encounter. Besides the well-known mathematicians who have brought fame to Hungary, students also enhance her reputation. Several international tests and contests have shown them to be among the best in their age groups. Wherever a young visiting Hungarian may study, he or she rarely belies this reputation.

Budapest will welcome the participants of the Second European Congress of Mathematics from July 21st to July 27th. Congress activities will take place mainly in the classical building of the Technical University on the banks of the river Danube and in the modern Budapest Convention Centre at the foot of Buda's hills. Besides traditional social activities, lectures and Round Tables are the two main components of the congress :

- the plenary addresses as well as the parallel session talks have been invited by the Scientific Committee established by the European Mathematical Society. They are designed for a wide audience and are to demonstrate the "unity of mathematics", theme chosen for the congress by the committee. No field is a lonely island ; on the contrary, it is the interaction between theories and applications from different fields that can lead to the greatest mathematical achievements;
- Round Tables are an original feature of the European Congresses, as initiated at the Paris Congress. They are prepared by multinational panels and address issues of interest to our community connected with its European dimension or its relations with other fields. The preliminary reports, together with an edited version of the debates, are incorporated into the Proceedings of the Congress.

Poster sessions where anyone wishing to do so may present his or her results are planned. A few young mathematicians will receive prizes to stimulate their research. Other activities include exhibitions, book sales, games, etc. A variety of special fields of mathematics will be represented in satellite conferences before and after the Congress at various sites in and around Hungary.

The Janos Bolyai Mathematical Society and the European Mathematical Society are pleased to invite the mathematical world to combine a week of scientific adventure with a few days of unforgettable discovery.

Hungary, surrounded by beautiful mountains, is situated in the heart of Europe. Budapest in turn is almost in the centre of the country and an ideal place for scientific, cultural and tourist activities. This historical city offers various sights, from Roman ruins to modern architectural achievements, and various events, from classical concerts to film festivals. No one can forget a walk across the Chain Bridge with its magnificent view of the Royal Palace, a stroll in the narrow streets of Castle Hill or through a park. Museums, art galleries, concerts and theatre performances can satisfy the most refined expectations. Sightseeing can be combined with a study tour of Hungarian gastronomy in an elegant restaurant, a traditional pub, or a Vienna-style cafe.

More information about the Congress is available by mail from :

János Bolyai Mathematical Society
Foutca 68, H-1027 Budapest, Hungary

by e-mail: ecm2jbms@math-inst.hu; or by anonymous ftp both from the Mathematical Institute of the Hungarian Academy of Sciences: circle.math-inst.hu:/pub/ecm2 and at the Server of the European Mathematical Society:

http://www.emis.de

Antal Balog
Secretary of the Organizing Committee

Call for the EMS Lectureship 1997

Bids for the EMS Lectureship 1997 are invited, following the rules outlined below, and should be sent to the secretary of the EMS, at the following address, not later than January 1, 1996.

Professor Peter Michor
Institut für Mathematik
Universität Wien
Strudlhofgasse 4
A-1090 Wien
Austria
Peter.Michor@esi.ac.at

The possibility to give the same lecture on two sites is welcome.

About the EMS Lectureship

1. Nature and purpose

The idea of the EMS lectureship is, in each odd-numbered year, to invite a distinguished mathematician to visit an institution within the area covered by the EMS, to give a series of between three to five lectures of an advanced expository nature on a topic of current research interest. The lecturer should subsequently provide a written version, which should be submitted for publication, normally to the 'Journal of the European Mathematical Society', when this is established. In the selection of the venue for the lectures, preference should be given to institutions which might not otherwise be able to host such a meeting. If the lecturer agrees, the lectures should be repeated at one other location, also within the area covered by the EMS but remote from the first.

2. Financial arrangements

The EMS will pay travel expenses for the lecturer, and will also pay a lecture fee upon receipt of the manuscript. The host institution will be responsible for the lecturer's accommodation and living expenses, and for insuring appropriate hospitality.

3. Timing and selection

For the lecturer in year n, there will be an announcement in the September issue of the Newsletter in year n-2 , inviting members to bid for a visit to their department by a named lecturer. At its first meeting in year n-1, the Executive Committee will agree on an ordered list of the top three choices for the combination lecturer + location. The President of the EMS will invite the lecturer to be the EMS Lecturer for year n. If the lecturer declines the invitation, then the second (and if necessary the third) choice will be approached. The host institution will then become responsible for making the detailed arrangements for the lectures, and making the appropriate publicity for the event.

* *

EMS Lectures 1995

The first EMS lectures were given by Hendrik W. Lenstra, Jr. at the Université de Franche-Comté, Besançon, June 12-15 1995. The topic of the 4 lectures was "Algorithms in algebraic number theory". Seven additional talks in algebra and algebraic number theory were given by Anne-Marie Bergé, Pierre Debes, Bas Edixhoven, Loïc Mérel, René Schoof, Jean-Pierre Serre and Jean-Pierre Tignol. About 90 participants came, from France, but also from many other European countries (Belgium, Germany, Italy, the Netherlands, Switzerland, UK, ...) and from more far away places (Canada, India, US). They appreciated the talks, which were very interesting and well presented. The format of this meeting - relatively few talks in a time span of three days and a half, with a main speaker giving four talks - seems to be very good.

The series was opened by Jean-Pierre Bourguigon, President of the EMS. He briefly presented the activities of the society. This was so convincing that some of the participants asked how many permanent employees EMS has!

Eva Bayer

The Zentralblatt für Mathematik and Specialized Information

Dieter Puppe

International Erwin Schrödinger Institute for Mathematical Physics

International Erwin Schrödinger Institute for Mathematical Physics, Pasteurgasse 6/7, A-1090 Wien, Austria

E-mail: secr@esi.ac.at

Supported by the Federal Ministry of Science and Research, Austria.

Translated by Elizabeth Haffner from the German original published in the *Mitteilungen der Deutschen Mathematiker-Vereinigung*.

By 'specialized information' we mean systematic information concerning the results and advances in a scientific field. It is designed to provide researchers, teachers, students, users and all other interested parties with an easy point of reference.

The *Zentralblatt für Mathematik und ihre Grenzgebiete* has been providing this service for its international readership since 1931. In 1971 the author was commissioned by the Heidelberg Academy of Sciences to work on the production of the Zentralblatt, and as such now provides us in the following article with the views, aims and perspectives of this 'specialized field'.

The subject is extremely topical: the ever increasing production of and therefore the increased availability of scientific publications (printed manuscripts, electronic mail, conferences, lectures etc.) leads inevitably to a reduction in the controls and standards traditionally imposed (structurally and financially) on the production of information.

1. A Brief History

We present here only a brief outline of the history of the availability of mathematical information. More can be found in [G/L/Sp], [S-Sch] and [W].

In the early days of modern scientific research results were exchanged by means of personal letters and announcements at academic meetings. Gradually specialized journals were established, but only in 1869 did the mathematicians think it necessary to create an instrument for specialist information as we know it today. This was the *Jahrbuch über die Fortschritte der Mathematik* published from 1914 until 1925 by de Gruyter and then by the Prussian Academy of Sciences. In principle it contained the mathematical publications of a period of one year in one volume. In the first year's report there were approximately 800 titles, half of which were reproduced from a total of 80 journals.

This *Jahrbuch* provided a solid source of reference for many decades. Delays arose with publication being held over to cope with the ever increasing volume of written material available from one year. This was one of the reasons that lead the publishing house Springer to establish the rival concern '*Zentralblatt für Mathematik und Ihre Grenzgebiete*'. which no longer divided primary literature according to year and thus was able to publish much faster and soon became very successful in quite a short time.

This positive development was interrupted by National Socialism and the Second World War. As the world could no longer be supplied with specialist information from Germany, *Mathematical Reviews* was founded in America in 1940 and in 1953 the *Referativnyi Zhurnal Matematika* in Russia, both working with the same aims and in principle according to the same procedures.

At the end of the war, the *Jahrbuch* ceased publication. The Zentralblatt continued but faced enormous problems for many years due to the general poverty in Germany and especially due to the division of Germany.

Detailed information about the development can be found in [G/L/Sp] and [W]. As a correction to [G/L/Sp, p.17] it should be noted that the termination of the co-operation agreement between the Heidelberg Academy of Sciences and the Academy of Sciences of the GDR towards the end of 1977 by the GDR did not take place *after* the integration of the west German publishing groups of the Zentralblatt in the Karlsruhe Specialist Information Centre but more than one year before. At that time the Federal Ministry for Research and Technology had indeed intended to change the editorial status and this was known to the GDR but the Heidelberg Academy persuaded the Federal Ministry not to implement changes so as not to

jeopardize co-operation with the Academy of the GDR, who were fully aware of this. It would appear that leading positions in the GDR had sought a pretext to terminate the contract because of mainly political reasons.

2. The Present and Future Prospects

At present there are three closely connected instruments involved in the publication of specialized mathematical information in Germany:

a) The printed journal *'Zentralblatt für Mathematik und ihre Grenzengebiete Mathematics Abstracts'*. Since 1978 24 volumes have appeared annually, with accompanying index volumes. Since 1986 each annual has received, on average, 50,000 (1994: 53,300) contributions (seminars, compiled reports, title announcements).

b) Maintaining the databank system available via (Fachinformationszentrum Karlsruhe) STN. This databank contains bibliographical contributions since 1972 and complete texts since 1985. Sometimes it contains more than just printed papers i.e. keywords and secondary classifications e.g. preprints which have not been published in the Zentralblatt. In 1994 such classifications amounted to 5,924.

c) CD-ROM 'CompactMath' - the first version of which appeared in 1991. The latest version includes volumes 701 to 785 of the Zentralblatt (from the beginning of 1990 to middle of 1994). Also included on the CD-ROM is the information mentioned in b) above. Early in 1995 a version will appear containing volumes 551 to 699, (from mid 1985 to beginning 1990), which will be available by subscription at no extra cost. In future this should be available in up-dated form regularly every 6 months. Shortly to be released are CD-ROMs containing all bibliographical data from volumes 1 - 549.

So the Zentralblatt is actually a composition of all of the three above-mentioned editions. The following institutions co-produce the Zentralblatt:

- Fachinformationszentrum (FIZ) Karlsruhe, by law a limited company, but which actually functions under the auspices of the Federal government, divided up throughout the Federal states, various scientific societies and the DMV.
- The Heidelberg Academy of Sciences with participation from other scientific academies in Germany.
- The publishing house Springer-Verlag.

A certain amount of confusion existed within this co-production, especially since 1979, concerning the legal standing and responsibilities of each contributing party which led inevitably to increased friction. A new contract was then drawn up in March, 1993, between Springer-Verlag and FIZ, who along with the Academy now share between them the scientific holder and relevant copyright ownership of the Zentralblatt. The Academy sees itself as being the safekeeper for all mathematicians world-wide, especially in Europe and more especially in Germany. Neither they, nor the author, as their representatives, have a vested interest in the Zentralblatt. This should be taken into account when evaluating this article.

This new contract is not just a formality. Quite the contrary. It has placed much higher expectations upon the three co-producing institutions. In a very short time it has achieved a marked improvement in the information released, as we can see from the following:

- a more exhaustive compilation (Section 4).
- a more prompt production (Section 5).
- more value for money (Section 8)

The German Mathematical Association (DMV) was always on hand to offer support. At present, co-operation is going quite smoothly, and the DMV project 'Fachinformation' has encouraged the German universities' acceptance of the digitalized version of the Zentralblatt.

Since 1992 co-operation has existed between it and the European Mathematical Society (EMS). The EMS instigated a commission for all questions involving Mathematical Information, comprising E. Lance (Leeds) and R. Piene (Oslo), especially to promote the co-operation of mathematicians on international fronts.

In August 1994, the International Mathematical Congress took place.

A.Dold was invited by the Executive Committee of the International Mathematicians Union. Also present were: R.Graham (President AMS), M.Grötschel (BoD DMV) F.Hirzebruch (President EMS), W.Jaco (Executive Director AMS for Mathematical Reviews), E.Lance (EMS Commission), R.Langevin (President Societé de

Mathématique de France), R.Piene (EMS Commission), B.Wegner (Editor-in-Chief Zentralblatt) and A.Zhizhenko (Russian Academy of Sciences Referativnyi Zhurnal). It was concluded that a fusion of MR with ZB, which some thought to be desirable, presented no realistic possibilities (see Section 9.). Most of the speakers were in favour of a unification of the ZB and Referativnyi Zhurnal with contributions from as many European countries as possible thereby forming a European Specialist Information system. Competition with MR was regarded as being desirable.

Developments in this last direction have already begun. A contract with the Russian Academy of Sciences has been drawn up and should be signed in the near future, which gives priority to editors of the RZ to publish annually about 7,000 seminar papers from the former Soviet Union directly into the Data Bank at FIZ Karlsruhe, therefore greatly relieving the editing staff at ZB.

In France the relevant Ministry commissioned a report concerning the following: 'Participation française au Zentralblatt, dans la perspective de son extension en une base européenne.' Planned is a substantial contribution from France on various levels of specialised information. To this end, on 4th and 5th October, 1994 in Heidelberg, talks between a French delegation and representatives from all member institutes for the ZB (including the DMV) took place, with complete and unanimous backing. In a few months the survey should be complete and the decision of the French Government will be known.

3. The Competition with MR

MR is *the* rival for the ZB and will remain so for the foreseeable future. Therefore the ZB must draw comparisons between itself and MR. One ought really to include the Russian Referativnyi Zhurnal, but because of the difficulties with the language barrier outside the Soviet Union, and now with new technical developments, the Referativnyi Zhurnal was never really able to compete on an equal footing with either of the other two journals. Having said that, it can, of course, as already mentioned, provide an important contribution to the future specialised information system. Most mathematical scientists have definite views and opinions concerning the quality of each journal in comparison with one another. These opinions are surely not pure fabrication.

For example, the popular opinion is that the ZB contains too many papers reviewed by the authors themselves. The publishers did in fact decide about 30 years ago to use this form of reviewing as a means of keeping the ZB up-to-date. Up to a point, this was achieved, but not as comprehensively as initially hoped. It also soon became obvious that this idea was not welcomed by the mathematicians themselves, so therefore, for the last few years there has been a reduction in authors reviewing their own papers (1993 2%). On the other hand both the MR and ZB make use of direct quotes provided by these reviews. More about that in Section 6.

There is one scientific survey about Mathematical Information which is less well known than it deserves to be - the Master's Thesis by Sara Miranda, accepted in 1985 by Monash University, Australia. Although it in principle covers the whole spectrum of Mathematical Information, even Miranda was eventually led to concentrate her efforts on the ZB and MR as the leading journals in this field. Her results can be summed up in the following sentence [Mi p.105]

> *On the evidence of the present study there is little to choose between the two abstracting services except that ZfM (Zentralblatt für Mathematik) is a little speedier.*

Naturally, her results can only be relevant for the time up to 1985. Upon the suggestion of the author, D. Meyer and T. Pehle compiled a comparison for the year 1993, the results of which appear later.

4. Quantity and Completeness of Reports

Both the ZB and MR have given themselves the task of correlating all literature which might be of interest to mathematicians. These aims can be reached only under certain restrictions. The number of documents processed in one year depends on the capacity of the editorial staff. A look at the following table shows how much documentation in the published seminar articles over the last few years has been open to discussion.

These figures were established between 1986 and 1992 with the help of the CD-ROM versions by omitting the entries which did not also appear in print. Special attention was given to avoid the repetition of documents, e.g. if a document appeared once as a preview and once as a publication, then it would be counted only once. For the year 1993, the figures are taken from [Me/Pe].

Year	Zentralblatt	Reviews
1986	47,829	40,947
1987	50,350	51,846
1988	48,753	45,950
1989	47,663	48,867
1990	45,496	50,954
1991	51,456	47,411
1992	48,386	48,650
1993	45,298	45,511
Total	385,231	380,136

In 1994, contributions to the ZB increased noticeably. According to the editing staff, they received 53,300 entries for printing and the Data Bank MATH an additional 5,924. Figures for MR for the year 1994 are not known to the author.

Since 1971 both MR and the ZB have been using for the most part a similar classification system which was developed together. The current version dates from the year 1991 and is denoted by MSC 91 (Mathematics Subject Classification). The roughest subdivision therein has 61 sections (numbered with some gaps from 00 to 94).

Table 1 shows how the entries for the year 1993 in both review journals are divided into sections in accordance with MSC 91. The figures come from [Me/Pe] and are determined directly by 'hand counting'.

It is noticeable that seven of these sections which refer mostly to Physics (78,80-83, 85 and 86) were not used in the ZB. This does not imply however that documents appearing in the Reviews classification cannot also be found in the ZB. If their mathematical content is such that it can be classified as such, then it will be dealt with there.

5. Promptness and Topicality

As mentioned in section 1, the ZB owes a great deal of its good fortune in the ratings to its promptness and its content of topical material. In [G/LSp. p. 16] it was announced (without naming its sources and without proper definition) that in the years 1936/37 the average time between the first appearance of a publication and the appearance of the related report in the ZB was 0.58 years, whereas in the Jahrbuch it took 2 years.

In the reports by the editors of the ZB allowed by the Heidelburg Academy, regular comments were passed concerning the topicality and comparisons then made with MR. Since the early 70's these comparisons have been more and more favourable to the ZB.

Miranda also arrived at the same results. She took (for 21 mathematical journals) the monthly average time needed (taking a uniform geographically divided sample) between the official release date of that particular edition and the appearance (the official date of going to print) of the corresponding seminar paper/report. She also tested the results if, as in the case of the ZB, the authors' self analysis and the abstracts were omitted. This was the case for 1980 and 1984. If one takes a middle line (average) between these results from the 21 journals, then one gets the following figures per month.

	MR	ZB	without AR	without abstracts
1980	16.6	12.9	13.0	13.6
1984	19.6	14.1	14.9	14.8

The figures in the last two columns represent the figures for the ZB not including the authors' reviews or abstracts. As one can see, this form of reporting does have a certain influence on the advantage of the ZB in the reckoning, but it is not the decisive point. Its relevance has become even less important, as in 1993 there were only 2.0% of these seminar papers, compared with 17.2% in 1980 and 16.1% in 1984.

The author was able to determine, with help from the CD-ROM-versions of the ZB and MR, just how much literature was available in the official publication year of 1987, at a certain point in time, and its relevant inclusion in the printed reports instrument. Double entries in the form mentioned in section 4 were eliminated. The result can be seen in the graph in illustration 1. (page 30 in the original). The years after 1987 were not included as the CD-ROM available from MR covers only 1987 to mid-1990.

ZB	MR	Number and name of section in MSC 91
374	372	00 General
554	772	01 History and biography
754	923	03 Mathematical logic and foundations
46	75	04 Set theory
2.301	1.820	05 Combinatorics
298	236	06 Order, lattices, ordered algebraic structures
98	104	08 General algebraic systems
1.248	1.461	11 Number theory
139	148	12 Field theory and polynomials
264	334	13 Commutative rings and algebras
728	724	14 Algebraic geometry
471	366	15 Linear and multilinear algebra; matrix theory
414	689	16 Associative rings and algebras
615	618	17 Nonassociative rings and algebras
118	166	18 Category theory, homological algebra
29	88	19 K-theory
650	1.354	20 Group theory and generalizations
226	342	22 Topological groups, Lie groups
321	298	26 Real functions
320	326	28 Measure and integration
863	725	30 Functions of a complex variable
167	183	31 Potential theory
432	653	32 Several complex variables and analytic spaces
296	195	33 Special functions
1.495	1.658	34 Ordinary differential equations
2.410	2.258	35 Partial differential equations
147	124	39 Finite differences and functional equations
133	84	40 Sequences, series, summability
840	462	41 Approximations and expansions
417	368	42 Fourier analysis
97	110	43 Abstract harmonic analysis
89	120	44 Integral transforms, operational calculus
239	133	45 Integral equations
1.245	1.356	46 Functional analysis
939	1.210	47 Operator theory
531	510	49 Calculus of variations and optimal control
360	354	51 Geometry
271	309	52 Convex and discrete geometry
1.364	899	53 Differential geometry
816	574	54 General topology
308	266	55 Algebraic topology
533	599	57 Manifolds and cell complexes
1.109	2.266	58 Global analysis, analysis on manifolds
2.446	2.242	60 Probability theory and stochastic processes
1.919	2.158	62 Statistics
2.712	2.012	65 Numerical analysis
2.772	1.673	68 Computer science
499	329	70 Mechanics of particles and systems
2.105	871	73 Mechanics of solids
2.165	1.120	76 Fluid mechanics
—	175	78 Optics, electromagnetic theory
—	145	80 Classical thermodynamics, heat transfer
—	2.610	81 Quantum Theory
—	936	82 Statistical mechanics, structure of matter
—	956	83 Relativity and gravitational theory
—	51	85 Astronomy and astrophysics
—	85	86 Geophysics
2.490	1.509	90 Economics, operations research, programming
599	319	92 Biology, natural and behavioral sciences
2.033	1.295	93 Systems theory; control
489	393	94 Information and communication, circuits
45.298	45.511	Total

Tabelle 1: Zahl der Dokumentationseinheiten in den gedruckten Versionen des Zentralblatts für Mathematik (ZBLM) und der Mathematical Reviews (MR) im Jahre 1993 nach Teilgebieten der Mathematics Subject classification MSC 91

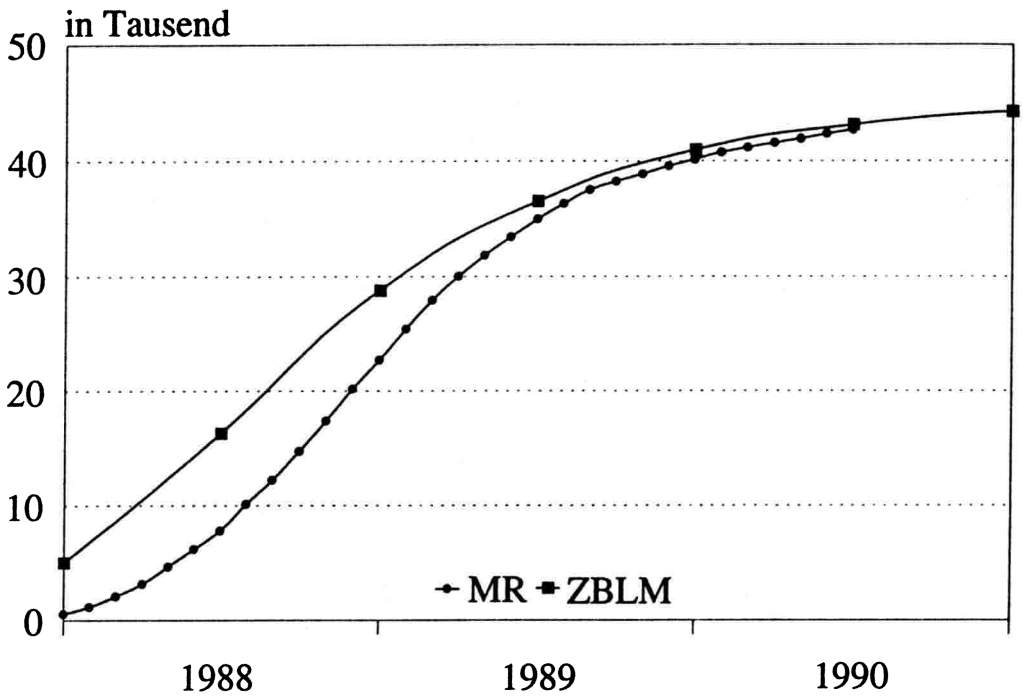


Abbildung 1: Zahl der Literaturdokumente mit offiziellem Publikationsjahr 1987 in Abhängigkeit von dem Zeitpunkt, bis zu dem sie in den gedruckten Versionen des Zentralblatts für Mathematik (ZBLM) bzw. der Mathematical Reviews (MR) dokumentiert waren. Für die Herstellung dieser Abbildung und der folgenden Abb. 2 und 3 ist den Herren G. Hoffleit, C. Kindl und W. Klemm zu danken.

In future current information will be available more and more by electronic means. The promptness and topicality of the ZB will no longer be judged by its printed form, but instead by the Databank MATH. Too little time and printing deadlines did not allow the author to examine the issue in this article further. However, whoever uses the Databank will be able to see/decide for himself that the high claims to topicality in 1994 are satisfied. In particular, the new technical developments will more than compensate for the deficit in 1993.

6. The Differing Types of Documentation

One of the most important questions concerning specialised information is, how should a report/seminar or other document appear in print. In practice, three types of printing have developed over the years, whereby we follow the division and description as given in [Me/Pe].

1. The author providing his own report on his own paper (self-appraisal)
2. Genuine outside adjudicating/appraisal
3a. Compilation/summary of excerpts from the paper with the name of the examiner provided
3b. Official summary/compilation
4. Title. Referral/reference

From illustration 2, used here with permission of the author, we see how the publications from the ZB and MR divide themselves up into the above divisions/categories for the year 1993, not only in total, but also in three representative subdivisions in the MSC-91 classification.

When comparing the graphs in illustration 2 we notice that there is little difference between the ZB and MR in their choice of documentation, even less so in the classical subdivisions 11 and 35.

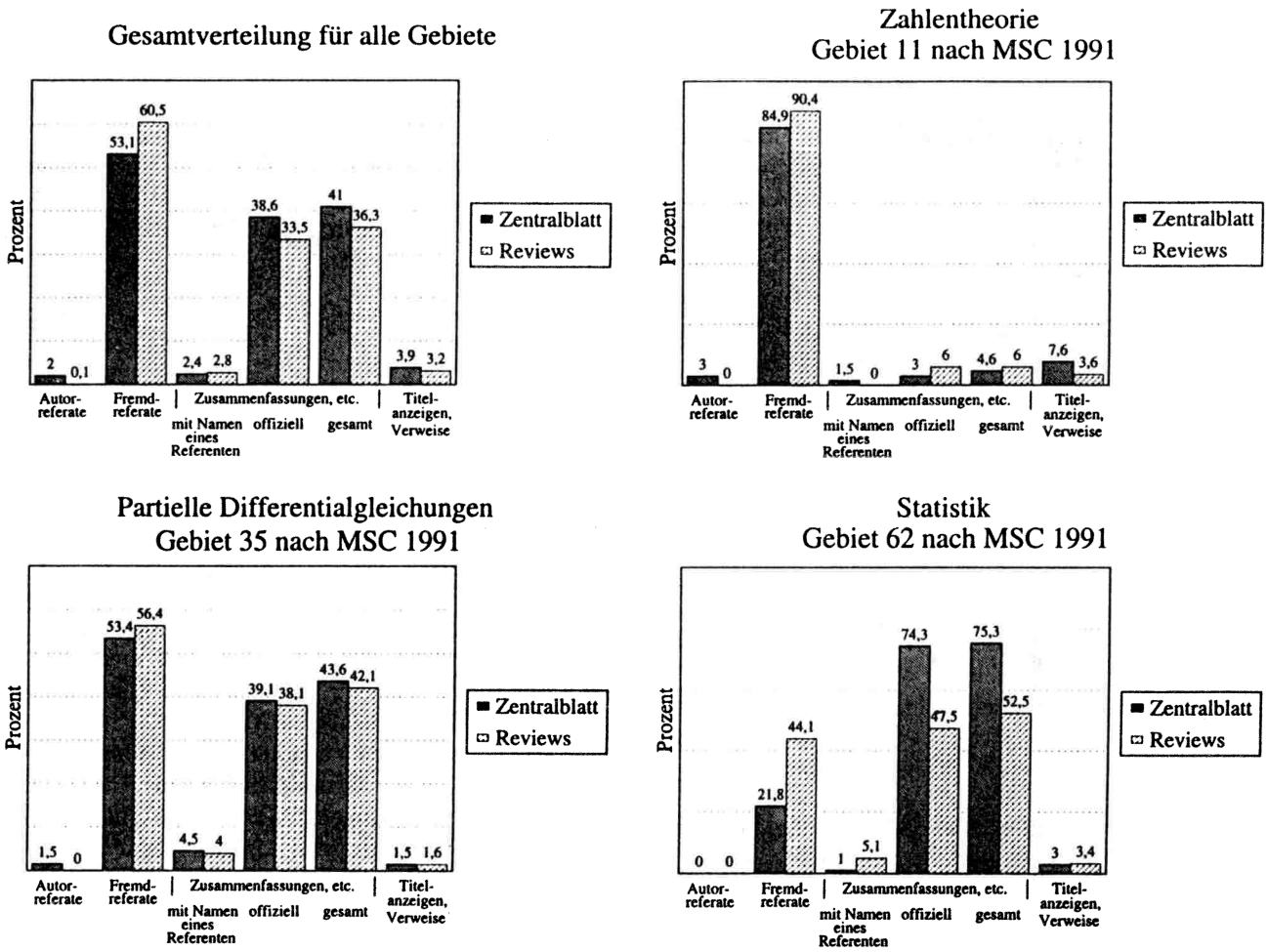


Abbildung 2: Verteilung der Dokumentationseinheiten in den gedruckten Versionen von Zentralblatt und Reviews des Jahres 1993 auf die verschiedenen Typen. Angaben für alle Einträge insgesamt sowie getrennt für die Gebiete 11, 35 und 62 nach MSC 91 als Beispiele von Teilgebieten der Reinen bzw. der Angewandten Mathematik und eines ausgesprochenen Anwendungsgebiets

7. Quality of Contents

The most difficult test in the examination and assessment of the instruments of specialised information is judging the quality of content. Objective, provable results are almost impossible to find. Amongst mathematicians one often finds the opinion that the MR has a better content. These views sometimes result from opinions formed, in some cases years ago, when the ZB really did have certain disadvantages.

Miranda said in [Mi] categorically, that she found no great significant differences between the ZB and MR regarding their content. Possibly her researching methods were not fine enough to decide in such a question.

Meyer and Pehle tried another approach in which to assess specialised information. The results are certainly not entirely free from subjective elements, but are at least to a certain extent reproducible. The documentation with a certain content (report and compilation, not just title and reference) were assessed as follows:

- 'good' when the topic or main results in the first publication were presented clearly and the methods used were mentioned.
- 'average' if only the main result or main problem was mentioned.
- 'bad' if the subject matter was dealt with in paraphrase or with too little emphasis on the content.

This method was used for the same samples as used in section 6 (2,500 pieces from the printed version in the year 1993 from ZB and MR). The results in percentages can be seen below:

	Zentralblatt	Reviews
good	50.7	54.0
average	46.0	44.6
bad	3.3	1.5

Again (as in section 6) the possible mistakes in the percentage can be assessed upwards for 'good' and 'average' by 2.0 and for the assessment 'bad' by 9.0. (according to the confidence intervals at the 5% level, [Me/Pe, section 5]).

The reader is left to decide whether or not these results indicate any advantage for MR against the ZB.

Of interest is a combination of the results on types of publication in section 6, with the quality results. These can be seen in illustration 3, (taken once again from [Me/Pe]). In this case the influence of 'self appraisal', because of its decrease, is of little importance. Here, once again, there is no noticeable difference between the ZB and MR. In both cases we see that not only does external refereeing come out on top, but that total distribution is also not much worse.

8. Price

Specialised information has its price. There are hopes to establish a communications system which can be entered by all interested parties and into which they can input their own material and also extract information as they require. Seemingly a good idea, it does seem hard to imagine how one can manage without the work-intensive filtering and filing of information.

At present, and for the foreseeable future, the largest expenditure for specialised information in the form which mathematicians are used to, wish for and need, lies not in the latest technological developments and processing but in personnel (editing staff, referencing). These must be paid for by the 'Users', unless they are taken over by a sponsor. The ZB was and is subsidised by the German government. The subsidy is however limited, with an ever-present danger of it being reduced even more.

Thankfully, the co-operation between its supporters (see section 2) enabled it to establish a price system (in 1995), which on the one hand covers the fixed costs, and on the other hand benefits development and modernization for the users, thereby remaining affordable for some mathematicians.

To 'use' the ZB, one must pay a yearly subscription or 7,900 DM (this price and those subsequently mentioned do not include VAT). This would normally happen through a Scientific Institution or Company. Therefore one receives, according to one's choice:

- the corresponding year's issues of the printed ZB
- *or* unlimited access to the Databank MATH for all of the members for that year
- *or* at half-yearly intervals two deliveries of the latest CD-ROM CompactMath

For orders additional to the above one must pay an extra 850 DM. One should note that in Germany the VAT on printed matter is only 7%, whilst for electronically processed data it is 15%, so, if one wants to have the printed version then one should choose it as a basic product at 7,900 DM. By ordering through society membership of the EMS (European Mathematical Society) or for example through the DMV, one receives a reduction on the above-mentioned price of 15%.

Of special interest to the individual are the following additional offers: if an institution subscribes to the printed version, each of its members can obtain further copies for a price of 370 DM. *The same offer stands for the CD-ROM with a price of 85 DM.* Also included is the necessary DOS program STN-PFS. The version for Windows costs a one-off price of 100 DM, and for UNIX 400 DM.

9. The Possible Merger between ZB and MR

For the cost return margin it would be more favourable for the mathematical world to be supplied with just one specialised information system. Today that would mean just one electronic data bank, from which all information, no matter how varied, would be derived. Thoughts along these lines would suggest a fusion (merger) between the ZB and MR.

These thoughts are not exactly new. Even at the founding of MR one was somewhat hesitant about creating a parallel enterprise to the ZB [Pi, p. 69ff]. After the Second World War, more thought was given to combining the powers of the MR and the ZB. The highest point of these efforts was reached in the years 1982 to 1986. The AMS (American Mathematical Society), as supporter of the MR, and the corresponding supporting Institutions of the ZB (the Academy, FIZ and Springer-Verlag) had, by the end of 1982, announced their common interest in a fusion/merger. There followed a series of discussions, which were not always easy, but in spring 1986 it seemed (financial and some other items outstanding), that a positive result was

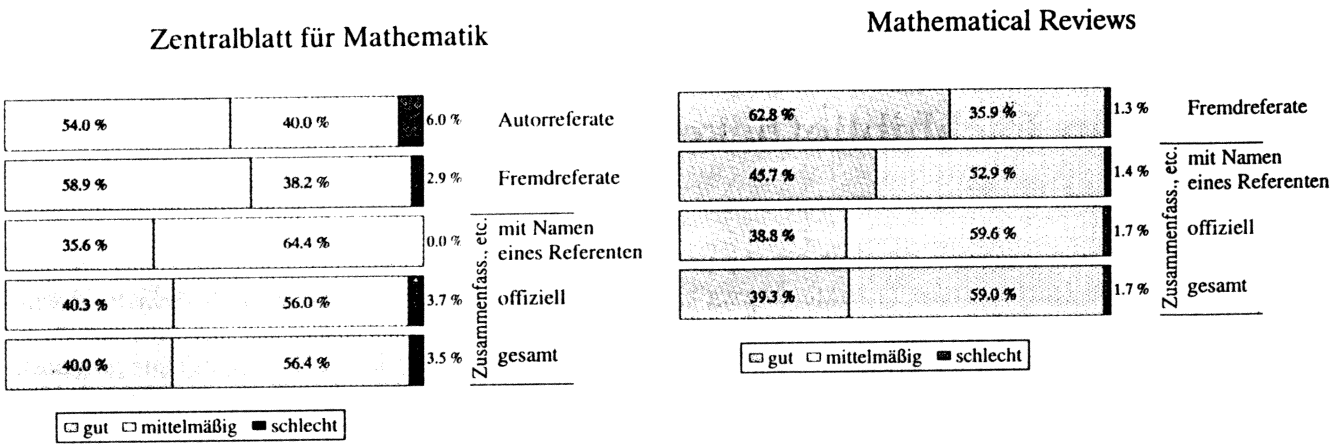


Abbildung 3: Inhaltliche Bewertung der verschiedenen Typen von Dokumentationseinheiten in den gedruckten Versionen von Zentralblatt und Reviews des Jahres 1993

getting nearer. At the same time, the German side considered the stronger marketing position of MR and a suitable division of the income. There followed a few months without communication, until the chief negotiator for the AMS, Prof. Armentrout, announced on the 27th January, 1987, by telephone, that the AMS had decided to break off discussions. An official reason was never given. Even unofficially there was nothing mentioned. Some small clues are mentioned in [Pi, p. 85-89], where other details of this series of events can be found.

More recently (1993/94) there has once again been correspondence and talks about this subject. But after their last experience, the ZB cannot be too optimistic. It is also apparent that the Americans are even less enthusiastic than in 1982-86 about sharing any editorials and copyright royalties occurred through the specialised information system. (Discussion, 1st October, 1993 in Heidelberg, Letter from the Executive Director of the AMS from 19th April, 1994).

This is the basis for the conclusions already mentioned in Section 2.

Literature:

[G/L/Sp] M.Grötschel, J.Lügger, W.Sperber, *Wissenschftliches Publizieren und Elektronische Fachinformatikon im Umbruch: ein Situationsberticht aus der Sicht der Mathematik.* In: S.D.Chatterji et al. (Eds.), Jahrbuch Überblicke Mathematik 1994; Braunschweig: Vieweg, p. 154-174.

[Me/Pe] D.Meyer, T.Pehle, *Vergleich der Referateorgane Zentralblatt für Mathematik - Mathematical Reviews, Abschulßbericht.* Unveröffentlichtes Manuskript; Universität Heidelberg, Mathematisches Institut, July 1994.

[Mi] S.Miranda, *A Comparative Analysis of Abstracting Services in Mathematics.* Master's Thesis; Graduate School of Librarianship, Monash University (Australia), May 1985.

[Pi] E.Pitcher, *A History of the Second Fifty Years American Mathematical Society 1939-88.* Providence, Rhodes Island, USA 1988.

[S-Sch] R. Siegmund-Schultze, *Mathematische Berichterstattung in Hitlerdeutschland. Der Niedergang des "Jahrbuchs über die Fortschritte der Mathematik".* Studien zur Wissenschafts-, Sozial- und Bildungsgeschichte der Mathematik Band 9; Göttingen: Vandenhoek & Ruprecht 1993.

[W] B. Wegner, *Berlin als Zentrum des mathematischen Referatewesens.* In: H.Begehr (Ed.), Mathematik in Berlin (to appear) p.609-618.

Author's current address:
Professor Dr Dieter Puppe
Mathematisches Institut
Ruprecht-Karls-Universität Heidelberg
Im Neuenheimer Feld 288
69120 Heidelberg.

Problem Corner

Paul Jainta, Werkvolkstr. 10, D-91126 Schwabach, Germany

Vlaamse Wiskunde Olympiade

It is not essential to have caviare for lunch all the time. Having served the Leningrad Mathematical Olympiad, a delicacy from Russia, the Cockaigne of mathematical gourmets, in the past Corner, I will now dish up plain cooking. Undoubtedly the Leningrad contest belongs to the Haute Cuisine of mathematical competitions, but in spite of that the European province likewise is a good cook for hearty mathematical competitive food. So let us poke our noses into Flandrian pots to relish the culinary art of the *Flanders mathematics olympiad.*

More than six years ago, on the initiatives of both **Franck De Clerck** (Rijksuniversiteit Gent) and **Paul Igodt** (Katholieke Universiteit Leuven) many colleagues and friends accepted to share with them the challenge of starting a mathematics Olympiad in Flanders, the Dutch-speaking part of Belgium. In their first exuberance the organizers were not fully aware of all material implications of this venture. It was their strong belief that the joy of mathematics should be brought to so many young people. Of course they were very conscious of this treat to be not solely a matter of Olympiad, for it's the local mathematics teachers who primarily are the sources of energy for this feeling. Nevertheless, attractive Olympiad-style problems can provide a wellspring of permanent renewal equally in mathematics teaching and learning.

Surprisingly the Vlaamse Wiskunde Olympiade (VWO) has reached a wide public all over the country rapidly. This shows that the founders have come close to their aims which are to promote the interest of high school students in mathematics and exact sciences, as well as to foster mathematics teaching by providing lots of challenging problems and examples to the teachers, not forgetting the high-flown plans of building and preparing a more efficient team of Dutch-speaking Belgians to participate in the International Mathematical Olympiad (IMO). Annually the most astute students of the VWO can follow an extra training package in problem solving. Among them the organizing committee selects three Dutch-speaking participants to constitute a Belgian team at IMO, another three members whose mother tongue is French are chosen by a sister organisation of VWO which acts in the French-speaking part of the country.

First IMO-achievements confirm that the Flanders initiators are well on their way to give young Belgian talents a boost.

But these promising results are due to a good cooperation and broad support through numerable authorities concentrated within the mathematical community. The following are all pulling in the same direction:

- the universities in Flanders, which created an attractive and stimulating scientific level
- the members of the jury, who prepared with great dedication the problems
- the hundreds of teachers who are the local promoters of VWO in their schools
- the ASHME organizing committee who gave the Belgian organizers permission to act as non-American coordinators of their competition
- the State Secretary of Education who actively supported this initiative for extra training sessions in view of participation at IMO
- the private companies which funded organisation and awards ceremonies.

Last but not least the founders are grateful to anybody who assisted VWO up to now to build up a tradition which will keep alive and renew for many years to come.

At the beginning of each June a panel is appointed by the organizing committee. This jury consists of 16 members and represents the different universities (7 emissaries), the Belgian Mathematical Society (1 representative), the Flemish Society of Mathematics Teachers (5 delegates) and the different school-nets (3 members). Choosing the problems and editing the distinct tests for VWO is the exclusive responsibility of this jury. Additionally it is in charge of correcting and grading the answers given by the participants and it is the panel who grants prizes.

IMO - Training sessions

Politics wants to get involved in the VWO, too. Each year, Flanders Mathematics Olympiad organises an extra training camp with the best of intentions to find apt candidates to participate in the IMO. Unfortunately a government decision of July 1989 prohibited involvement in the IMO in China 1990. This decision was taken as a consequence of the student repression in Beijing, June 1989. As a result, VWO did not offer training sessions in 1990. In 1991 the organizers made a fresh start in IMO activities.

Instructed by a number of free-lance teachers which were recruited from high school as well as from university a few (up to 15-20) talented contestants participated in a series of five one-day meetings. These students are selected by the organising committee of VWO, based upon their final scores achieved while competing in one or several years and with special attention to attracting in particular young students (which will have a chance to enhance their skill in problem solving for more years). These students picked out at last, were confronted with some fundamental problem solving techniques useful in various fields such as complex numbers, geometry, number theory, polynomials, functional equations, sequences and series, inequalities. Moreover they are tackling numerous IMO-problems posed in the past.

The competition

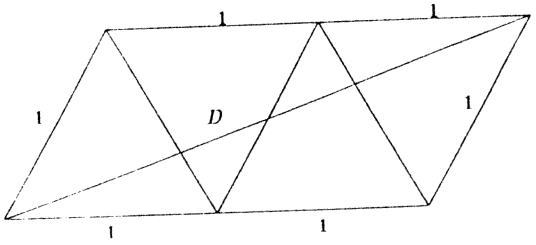
The Olympiad consists of three consecutive mathematics examinations called rounds. Both the first and second round consist of 30 multiple choice questions with five alternatives to answer. There is only one way to respond to the problem correctly. The problems in the final round do not involve options. Here the finalists meet four questions for which they are expected to write down well-founded and elaborate solutions.

In each school there is a resident VWO-coordinator who supervises administration and organisation of the local undertaking. The first stage is organized in the school and guided by the assigned coordinator. In this round time allowed to answer is three hours (for 30 questions). A correct answer is worth four points but whenever an answer is marked wrong one point is deducted from the score. In the case a question is omitted, zero points are credited. In order to yield positive results every participant starts with 30 points. The second level (the AHSME part) in the districts is implemented by the national coordinators of VWO. The examinations take place in universities respectively. The AHSME competition gives every contestant 90 minutes to work on the 30 problems submitted. Here for each correct answer participants get five points while skipping a question still yields two points and incorrect answers are worth zero points. Thus this marking scheme leads to scores between 0 and 150.

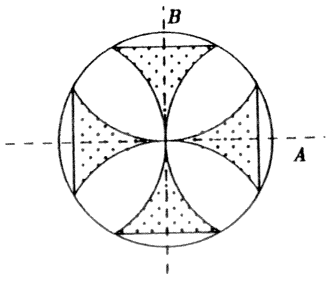
In the end I will give a taste of the Flanders Mathematics Competition. To try out the taste of Flanders cooking I ladle out six portions of the VWO 1989-1990 resp. 1990-91.

Q28. A given parallelogram consists of four congruent equilateral triangles with sides of length 1 (see figure). Determine the length of diagonal D.

(A) $\sqrt{5}$ (B) $\sqrt{6}$ (c) $\sqrt{7}$ (D) $\frac{\sqrt{29}}{2}$ (E) 3



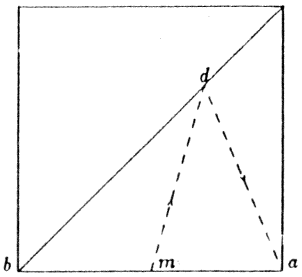
Q29. Compute the area of the shaded figure supposing all arcs belong to circles with radius R and A and B are mutually perpendicular axes of symmetry.



Q30. A rectangular floor is tiled by squares; there are 1274 tiles arranged in one direction and 990 in the other. If one draws a diagonal line on the floor, how many tiles will be cut? (Only those tiles are counted which are cut by the diagonal in the inner part.)

(A) 1271 (B) 1274 (C) 1613 (D) 2262 (E) 2264

Q31. In a square with side of length 1 one takes one of the diagonals. From the midpoint m of a side one walks to a point d on the diagonal from where one returns to the endpoint a of the same side (not on the diagonal, see figure)
What should be the distance between d and b (the other endpoint of the side), if one wants the sum of the distances $|md|+|da|$ to be a minimum?



Q32. Let n be the natural number consisting of 1991 ones: n = 111...1.
Prove: n is not a prime number.

Q33. Let ABC be an equilateral triangle. Let X denote a point on side AB different from A and B. One can determine in a unique way points Y and Z such that

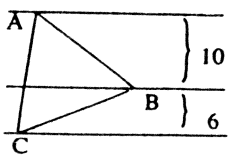
- Y lies on]BC[
- Z lies on]AC[
- the triangle XYZ is equilateral

Determine the rations $|AX|:|XB|, |BY|:|YC|$ and $|CZ|:|ZA|$ if you know the area of triangle XYZ is half the area of triangle ABC.

Solutions to previous problems

No other solutions to the problems Q17 to Q21 were received. So I give a shortened version of the solutions.

Q17. In the diagram, what is the area of the equilateral triangle ABC?



A) $196\frac{\sqrt{3}}{3}$ B) $56\sqrt{3}$ C) $\frac{221\sqrt{3}}{3}$ D) 84 E) $\frac{189}{\sqrt{3}}$

Solution: (A)

Let α be the angle formed by side CB and one of the parallel lines, and k the side length of the equilateral triangle. According to the figure we have now $k\cdot\sin\alpha = 6$ and $k\cdot\sin\left(\frac{\pi}{3} - \alpha\right) = 10$. The rest is simple calculation. □

Q18. You are given a rectangle with length 8 and width 2, and you have rectangular tiles, 2 units long and 1 unit wide. The large rectangle is to be tiled with the smaller ones.

In how many ways can this be done, assuming that the tiles are indistinguishable?

A) 8! B) 2^4 C) 34 D) 35 E) 36

Solution: (C)

Let u(n) denote the number of ways a rectangle of length n can be tiled with paving-stones. Now one can put another stone next to a so tiled rectangle in two different ways: one has to pave lengthways or widthwise. This way one obtains the well-known recursion u(n) = u(n-1)+u(n-2) (*Fibonacci* sends his regards!) and therefore u(1) = 1 , u(2) = 2 and finally u(8) = 34. □

Q19. Let $a^{(1)} = a$, $a^{(2)} = a^a$, $a^{(3)} = a^{(a^a)}$, and generally $a^{(n+1)} = a^{(a^{(n)})}$.

What is the smallest integer n satisfying the inequality $3^{(n)} > 9^{(1993)}$?

A) 1994 B) 1995 C) 3987 D) 3988 E) None of these

Solution: (A)

Denote this composition *sp*(super power). One can prove by mathematical induction, using the fact $3^a = 9^{\frac{a}{2}}$, that for any natural n the following relation is true: $3sp(n+1) > 3 \cdot 9sp(n)$. From this result (A) follows. □

Q20. Consider all (ordered) triples (a,b,c) of positive integers a,b,c chosen from the set $\{1,2,\ldots,10\}$. For each triple find $\min\{a,b,c\}$, and form the arithmetic mean m of the 1000 minimum elements formed in this way.

What is this value, correct to one decimal place?

A) 1.5 B) 2 C) 3 D) 3.5 E) 4

Solution: (C)

The number n of triples (p,q,r) of which p has minimal value is $n(p) = 3 \cdot (10-p) \cdot [9-p)+2]+1$. With this formula one obtains a value a little greater than 3. □

Q21. Let n be written in decimal notation $(n = abcde)$ and let $f(n) = bcdea + 1$.
So we have, for example: $f(4) = 5$; $f(24) = 43$; $f(809) = 99$.
If we define a sequence u_n such that $u_0 = p$ and $u_{n+1} = f(u_n)$, which statement is true?

A) the sequence (u_n) is convergent
B) the sequence (u_n) is bounded
C) the sequence (u_n) is repeating
D) the sequence (u_n) equals 1 everywhere
E) the sub-sequence (u_{u_n}) is constant

Solution:

B is true. The sequence $f(2)=3,\ldots,f(10)=2$ is a counterexample for *A,D* and *E* together. □

Finally, propose problems for which readers will send in solutions. Proposals should, whenever possible, be accompanied by a solution, references, and other insights which are likely to be of help for the editor. They can be anything from elementary to advanced, from easy to difficult. Original problems are particularly sought. So, please submit any interesting problems you come across, especially those from (problem) books and contests that are not easily accessible. But other interesting problems may also be acceptable provided they are not too well known and references are given as to their provenance. I hereby invite my readers to share them with their colleagues and students.

We will expand this section with another corner of new problem sets of pre-Olympiad type shortly, the so-called ***Skoliad Corner***. for, it seems a good idea to acknowledge the interests of those readers who are beginning to try their hand at problem solving or who are looking for materials to use with Mathematics clubs and in the classroom. So we will be giving contest questions, sometimes in short answer or multiple choice format, when we will given the answers only in the next issue. For other sets we welcome solutions ***from (pre-university) students***, too. The Skoliad Corner will evolve to meet the response of our readers. **I welcome your input, and especially problem sets and solutions for use!**

That completes our space this number. The Olympiad season is over - send me your contests, your Skoliad problem sets as well as your nice solutions to problems in the Corner, and any suggestions for the future of this column.

BRIEF REVIEWS

Edited by Ivan Netuka and Vladimír Souček. Books submitted for review should be sent to the following address: Ivan Netuka, MÚUK, Sokolovská 83, 186 00 Praha 8, Czech Republic.

A.Borovik, A.Nesin: Groups of Finite Morley Rank, Oxford Logic Guides, vol.26, Clarendon Press, Oxford, 1994, xvii+409 pp., GBP 45.00, ISBN 0-198-53445-0

The book presents the current state of the structure theory of groups of finite Morley rank. The necessary tools from finite groups theory are explained in a self-contained manner; the first five chapters are introductory, containing part of basic group theory and model theory. The background to groups of finite Morley rank comes from model theory, but the algebraic aspect is also significant. The class includes finite groups, and also algebraic groups over algebraically closed fields; the investigated groups behave to a large extent like finite extensions of algebraic groups. The book is suitable for graduate students in algebra or logic as well as practising group theorists and model theorists. (tk)

R.E.Moritz: Memorabilia Mathematica. The Philomath's Quotation Book. 1140 Anecdotes, Aphorisms and Passages by Famous Mathematicians, Scientists and Writers, MAA Spectrum Series, The Mathematical Association of America, Washington, D.C., 1993, vii+410 pp., ISBN 0-883-85321-3, ISBN 0-883-85513-5

This is an unaltered and unabridged republication of the first edition published in 1914. The book contains 1140 anecdotes, aphorisms and passages by famous mathematicians, scientists and writers. Every one knows that the fine phrase *God geometrizes* is attributed to Plato, but few know where this famous passage is found, or the exact words in which it was first expressed. The aim of this book is to bring together exact quotations with their exact references. This publication leads the reader through several areas of mathematics (logic, arithmetic, algebra, geometry, calculus, modern mathematics, application, ...), offers nice and interesting views of the nature of mathematics and its connections with philosophy and science (the fundamental concepts of time and space, ...), contains ideas and aphorisms about study and research in mathematics, teaching of mathematics (mathematics as a language, mathematics as a fine art). Some chapters are devoted to work and life of famous mathematicians (persons and anecdotes, ...) or collect paradoxes and curiosities. The book can be recommended as a source for pleasure, encouragement and inspiration. (jbe)

J.Gilbert, D.Kershaw (Eds.): Large-Scale Matrix Problems and the Numerical Solution of Partial Differential Equations, Advances in Numerical Analysis, vol.III, Clarendon Press, Oxford, 1994, viii+212 pp., GBP 30.00, ISBN 0-198-53463-9

The book represents proceedings of the Fifth Summer School in Numerical Analysis held at Lancaster University in July 1992. Only the six invited lectures are included. One third of the book is written by J.L.Barlow and deals with parallel solution of the symmetric eigenvalue problems, especially on message passing parallel architectures. The last developments in three methods are carefully described and studied from that point of view: Jacobi's method, bisection and multisection method with inverse iteration, Cuppen's divide and conquer method. J.Dongarra presents benchmark results of the LAPACK package, the successor of LINPACK and EISPACK, designed for "standard" vector/parallel architectures. The performance has been measured on about ten such machines. H.C.Elman presents the survey lecture on iterative methods for linear systems. The stationary iterative methods and the Krylov subspace CG methods are included upto the newest Bi-CGSTAB. The general purpose preconditioning algorithms suitable for large sparse matrices are also described here. The second part of the book is devoted to PDE solvers. R.E.Bank presents hierarchical preconditioners for elliptic PDE equations. The preconditioners are based on a decomposition of finite element space to direct sum of two or more simple spaces, where only first of them guarantees the continuity of solution from element to element. Mathematical study and approximation of semi-conductor models, by J.W.Jerome, is concerned to the drift-diffusion model used for modelling of the quantum devices. The sixth contribution, M.Padolfi on Hyperbolic Systems, is only an extended summary, no lecture. (zv)

R.Schmalz: Out of the Mouths of Mathematicians. A Quotation Book for Philomaths, MAA Spectrum Series, The Mathematical Association of America, Washington, D.C., 1993, x+294 pp., ISBN 0-883-85509-7

This book is a similar compilation as the book *Memorabilia Mathematica* of Robert Moritz. It contains 727 quotations (with their complete references) from 292 contributors — mathematicians of twentieth century. Thus, the book of R.Schmalz opens the reader the admirable world of mathematics through the words of mathematicians who are its creators. The book presents many valuable views of the development of mathematics (particular disciplines, mathematics in general, pure and applied mathematics), views of doing mathematics (the creative process in mathematics, moments of mathematical insight, mathematics and matters of the spirit), views of mathematics education, of problems of 20th century (mathematics and computers) and so on. For the reader, *Mathematics and the arts, About*

mathematicians, Anecdotes and miscellaneous humour can be the most attractive parts of the book. The author index and topic index make the publication very user–friendly. The book can be warmly recommended to researches, teachers and students as well as writers and speakers. It will give pleasure to anybody who likes mathematics. (jbe)

M.Artin: Algebra, Birkhäuser Advanced Texts. Basler Lehrbucher, Birkhäuser, Basel, 1993, xiii+705 pp., DM 88.00, ISBN 3-764-32927-0

This book was originally published in English in 1991 (Prentice Hall Inc.). It is a nice textbook that can be used for undergraduate and graduate courses. The book presents basic as well as advanced parts of algebra and linear algebra, the material covered in the book is more or less standard (groups, symmetry, representations, factorization, rings, fields, Galois theory, vector spaces, linear mappings, matrices, bilinear forms, linear groups). The book is very well-written both from a scientific and formal point of view. It contains many examples and exercises, index and bibliography. Thus, this textbook is suitable for the systematic long-termed study. Algebra of M.Artin could be very useful for students as well as for teachers. (jbe)

A.E.Solow (Ed.): Learning by Discovery. A Lab Manual for Calculus. Resources for Calculus Collection, volume 1, MAA Notes and Report Series, Number 27, The Mathematical Association of America, Washington, D.C., 1993, xiii+165 pp., ISBN 0-883-85083-4

This volume of the MAA Notes is a collection of 26 laboratory modules for use by the classroom calculus teacher. These modules cover the standard topics of calculus, such as limits, derivatives and integrals, sequences and series or multivariable functions. Each module follows the same format. Firstly, *Goals of the lab* are listed. The following sections, *Before the lab* and *In the lab*, consist of exercises, problems, discussions and hints for students. The next section, *Further Exploration*, extends the ideas of the lab and mostly does not require use of the computer. The last section, *Notes to Instructor*, contains suggestions for teachers and a summary of computer requirements. These labs are software-independent, but there are some examples of computer programs for Derive, Maple and Mathematica in several modules. This book is recommended to all teachers of calculus. (ml)

S.Kaufmann: Mathematica as a Tool. An Introduction with Practical Examples, Birkhäuser, Basel, 1994, 448 pp., DM 58.00, ISBN 3-764-35031-8, ISBN 0-817-65031-8

This book is an introduction to Mathematica, one of the Computer Algebraic Systems. The book is written for engineers, scientists and applied mathematicians and therefore it shows those aspects of Mathematica which are useful for such users. The book consists of three parts: Basics, Structure and Programming. The first part contains an overview of the main commands of Mathematica. The second part gives the reader a possibility to study a detailed syntax and an evaluation process. The reader needs this knowledge for the third part, programming in Mathematica. Each of these parts is divided to many sections. Every such section contains an explanation of the topic, exercises and a summary of new commands. Some sections contain a paragraph of solutions of possible difficulties, which is very useful. There is also a detailed index at the end of the book. This book is very nicely written and recommended to everybody. (ml)

I.Gohberg, L.A.Sakhnovich (Eds.): Matrix and Operator Valued Functions. The Vladimir Petrovich Potapov Memorial Volume, Operator Theory Advances and Applications, vol.72, Birkhäuser Verlag, Basel, 1994, xxviii+211 pp., sFr 98.00, ISBN 3-764-35091-1, ISBN 0-817-65091-1

This is a memorial volume dedicated to V.P.Potapov. The contributions given by his pupils , collaborators and followers (articles by I.Gohberg, D.Z.Arov, T.Ja.Azizov and E.I.Iohvidov, Yu.P.Ginzburg and L.V.Shevcuk, T.S.Ivanchenko and L.A.Sakhnovich, V.E.Katsnelson, A.Ya.Kheifits and P.M.Yuditskii, M.G.Krein and I.E. Ovcharenko, A.A.Nudel'man, A.L.Sakhnovich, L.A. Sakhnovich) enlighten the relation of the work of V.P.Potapov to recent advances in branches of mathematics like operator theory (operators in spaces with indefinite scalar products), theory of complex variables , approximation and interpolation theory for matrix functions, theory of inverse problems for differential equations etc. The importance of V.P.Potapov work, in particular of his theory oi multiplicative decomposition of contractive matrix functions which was published in the years 1950 – 55 (and which is based on a suitable matrix analogy of the Blaschke-Riesz decomposition of a holomorphic function in a disk) in all these areas is explained. The articles give also nice reminiscences on V.P.Potapov's interesting personality and Odessa mathematical life in general. (mz)

J.Hoffmann-Jørgensen, J.Kuelbs, M.B. Marcus (Eds.): Probability in Banach Spaces, 9, Progress in Probability, vol.35, Birkhäuser, Boston, 1994, vi+431 pp., DM 188.00, ISBN 0-817-63744-3, ISBN 3-764-33744-3

This volume publishes a selection of papers by the participants of Probability in Banach Spaces Conference held at Sanjberg, Denmark, August 16–21, 1993. The contributions cover a broad range of topics related to the subject . The recommended basic source of the information on the subject , also for those willing to acquaint with the presented volume, is the recent book of M.Ledoux and M.Talagrand . The general aim of the discipline called "Probability in Banach Spaces" is to understand the behaviour of large classes of stochastic processes in a setting which is as general

as possible. Sometimes, new deep insights– even about familiar processes and objects like Gaussian measures– are obtained by these general methods. The volume is divided into the following sections: Random Series, Exponential Moments, and Martingales ; Strong limit theorems ; Weak convergence ; Large Deviations and Measure Inequalities ; Gaussian Chaos and Wiener Measures ; Topics in Empirical Processes, Spacing Estimates, and Applications to Maximum Likelihood Theory. The book contains contributions of many leading specialists and shows the progress in the field – which developed rapidly in the last 20 years and which already has profound impacts on probability, functional analysis and related fields. (mz)

R.M.Smullyan: Gödel's Incompleteness Theorems, Oxford Logic Guides, vol.19, Oxford University Press, Oxford, 1992, xiii+139 pp., GBP 20.00, ISBN 0-195-04672-2

Self-reference, diagonalization and fixed points play a substantial role in Gödel's incompleteness proofs, recursion theory, combinatoric logic, semantics and metamathematics; the main purpose of this book is to give a unification of fixed points in these areas. In Chapters 12-20, such a one is presented; it is based on abstract structures called sequentials systems. Its generalization, connected with problems of fixed points in combinatory logic, which is more detailed studied in Chapters 17-19, is formulated in the last chapter.

A motivation of the subject (for non-experts, of course), can be found in Chapters 5-8, and the first three ones can be viewed as an elementary introduction with interesting examples and formulations. Moreover, Chapters 6-8 present a concept of recursion theory based on the notion of elementary formal systems. In Chapter 9, Peano arithmetic is discussed in this spirit and in Chapters 10 and 11 some generalizations of many of the results for recursion theory are established.

This interesting book is intended for beginners and experts alike. A knowledge of mathematical logic is needed for reading of the Chapters 5 ("Self-reference in arithmetic") and 9 only. (jm)

A.P.Fordy, J.C.Wood (Eds.): Harmonic Maps and Intergrable Systems, Aspects of Mathematics, vol.E 23, Friedrich Vieweg & Sohn, Braunschweig, 1994, 329 pp., DM 88.00, ISBN 3-528-06554-0

On the mathematical side, the theory of harmonic maps between Riemannian manifolds is an important theme in differential geometry intensively studied last decades. On the side of mathematical physics, the integrability of σ-models and soliton-like solutions of various nonlinear equations became very popular topics recently. Both subjects belong to a circle of interrelated ideas quickly developed by an intensive research on both sides. The book brings a collection of papers describing various aspects of the subject. The first two introductory articles describe basic methods of integrable systems used in a soliton theory and show how they can be applied to the theory of harmonic maps. They are very nicely written and give a basic orientation in the field to an uninitiated reader. The other ten articles discuss connections with geometry of surfaces (zero curvature formulation of classical equations, e.g. for constant mean curvature of constant Gauss curvature surfaces); chiral models (soliton type solutions and their time evolution); applications of the Adler-Kostant-Symes scheme for construction of harmonic maps and the twistor theory methods of finding harmonic maps. As a whole, the book gives a coherent description of the field and is very valuable both for mathematicians and physicists interested in the field. (vs)

K.Yang: Complex Algebraic Geometry. An Introduction to Curves and Surfaces, Pure and Applied Mathematics, vol.149, Marcel Dekker, Inc., New York, 1991, viii+303 pp., $ 115.00, ISBN 0-824-78591-6

The book consists of a collection of seminar notes and its purpose is to be a guide to complex algebraic geometry for nonexperts. The content of the book is similar to the classical book of Griffiths and Harris: Principles of Algebraic geometry, Wiley 1978 but the book is more comprehensive and a lot of proofs are omitted. On the contrary, the main ideas and principles of algebraic geometry are very well presented here. The analytic approach is used frequently in the book together with some special topics in complex manifold theory. Special attention is paid to the theory of curves and compact Riemann surfaces as well as to algebraic surfaces and their Kodaira-Enriques classification. (jbu)

J.-L.Brylinski: Loop Spaces, Characteristic Classes and Geometric Quantization, Progress in Mathematics, vol.107, Birkhäuser, Boston, 1992, xvi+300 pp., DM 94.00, ISBN 3-764-33644-7, ISBN 0-817-63644-7

Characteristic classes are cohomology classes associated to a vector bundle or a principal bundle over a manifold, they are often used as obstructions to the existence of some structures on a bundle. In the last years characteristic classes have been used to construct some objects in infinite-dimensional geometry, loop groups, geometric quantization and gauge theory. In the book a generalization of Chern-Weil theory of characteristic classes to the case of gerbes (i.e. fibre bundles on a manifold, fibres of which are groupoids) is developed. The gerbes are frequently used in geometry, the book gives a foundation of the theory of Dixmier-Douady sheaves of groupoids and their relations with cohomology of Lie groups and loop groups. The book contains also parts devoted to the theory of the space of knots and its structure (complex, symplectic, Riemannian), description of line bundles over loop spaces, Delinghe cohomology and use of line bundles in geometric quantization theory. The last chapter treats the Dirac magnetic monopole and its relation with the previous theory. The book is very well written and presents also a lot of open problems for further research. (jbu)

M.Audin, J.Lafontaine (Eds.): Holomorphic Curves in Symplectic Geometry, Progress in Mathematics, vol.117, Birkhäuser Verlag, Basel, 1994, xi+328 pp., sFr 98.00, ISBN 3-764-32997-1, ISBN 0-817-62997-1

The book is based on lectures given in CIMPA Summer School held in Sophia-Antipolis in July 1992 and was devoted to the study of results of Gromov on pseudoholomorphic curves in symplectic manifolds and related topics. There are several individual papers composed together by editors in a way that as a result we have very good and systematically presented source for the study of the subject and further research. In the introduction an indication how to solve some topological problems in symplectic geometry using pseudoholomorphic curves techniques is given. The main part of the book is divided into three parts. In the first part, a nice introduction to the basic symplectic geometry and the relation between symplectic and almost complex manifold is presented. Some relevant Riemannian geometry and theory of linear connections, Chern classes and Riemann-Roch theorem is introduced in part two. In the last part several main topics from the theory of holomorphic curves in almost complex manifolds, as e.g. their singularities, Gromow-Schwarz lemma, compactness problems and symplectic rigidity are studied. There are also several appendices to the chapters with remarks, comments and open problems. Two chapters are written in French, the rest in English language. (jbu)

A.Visintin: Differential Models of Hysteresis, Applied Mathematical Sciences, vol.111, Springer-Verlag, Berlin, 1994, xi+407 pp., 46 fig., DM 94.00, ISBN 0-387-54793-2, ISBN 3-540-54793-2

The mathematical theory of hysteresis became already a standard topic within Springer's publishing activity. After the English version of the pioneering monograph by Krasnosel'skii and Pokrovskii (1989), Mayergoyz' monograph (1991) on the Preisach model of hysteresis and the Proceedings of the Montecatini course on hysteresis and phase transitions (Brokate et al. 1994, A. Visintin, ed.), the present volume provides the first complete information on the state of affairs in modelling of phenomena described by partial differential equations with constitutive laws of hysteresis type. The book is divided into two parts. In the first part the author gives a list of models of hysteresis that characterize constitutive relations in systems with memory and studies the properties of the corresponding hysteresis operators in appropriate function spaces. The exposition is mainly focused on elastoplasticity, but connection to other branches of applied sciences, e.g. ferromagnetism, phase transitions or fracture dynamics is also shown. The second part presents the results achieved mainly by the author in the 80's and provides a detailed analysis of methods of solving partial differential equations with hysteretic nonlinearities. This volume will certainly become a basic reference book in the theory of partial differential equations with hysteresis. It is of high interest for researchers and advanced students in this area. (pk)

A.Heck: Introduction to Maple, Springer-Verlag, Berlin, 1993 xiii+497 pp., 84 fig., DM 68.00, ISBN 0-387-97662-0, ISBN 3-540-97662-0

Maple is a modern computer algebra system that automates the symbolic, numeric and graphic computation in mathematical problem solving. This aspect makes MAPLE a powerful tool for students, teachers, scientists, engineers and anyone who needs mathematics. Book itself is nice introduction to Maple and provides a gentle presentation of this algebra system. It intends to teach not only what can be done by the system but also why and how this can be done. Emphasis is more on understanding Maple than on factual knowledge of build in facilities. The book contains both elementary and more sophisticated examples and many exercises. They stimulate to use the Maple and encourage to find ones own way through system. On the other hand, the usage of Maple as a programming language is not discussed at a higher level that of defining simple procedures and using simple language constructs. However, the Maple data structures are discussed in great detail because good understanding of them is necessary for manipulating and simplifying expressions effectively and forms a good starting point to acquaint with Maple as a programming language. Notice that the version used and described is that of Maple V Release 2. Book itself is based on courses given by the author at Nijmegen University since 1987. (ja)

H.Fujimoto: Value Distribution Theory of the Gauss Map of Minimal Surfaces in R^m, Aspects of Mathematics, vol.E21, Friedrich Vieweg & Sohn, Braunschweig, 1993, xiv+207 pp., DM 64.00, ISBN 3-528-06467-6

The main topic of the book is an analogue of value distribution theorems in classical function theory for the Gauss map of a minimal surface. Everybody knows that a (nonconstant) entire function misses at most two points in $P^1(\mathbf{C})$. A generalization for holomorphic maps from $\mathbf{C}$ to $P^n(\mathbf{C})$ was found by E.Borel and R.Nevanlinna. The Gauss map of an oriented m-dimensional surface M can be interpreted as a map from M to $P^{m-1}(\mathbf{C})$. The author proved recently a very nice theorem saying that the Gauss map of a (nonflat) complete minimal surface in $\mathbf{R}^3$ misses at most 4 points in $P^1(\mathbf{C})$ and an analogue of it in higher-dimensional situation. A more detailed understanding came with defect relations proved during last few years. The book contains a systematic exposition of these facts. The basic tool is the value distribution theory for holomorphic maps from $\mathbf{C}$ to $P^{k_1} \times \ldots \times P^{k_l}$, which is developed from the beginning here. The book is nicely and systematically written and uses only minimal prerequisites, hence it can be recommended to anybody

interested in the subject, including graduate students. (vs)

M.M.Djrbashian:Harmonic Analysis and Boundary Value Problems in the Complex Domain, Operator Theory. Advances and Applications, vol.65, Birkhäuser, Basel, 1993, xiii+256 pp., sFr 128.00, ISBN 3-7643-2855-X, ISBN 0-8176-2855-X

The book under review is devoted to harmonic analysis in the complex domain. First, the interpolation expansions for some Banach spaces of entire functions of any natural order are established. The interpolation nodes are the zeros of entire functions of Mittag-Lefler type. With the help of this expansions an explicit construction of systems of vector functions forming biorthogonal systems in the Hilbert space of s-dimensional vector functions on the interval $(0, \sigma)$ is given. It is shown that these biorthogonal systems can be interpreted as systems of functions on s intervals going out from the origin and lying on the Riemann surface G^{∞} of $\mathrm{Ln}z$ and that these systems (similarly to the classical Fourier systems) represent systems of eigenfunctions for certain boundary value problems for differential operators of fractional order in the sense of Riemann-Liouville. Finally, the passage from G^{∞} to the complex plane $\mathbf{C}$ is made and as a result the systems of entire functions similar to Fourier systems in the weighted L_2 - classes over suitable sets of intervals in $\mathbf{C}$ are obtained. The analytical apparatus is technically very complicated and is based on the thorough study of entire functions of the Mittag-Lefler type. There are a lot of misprints. (jf)

P.M.Neumann, G.A.Stoy, E.C.Thompson: Groups and Geometry, Oxford University Press, Oxford, 1994, vi+254 pp., 19.50, ISBN 0-198-53452-3, ISBN 0-198-53451-5

Groups and Geometry, undoubtedly, contributes to the desired student's understanding of the whole of mathematics by demonstrating the linkages amongst various mathematical theories presented often in separate university courses. The book consists of two parts. The first part is dedicated to the algebraic theory of groups, yielding the key-notion of a G-space and examining its algebraic properties, while the second one deals with Euclidean, affine, projective and inverse geometries as G-spaces for an appropriate group G acting on a point-space Ω. Using the notion of the equivalence of G-spaces, a vectorial representation of geometry is defined and problems of the independence of geometrical properties upon the choice of the particular coordinate system is handled efficiently and with elegance.

Both parts of the book differ not only in contents but also in a didactic approach. Many useful statements are subjects of numerous exercises which, in the first part of the book, are preceded by the 'Specimen solutions to selected exercises'. It was this feature which was helpful to me and, as I believe, will be so to most of average readers in their respective effort to understand and learn the theory. The first part contains many examples, the overwhelming majority of which appears to be ready for use in the second part of the mentioned book.

Some other than vectorial representations of geometries are presented in the e second part. To deal with circular inversions, the complex numbers are employed and the geometrical significance of the quaternions (and to some extent also of Clifford algebras) are demonstrated. The chapter on symmetries of Platonic polyhedra offers the most interesting finite transformation groups. The spacial imagination of the readers is stimulated and cultivated in many places, where the considerations are linked to the 'real space geometry'. The last chapter introduces the 'group of the Rubik's cube' and encourages curious readers to learn about it by their 'sense of touch'.

The title seems to me as an excellent text-book. especially for a university course designed to complete the education in geometry for the prospective secondary-school mathematics teachers. Furthermore, a mention of non-Euclidean geometries would add - in my opinion - to the excellence of this book. (jtro)

D.Gillies (Ed.): Revolutions in Mathematics, Clarendon Press, Oxford, 1992, viii+353 pp., GBP 55.00, ISBN 0-198-53940-1

This is a collection of fifteen essays written by outstanding historians of mathematics, about some significant events in mathematics: the discovery by the ancient Greeks of incommensurable magnitudes; the creation of transfinite set theory by G. Cantor; A. Robinson's non-standard analysis; the presentation of some of the most important results in the Descartes's Gometrie; Leibnitz's and Newton's work on the infinitesimal calculus, critic of Berkeley and Maclaurin's reply; non-Euclidean geometry; the transformation of geometrical thought in the nineteenth century; non-commutative algebra; algebraic number theory; Finsler's theory of sets; the work of Frege in logic. All these themes are unified by the question implicitly contained in the title of the book: do there occur revolutions in mathematics? This question was proposed under the influence of the pioneering work of J.S.Kuhn: The structure of scientific revolutions (1962), where a new approach to the historiography of science is coined. The basic concepts of Kuhn's theory are discussed and the problem of their applicability to the history of mathematics is illuminated from different sides. A very extensive and interesting bibliography is available. (jf)

I.Rubinstein, L.Rubinstein: Partial Differential Equations in Classical Mathematical Physics, Cambridge University Press, Cambridge, 1993, xiv+676 pp., GBP 60.00, ISBN 0-521-41058-4

Partial differential equations are fundamental for the modelling of natural phenomena in various fields of natural sciences. The book represents a general approach that views the theory of partial differential

equations as an interdisciplinary science that considers mathematical phenomena as a reflection of their physical counterparts. It gives a concise, comprehensive and mathematically rigorous account of the classical theory of partial differential equations together with simultaneous origins of basic mathematical objects in different contexts in natural sciences and it takes great care in explaining the consequences of purely mathematical results for corresponding modelled phenomena. The first chapters are devoted to deducing of typical equations of mathematical physics. Chapter 3 deals with Cauchy problem for first order PDES. The following chapter starts the study of second order PDE with classification of PDES with linear principal part. In the next four chapters the Cauchy, mixed and Goursat problem for the wave equation are treated. Chapters 9-12 study harmonic functions and elements of potential theory while chapters 13-18 consider analogous problems for the heat equation. Chapter 19 offers a variety of applications of Fourier methods in bounded regions. As a counterpart for unbounded regions, integral transform methods are described in the last chapter 20. The main text is accompanied by 5 appendices on Bessel functions, Sturm-Liouville problem, etc. Especially interesting is the Appendix 5 giving examples of solutions of nontrivial engineering problems. While the bulk of the book is addressed to graduate students of applied mathematics and of the natural and engineering sciences, some parts are of interest for specialists in the field. (js)

D.W.Stroock: A Concise Introduction to the Theory of Integration. Second Edition, Birkhäuser, Boston, 1994, viii+184 pp., DM 58.00, ISBN 0-817-63759-1, ISBN 3-764-33759-1

This book combines in 158 pages basic facts of modern integration theory and parts of advanced calculus. It begins with Riemann and Riemann-Stieltjes integration. Then the idea of the Lebesgue measure and Lebesgue integral is explained. The existence of the Lebesgue measure is done via the exterior measure. Measurable sets can be approximated by open sets to within arbitrarily small measure. Standard material on the Lebesgue integration with respect to abstract measures is covered. Lebesgue's differentiation theorem is proved using the Hardy-Littlewood maximal function and Sunrise Lemma. Tonelli's and Fubini's theorems are presented in the context of σ- finite abstract measures. Steiner symmetrization and the isodiametric inequality is used to prove that the Lebesgue measure is a special case of Hausdorff type measures. The chapter "Changes of Variable" differs from traditional approaches. First the polar coordinates (with a suitably defined surface measure) are introduced. It is in turn explained that Lebesgue's measure can be differentiated across a smooth surface (Jacobi's transformation). At transformation formula is proved for C^2 - mappings, which simplifies arguments and still provides an applicable result. For a hypersurface of class C^3, the surface measure is introduced and a form of the divergence theorem is proved. The rest of the book covers more or less standard material: inequalities, Lebesgue spaces and convolution. The last chapter (20 pages) provides the Daniell, Stone and Riesz representation theorems, the dual of L^2 and von Neumann's proof of the Radon-Nikodym theorem. The book is an excellent (and surely concise) introduction to the subject. The author succeeded in choosing the right level of generality and showed how a good combination of a measure and integration course and advanced calculus can be done. Strongly recommended to students as well as to teachers. (in)

J.Dauns: Modules and Rings, Cambridge University Press, Cambridge, 1994, xviii+442 pp., GBP 45.00, ISBN 0-521-46258-4

This book is a well written introductory textbook which will appeal to both upper level undergraduate and beginning graduate students. Also anyone who needs to learn ring and module theory from the backgrounds will find the book useful (no prerequisites beyond the scope of standard linear algebra are necessary). The first part of the text covers some basic material (as free modules, projective modules, simple modules, primitive rings, tensor products) while the second part is devoted to more advanced concepts (hereditary rings, flat modules, universal purity, pure injective modules). The material is supplied with numerous exercises. (tk)

D.Stirzaker: Elementary Probability, Cambridge University Press, Cambridge, 1994, x+406 pp., GBP 45.00, ISBN 0-521-42028-8, ISBN 0-521-42183-7

This is a modern and more than an elementary treatment of the topic. The style of the presentation resembles the famous book of William Feller. It is more concise, however, and includes recent results from the probability theory and is easy to follow. The book is both rich in theory and examples. The theoretical parts cover the standard topics of an elementary course on the topic. The examples form an excellent and most important part of the book. The reader will find various applications from insurance, risk theory, and simulation techniques as well as classical probability puzzles. The book is an excellent one, recommended to everybody. (jh)

A.S.Kechris: Classical Descriptive Set Theory, Graduate Texts in Mathematics, vol.156, Springer-Verlag, New York, 1995, xvi+402 pp., 34 fig., DM 79.00, ISBN 3-540-94374-9, ISBN 0-387-94374-9

Classical descriptive set theory is understood as the study of Borel and projective sets in Polish spaces. The aim of this monograph is to give an introduction to this theory and ideas of connections to other areas of mathematics. The core of the theory is contained in separate chapters on Borel, analytic, co-analytic and projective sets. As well as recent knowledge of the classical theory on separation of sets, projections, uniformizations, selections etc., detailed study is devoted also to infinite games and their connections to definability of sets. The theory of ranks

and scales is the central point in some parts of the theory of co-analytic and analytic sets. The periodicity theorems concerning properties of the higher projective classes form the main content of the last chapter. There are many applications and some closely connected topics are investigated, too. Let us point out, for example, the very interesting part on relations to set theory including the forcing method, Ramsey type theory for sets with the Baire property and its application to prove Rosenthal theorem on Banach spaces containing l_1. Extra paragraphs are devoted to measure theory and many results on hyperspaces of sets and σ-ideals of sets can be found. The book contains in some directions much more than the only introduction to the classical theory. Many classical results appear in a generality only recently known. Many of the author's own results and/or proofs are given. The organization of the book is very clear and make it easy to be used not only as an introductory text but also as a reference source. The proofs are often very brief and they assume the reader has some experience. There are about 400 exercises giving often more information about further known results with hints to prove them. The introductory chapter is devoted to Polish spaces and three appendices to a set-theoretical background needed throughout the book. The information on relations to other parts of descriptive set theory and other areas of mathematics are added. The book is an up-to-date survey of the knowledge on "definable" sets in Polish spaces which could not have been covered by classical monographs or by recent books devoted to modern effective descriptive set theory or to the theory of analytic topological spaces. (phol)

R.M.Corless: Essential Maple. An Introduction for Scientific Programmers, Springer-Verlag, New York, 1995, xv+218 pp., 32 fig., DM 34.00, ISBN 0-387-94209-2, ISBN 3-540-94209-2

This book is another addition to the family of MAPLE (a computer algebra system) textbooks. For this reason, it gives an overview of the MAPLE basic constructs and an introduction to MAPLE programming. What features has this book got then? Firstly, it is an accelerated introduction to MAPLE. Secondly, it is written for scientific programmers, which means for those who have experience with any computer language (for instance C or Pascal). And finally, it contains a keyword summary (Chapter 4). The summary is very useful for everybody who doesn't want to learn the exact form of all MAPLE commands. The chapter is easy to use, since it is organized by subject matter. Of course, the book contains many exercises and an index. The book is very nicely written and recommended to everybody. (ml)

M.Fukushima, Y.Oshima, M.Takeda: Dirichlet Forms and Symmetric Markov Processes, de Gruyter Studies in Mathematics, vol.19, Walter de Gruyter, Berlin, 1994, viii+392 pp., DM 168.00, ISBN 3-110-11626-X

The book represents an essentially enlarged version of Fukushima's monograph "Dirichlet forms and Markov processes" (Kodansha and North-Holland, 1980), partly combined with Oshima's lectures in 1988. The text is reorganized and contains new material covering the research in this field in the last decade. The first part of the book is a self-contained introduction to the theory of symmetric Dirichlet forms and is concerned with notions like Dirichlet forms, Markovian semigroups, capacity, quasi-continuity, closability or formulae of Beurling-Deny and LeJan. (Notice that this theory has its roots in the notion of a Dirichlet space introduced just by A. Beurling and J. Deny in 1958.) In the second part this analytic theory is unified with the probabilistic potential theory based on symmetric Markov processes and developed further in conjunction with the stochastic analysis based on the additive functionals. The Appendix contains chapters on Choquet capacities, Hunt processes, martingale additive functionals and regular representations of Dirichlet spaces. Nowadays, the theory of Dirichlet forms has undergone its rapid development. New methods and approaches have brought more understanding of some classical parts of this field. Besides the book under review new monographs appeared quite recently - book by N. Bouleau and F. Hirsch (1991), lecture notes by Y. Oshima (1988), or the treatment of non-symmetric Dirichlet forms by Z.M. Ma and M. Röckner (1992). (jl)

R.Bölling (Ed.): Das Fotoalbum für Weierstrass. A Photo Album for Weierstrass, Friedrich Vieweg & Sohn, Braunschweig, 1994, xii+116 pp., DM 98.00, ISBN 3-528-06602-4

At the occasion of his 70th birthday on 31st October 1885, the famous German mathematician Karl Weierstrass (1815–1897) was given a gift of a photo album with portraits of mathematicians. Nowadays, after hundred years, this album still exists. The publishing house Vieweg has issued this photo album of Weierstrass; it contains portraits of 334 mathematicians of Weierstrass' time. Editor Reinhard Bölling (Institut für Mathematik, Universität Potsdam) wrote the introductory parts about the life of Weierstrass, about the album and the birthday celebration. Further, the book contains extracts from some letters which are connected with the subject, the list of people featured in the album, sources and bibliography. All texts are in German and English. The book can be warmly recommended to everyone interested in the history of mathematics of 19th century. (jbe)

S.Chikara, S.Mitsuo, J.W.Dauben (Eds.): The Intersection of History and Mathematics, Science Networks - Historical Studies, vol.15, Birkhäuser, Basel, 1994, x+257 pp., DM 118.00, ISBN 3-764-35029-6, ISBN 0-817-65029-6

On the occasion of the 21st International Congress of Mathematicians (Japan, 1990), Japanese historians of mathematics organized the History of Mathematics

Symposium as one of the satelite conferences of the Congress. The Symposium preferred the following fields of study: mathematical traditions in the East, the history of modern European mathematics, interaction between mathematical research and the history of mathematics. The book presents 16 papers based on lectures from the Symposium. In the introductory contribution *Mathematics: A Historian's Perspective*, J. W. Dauben points out that an independent historian's research can make an indispensable contribution to the fruitful development of mathematics. Many interesting problems of the history of mathematics are discussed in the following articles (*Complex Curves – Origins and Intrinsic Geometry, Determinant Theory and Its Historical Evaluation, Three Aspects of the Theory of Complex Multiplication, Indian Mathematics in Arabic* and so on). The book can be recommended both to mathematicians as well as to students, it can be interesting for historians. (jbe)

S.Popkorn: First Steps in Modal Logic, Cambridge University Press, Cambridge, 1994, xiii+314 pp., GBP 25.00, ISBN 0-521-46482-X

The book deals with propositional modal logic on a classical (2-valued) base. The book is a good, clear and correct introduction to this whole subject. For a reader, a preliminary disposition of basic results of propositional logic is useful. The book is primarily aimed at a computer science readership, but no special knowledge of this field is assumed. Part 1, "Preliminaries", consists of a presentation of propositional logic and an introduction of propositional modal languages. In Part 2, the Kripke style of semantics for modal languages, based on the substantial notion of labelled transition structures, is discussed and a description of these structures by modal formulas is demonstrated. A proof theory (a syntax of deductions), and some completeness results, i.e., results about relations of semantic validity and the syntactic one, are presented in Part 3. Here, the difference between the completeness of the usual propositional logic and the modal one is clarified. The following two parts can be seen as a presentation of deeper results of a first course of modal logic. The fourth is called "Model constructions". The fifth contains, for example, the chapters "SLL logic" (connected with dynamic logic) and "Löb logic" (connected with properties of so called derivability conditions, which state the relations between the provability and its formalization). In Part 6, the useful appendices A and B "The what, why, where,... of modal logic" and "Some solutions of the exercises" are presented. (jml)

Yu.V.Egorov, M.A.Shubin (Eds.): Partial Differential Equations II. Elements of the Modern Theory. Equations with Constant Coefficients, Encyclopaedia of Mathematical Sciences, vol.31, Springer-Verlag, Berlin, 1994, 263 pp., 5 fig., DM 148.00, ISBN 3-540-52001-5, ISBN 0-387-52001-5

This volume is divided into two parts: I. Linear Partial Differential Equations. Elements of Modern Theory. (Yu.V.Egorov, M.A.Shubin) and II. Linear Partial Differential Equations with Constant Coefficients (A.I.Komech). The first part is basically devoted to those aspects of the theory that are connected with the direction which originated in the sixties and was later called "microlocal analysis". According to the authors: "This paper should be considered simply as an introduction to a series of more detailed papers by various authors which are being published in this and subsequent volumes in the present series and which will contain a detailed account of most of the question raised here." In the second part, the application of the distribution theory to partial differential equations with constant coefficients is treated. This survey can be of a great use not only to the researchers and graduated students in mathematics, but also to the theoretical physicists. (oj)

Yu.V.Egorov, M.A.Shubin (Eds.): Partial Differential Equations VI. Elliptic and Parabolic Operators, Encyclopaedia of Mathematical Sciences, vol.63, Springer-Verlag, Berlin, 1994, 325 pp., 5 fig., DM 144.00, ISBN 0-387-54678-2, ISBN 3-540-54678-2

This volume contains: I. Elliptic Operators on Closed Manifolds (M.S.Agranovich), II. Degenerate Elliptic Equations and Boundary Problems (S.Z.Levendorskij, B.Paneah), III. Parabolic Equations (S.D.Ejdel'man). In the first part, the elliptic differential and pseudodifferential operators with infinitely smooth symbols on infinitely smooth closed manifolds are considered. Spectral properties of elliptic operators are discussed, in general, without assuming selfadjointness. The subject matter of the second article is a survey of results concerning boundary value problem where the elliptic operator or/and boundary operators degenerate on some subsets. It is emphasized that many properties of elliptic operators and boundary value problems carry over to nondegenerate cases and the a priori estimates hold in other pairs of spaces. The core of the third part is the theory of the Cauchy and boundary value problems for linear parabolic equations and systems. The titles of the chapters are: Systems, problems, spaces. Fundamental solutions, Cauchy Problem. Parabolic boundary-value problem. (oj)

M.A.Shubin (Ed.): Partial Differential Equations VII. Spectral Thoery of Differential Operators, Encyclopaedia of Mathematical Sciences, vol.64, Springer-Verlag, Berlin, 1994, 272 pp., DM 148.00, ISBN 3-540-54677-4, ISBN 0-387-54677-4

Written by G.V.Rozenblum, M.A.Shubin and M.Z.Solomyak, the volume called Spectral Theory of Differential Operators contains a survey of various aspects of spectral analysis of many-dimensional linear operators (not only self-adjoint ones).

The authors emphasize that they "have striven to achieve a great degree of completeness in sections dealing with more up-to-date questions. In this

respect the individual scientific interests of the authors have played a certain role". The book represents a brilliant contribution to the series Encyclopaedia of Mathematical Sciences. (oj)

V.Komornik: Exact Controllability and Stabilization. The Multiplier Method, Research in Applied Mathematics, vol.36, J.Wiley & Sons, Inc., Chichester, 1994, viii+156 pp., GBP 19.95, ISBN 0-471-95367-9, ISBN 2-225-84612-X

The book is intended as an introduction to the theory of exact controllability and stabilization. At the same time, it contains many new results. Based on a series of lectures, the text is brief and concise, vivid and well written. The author deals with the wave equation, Maxwell's equations, Kirchhoff's plate equation and - in the last section - with the KdV equation. However, the methods presented in the book can be applied to some other equations as well. The first part (Chapters 1-7) is devoted to exact boundary controllability. While in Chapters 2-4 some results of Lions (with certain changes) are reproduced, in Chapter 5 a general and constructive approach to improve the usual estimates of the exact controllability time is developed. By means of that, in Chapter 6 most of the results from Chapters 3 and 4 are improved. In the second part the stabilizability is studied. In Chapters 8 and 9, among others, strong and uniform boundary stabilization theorems are proved. (oj)

W.K.Hayman: Multivalent Functions. Second Edition, Cambridge Tracts in Mathematics, vol.110, Cambridge University Press, Cambridge, 1994, xii+263 pp., GBP 35.00, ISBN 0-521-46026-3

All diletantes of geometric function theory will be very grateful to professor Hayman for the second edition of his – now classical – book Multivalent functions from 1958. All experts will admire and highly esteem the way in which he succeeded, without changing the conception of the book, in presenting an up-to-date book reflecting all the substantial progress made in the last 35 years in the theory of multivalent and univalent functions. Everywhere one can feel the traces of a careful inspection. Some of the original proofs have been simplified, newly added results have been chosen with a fine taste. We quote the regularity results of Eke (from 1967), Clunie-Pommerenke results on the coefficient estimates of mean p-valent functions (from 1967) and their sharpened form for univalent functions by Bernstein (1986) and Pommerenke (1985). The completely new Chapter 6 is devoted to the study of coefficient differences estimates and contains the results of Lucas (from 1969) for mean p-valent functions, of Leung (from 1978) for starlike functions and some recent results (from 1992) by Dawei Sheng. All the presentation of Hayman's pioneering regularity result for univalent functions (from 1955) and of the extraordinary elegant new proof of the classical Bloch's theorem by Bonk (from 1990) is to be welcome. In 1985 the Bieberbach conjecture was settled by L. de Branges. The entirely new chapter 8 is devoted to this great event. The author follows the new simplified proof of Milin's conjecture given by Weinstein in 1991 and presents, for the first time in the book literature, a self-contained proof of all results of de Branges. The reading of this well-thought-out book, written in the precise and absolutely clear Hayman's style, is a deep aesthetical and intellectual experience. (jfu)

J.Pfanzangl: Parametric Statistical Theory. With the assistance of R.Hamböker, de Gruyter Textbook, Walter de Gruyter, Berlin, 1994, xiii+374 pp., DM 98.00, ISBN 3-110-13863-8, ISBN 3-110-14030-6

The author cites a bon mot saying that a book consists of two equally important parts: the part which has been written and the part which has been omitted. The omitted part of the book under review includes both robust methods and Bayesian theory as well as some traditional topics considered by the author as practically less important, like admissibility, minimaxity, or Rao-Cramer lower bound. On the other hand, the core of the parametric statistical theory is treated in full depth and precision. The book starts with notions of sufficiency and completeness, exponential families, monotone likelihood ratio, equivariance and invariance. The non-asymptotic part of the book treats point estimation with emphasis on mean unbiased estimators and convex loss functions, testing hypotheses with traditional topics, and confidence procedures. The notions of concentration and median umbiasedness link both point and interval estimation. The asymptotic part of the book treats consistency, especially of M-and ML estimators, asymptotic distributions of estimators, asymptotic bounds for the concentration of estimators and confidence bounds and, finally, asymptotic test theory. The concept of local asymptotic normality and the Convolution Theorem play the main role. Numerous carefully chosen examples are worked out, relatively few are left unsolved as exercises for the reader. Motivating considerations and historical remarks enliven the rigorous mathematical text. (vd)

K.Jänich: Linear Algebra, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1994, ix+204 pp., 58 fig., DM 64.00, ISBN 0-387-94128-2, ISBN 3-540-94128-2

This text explains much of the standard material from linear algebra. It begins with with sets and maps, vector spaces and linear maps. Then it continues via matrix calculus and determinants to systems of linear equations. The text also contains presentations of Euclidean vector spaces and then it focuses on eigenvalues. The final chapters are dedicated to the principal axes transformation and to the classification of matrices (including the Jordan normal form and the Sylvester inertia theorem). Detailed answers to exercises are given at the end of the book. The book is nicely written and one can agree with the author: "...I

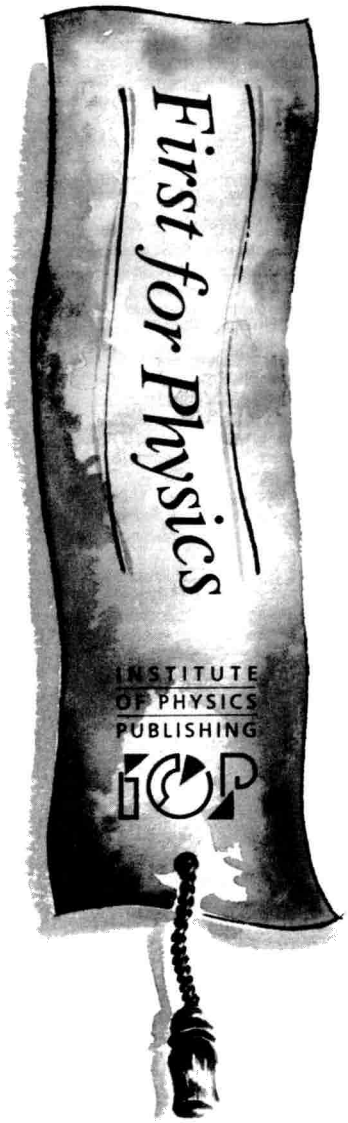
hope the reader will still see the presence of a young lecturer, enthusiastically urging his audience to enjoy linear algebra." The reader may be interested also in the special way the book is organized: "...Since I had a mixed audience of mathematics and physics students, I tried to give each group some special attention, which in the book results in certain sections being marked "for physicists" or "for mathematicians". ..." The usual price for this approach is paid: many important proofs are not included in the text. (lbe)

N.Koblitz: A Course in Number Theory and Cryptography. Second Edition, Graduate Texts in Mathematics, vol.114, Springer-Verlag, New York, 1994, x+235 pp., 5 fig., DM 68.00, ISBN 0-387-94293-9, ISBN 3-540-94293-9

This book is the second edition (the first one published in 1987); it gives new insights into the number theory and the cryptography and provides a complete introduction, beginning with finite fields and quadratic residues, then moving to cryptosystems and to the ideas of the public key cryptography. The final two chapters present a nice exposition on the use of primes and on the factoring of numbers (including e.g. pseudoprimes and Fermat factorization) and a detailed exposition on the application of elliptic curves to cryptography. The text is accompanied by numerous exercises and references. The answers to exercises are given at the end of the book. The text is clearly arranged and very well written. To amuse readers, the text uses some exercises with a message written in the Cyrillic alphabet (cf. the exercise III.2.10 where the solution is found in Russian and has the meaning "GLORY TO THE CPSU"). The following words of the author are worth noticing: "... The author's royalties from sales of the book will be used to buy mathematics and science books for the universities and institutes of those three countries (Vietnam, Nicaragua and El Salvador)." (lbe)

A.Tucker: Applied Combinatorics. Third Edition, J.Wiley & Sons, Inc., New York, 1995, ix+462 pp., GBP 18.50, ISBN 0-471-11091-4, ISBN 0-471-59504-7

The book acquaints the reader with the wide area of combinatorial analysis. In spite of the fact that it is designed for use by students there are no doubts that it can be useful also for everyone who is interested in the applications of combinatorics. The book contains the basic results and method concerning graph theory (planar graphs, graph coloring, covering circuits, properties of trees, the travelling salesperson problem, network algorithms) and enumeration (arrangements, selections, distributions, ordinary and exponential functions, recurrence relations and their solutions, inclusion-exclusion formula). In the chapter on additional topics, there is an enlightening discussion of Polya's formula and application of graph theory for some types of games; in the appendix few words are devoted to set theory, logic, mathematical induction and the pigeonhole principle. At the end of every chapter there is a summary and references; the book provides a glossary of counting and graph theory terms and a bibliography containing about thirty titles. In the book theory is minimized and the proofs are given only sometimes, e.g. if they can be used for solving problems. The explanation of the theory comes out of the motivation examples. There is a large amount of solved problems and examples and many exercises for the reader (with the results of many of them). At the end of the preface the author thanks his students because "it was they who taught me how to teach this subject." In my opinion, the book documents that the students were really good teachers. (ec)



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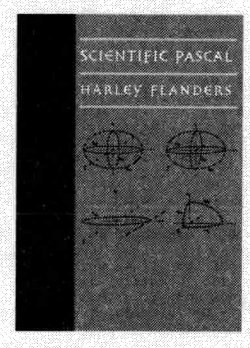

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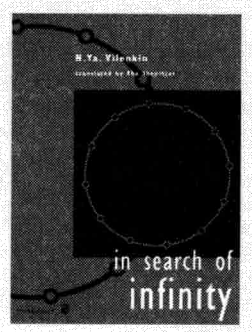

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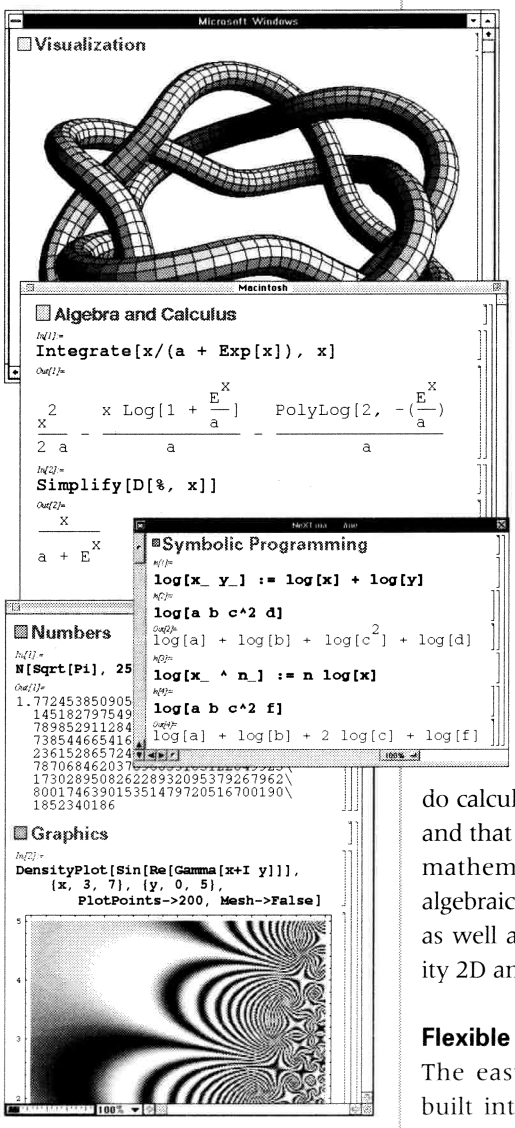

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